KNOWLEDGE GAP OF THE FARMERS IN PULSE PRODUCTION

BY

SHILPI KUNDU

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Approved By:

.....	.....
(Professor Dr. Md. Rafiquel Islam)	**(Professor Dr. Md. Sekender Ali)**
Supervisor	**Co-supervisor**

.....
(Professor Dr. Md. Rafiquel Islam)
Chairman
Examination Committee

CERTIFICATE

This to certify that the thesis entitled, **"KNOWLEDGE GAP OF THE FARMERS IN PULSE PRODUCTION"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (MS) in AGRICULTURAL EXTENSION** embodies the result of a piece of *bona fide* research work carried out by **SHILPI KUNDU, Roll No. 04 01275**, Registration **No. 04 01275** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:.....
Dhaka, Bangladesh.

.....
(Professor Dr. Md. Rafiquel Islam)
Supervisor

DEDICATED TO
MY
BELOVED PARENTS

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ABSTRACT

The study was conducted in Raghdi Union under Muksudpur Upazilla of Gopalgonj District. The main purpose of the study was to find out the knowledge gap of the farmers in pulse production, to explore the relationship & contribution of the selected characteristics of the farmers to/on their knowledge gap in pulse production and to identify problems faced by the farmers in pulse production. Data were collected personally through interview schedule from 112 randomly selected pulse farmers from three villages of the selected union during 13 July to 12 August, 2011. Knowledge gap of the farmers in pulse production was dependent variable and selected characteristics were independent variables. Finding revealed that about two third (64.3 percent) of the respondents had medium to high knowledge gap in pulse production. Co-efficient of correlation shows that out of 10 variables only 5 variables namely age, education, farming experience, economic motivation and risk orientation had significant negative relationship to knowledge gap. Stepwise multiple regression analysis shows that out of 10 variables only 3 such as education, farming experience and economic motivation had negative contribution on knowledge gap in pulse production and they combinetly explained 45.8 percent knowledge gap. Out of 11 selected problems lack of HYV seed ranked first followed by high price of HYV seed and lack of knowledge on disease and pest control.

CHAPTER I

INTRODUCTION

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1.1 Background

Bangladesh is a country of 1,47,500 square kilometers and it is geographically located between 20° 34" and 28° 88" north latitude and 80° 1" and 92° 42" east longitude. Agriculture is the heart of Bangladesh. Bangladesh endowed with a favourable climate and soil for the production of different crops year round due to having a lot of rivers and tributaries. Heavy silts deposited by the rivers during the rainy seasons are continuously enriching the alluvial soil.

Pulses play an important role in agriculture and in the diet of people of Bangladesh. The importance of pulses in the dietary system of people of Bangladesh is often forgotten, pulses have been considered as a poor man's diet since those are the cheapest source of protein.They occupy an area of about 0.3 million hectare (2.34 percent of the total cropped area and contribute about 1.07 percent of the total grain production of the country (Ahmed 1985) The major pulses are grasspea, lentil, chickpea, mungbean, fieldpea etc. Among these grasspeas, lentil, chickpea and fieldpea are grown during winter season and contribute about 80 percent of the total pulse. Most of the pulse crops are grown in a few districts. These are Faridpur, Pabna, Jessore, Rajshahi, Kustia Rangpur, Tangail and Kishoregonj (Gowda, 1984).

There is a tremendous pressure on the cultivable land and farms are usually very small due to increasing population, land fragmentation , economic ownership and inheritance regulation. According to BBS, 2009 the total land area of Bangladesh is 14.84 million hectare of which 8.29 million hectares are cultivable land and 8.022 milion hectares are net cropped area. There is no scope to bring any new land under pulses cultivation. Average area of land for pulses production decline gradually (BBS and DAE, 2010). To meet the existing food demand of the population, production per unit area must be increased that means croping intensity must be increased.

In spite of this, the per capita daily consumption of pulse is about 10 gm in Bangladesh as compared to neighboring India where it is about 45 gm as against the Food and Agricultural Organization (FAO)/World Health Organization (WHO) recommended minimum pulse intake of 80 gm per day per capita (Gowda, 1984). Pulses have not only twice the protein content of cereals, but also contain more protein on weight basis than eggs, fish and flesh foods. Pulses also play an important role in providing valuable fodder and feed stuff to the cattle and poultry. Pulses have the remarkable quality of helping the symbiotic root rhizoid in fixing atmospheric Nitrogen. Prosperity of agriculture is generally measured by the level of production and the extent of probability. Bangladesh endowed with a favourable climate and soil for the production of different crops year round. Although the agro-climatic conditions of Bangladesh are so suitable for the cultivation of large variety of crops but about 80 percent of the gross cropped area are at present confined to the production of rice and wheat. As a result, the people of Bangladesh are suffering from severe malnutrition. The Government of Bangladesh has given emphasis on pulse production in the year round to meet the nutritional and caloric need increasing employment opportunities and income of the farmers. To make the pulse cultivation profitable, it is necessary to involve farmers in production, planning and ascertain problem with regard to pulse production.

Since all pulse crops are traditionally grown during dry winter months, the reasons for decline in the area under it is quite clear. There is acute competition of land during winter season. To maintain food security farmers produce more and more rice, wheat. Recent experiences show that it is feasible to grow summer mung bean and black gram with proper management under the existing cropping patterns of the country. At present every year we have to import a lot of pulses from our neighboring country. It is therefore necessary to raise our pulse production through increasing cropping intensity and introducing modern methods.

Food production has been given the highest priority in Bangladesh for meeting the demand of its ever increasing population. As a consequence, cereal production has increased significantly over the past few years but pulse crops have been declining

gradually during the last few years. It occurs due to lack of appropriate knowledge on pulse crops and moreover most of the technical and financial support directed towards rice and wheat. Table 1 shows area under pulse and their production for last 10 years.

Table1. Area under Pulse Crop and their Production (1999- 00 to 2008- 2009)

Year	Area ('000'acres)	Production ('000' M. Tons)
1999-2000	1184	370
2000- 2001	1128	352
2001- 2002	1126	344
2002- 2003	1108	349
2003-2004	1040	333
2004- 2005	947	316
2005- 2006	833	279
2006- 2007	810	271
2007-2008	567	205
2008-2009	559	196

Source: Yearbook of Agricultural Statistics of Bangladesh, 2009

As such it has gained priority for the generation of new technologies and in terms of research in pulses and onward transfer of those to the end-users. In Bangladesh, the modern and the HYV program was launched in the middle of 20th century. For this purpose, the government of Bangladesh has established agricultural research system to generate appropriate technologies and also extension system to transfer these technologies at the farmer levels to increase production. At present different research organizations under National Agricultural Research System (NARS) have been working with a view to develop technologies in the field of agriculture. These research institutes are BARI, BINA, BSMRAU, BAU, etc. They develop a lot of modern varieties of different pulses and also develop different practices for production of these modern varieties. But at farmers' level, the yields of different varieties are not same as that of the research stations because farmers do not follow the entire package of practices. As such there is large yield gap between the experimental stations and those of farmers' field.

To increase the production of pulses farmers need to adopt modern varieties as well as the appropriate practices as recommended. The recommended practices are balanced fertilizer application, timely and appropriate irrigation, modern recommended variety, time of sowing, weeding, and insect pests' control. Low yield can be mitigated in the era when scientific knowledge is available and that knowledge is used appropriately.

1.2 Statement of the problem

There are number of proven recommended technologies but not all of those are accepted by the farmers although they are intelligent and hard working. As a result a wide gap between actual achievement and achievable potential in the pulse farming system still exists. Attainment of highest possible yields in pulse and thereby maximum profit may be achieved only when farmers are well equipped with required technological knowledge and needed inputs and other relevant supports and most authentically if knowledge and skills are applied correctly in the field. On the basis of the above discussion, the researcher undertook an investigation entitled "Knowledge Gap of the Farmers in Pulse Production." The main purpose of the study was to determine knowledge gap of the farmers in pulse production, to find out relationship between selected characteristics of the farmers and their knowledge gap and to ascertain the contribution of the selected characteristics of the farmers to their knowledge gap in pulse production. The study attempts to find out the answers of the following questions:

1. To what extent the farmers have knowledge gap in pulse production?
2. What are the selected characteristics of the pulse producing farmers?
3. To what extent the relationships exist between the selected characteristics of the farmers and their knowledge gap?
4. To what extent the selected characteristics of the farmers contribute to their knowledge gap?
5. What are the constraints faced by the farmers in pulse production?

1.3 Objectives

The main objective of this study is to find out the knowledge gap of the farmers in pulse production. However, the specific objectives of the study are as follows:

1. To determine and describe the following characteristics of the pulse farmers:
    a. Age
    b. Education
    c. Farm size
    d. Pulse production area
    e. Farming experience
    f. Annual family Income
    g. Credit received
    h. Agricultural inputs availability
    i. Economic motivation
    j. Risk orientation
2. To determine the knowledge gap of the farmers in pulse production
3. To explore the relationship between the selected characteristics of the farmers and their knowledge gap in pulse production
4. To explore the contribution of the selected characteristics of the farmers on their knowledge gap in pulse production
5. To identify the constraints faced by the farmers in pulse production

1.4 Scope and limitations of this study

The study was undertaken with a view to have an understanding of the knowledge gap of the farmers in cultivating pulse crops. In order to conduct the research in a meaningful and manageable way it becomes necessary to impose some limitations in regard to certain

dimensions of the study. Considering the limitation of time, money and other resources available to the researcher, the following limitations have been observed throughout the study.

1. The study was confined to Muksudpur upazilla in Gopalgonj district.
2. The study was limited to the pulse growers and they were the population of this study.
3. Population for the study was kept confined within the heads of the farm families because they were the decision makers in their respective families and also to those who were directly associated with the pulse production.
4. There were various issue of determining knowledge gap and many sorts of constraints connected with this issue. It was not possible for the researcher to include all aspects of pulse production constraints in a single study. In this study the researcher considered only six knowledge gap determination by the pulse growers for pulse cultivation.
5. Collection of all relevant data was limited to the farmers growing in pulse in the study area.
6. Relationship of the knowledge gap in pulse cultivation could be studied with the various characteristics of the farmers but only 10 characteristics of the farmers were selected for investigation in this study.

1.5 Assumptions of the study

An assumption is the supposition that an apparent or principle is true in the light of the available evidence (Goode and Hatt, 1952). The researcher had the following assumptions in mind while undertaking this study:

1. The respondents included in the sample were capable of furnishing proper responses to the questions included in the interview schedule.
2. The responses furnished by the respondents were reliable. They express the truth while passing their opinions and providing information.
3. The views and opinions furnished by the pulse growers included in the sample were the representative views and opinions of all the pulse growers of the study.

4. The researcher who acted as interviewer was well adjusted to the social and cultural environment of the study area. Hence, the respondents furnished their correct opinions without hesitation.
5. Data were normally and independently distributed with their means and standard deviation.

1.6 Definition of terms and concepts

A number of terms, concepts and variables have been used throughout the study with specific meaning. In order to avoid the undesired confusions of the meaning, these are defined and interpreted as follows:

Gap: Gap means the difference between what was intended and what has been obtained or achieved.

Technology: Technology refers to the combination of knowledge, inputs and management practice which are used together with productive resources to gain a desired output.

Age: Age of a farmer referred to the period of time spent by him starting from birth to the time of interview.

Education: Education means years of schooling. It implies to the extent of formal schooling of the respondent at any kind of educational Institutes.

Farming experience: Farming experience means the length of time period spent by the farmers in crop production activities up to the time of interview.

Farm size: Farm size means the total area of land on which a farmer's family carries on farming operations in term of full benefit to the family.

Pulse production area: The area of land which is engaged in pulse crop production.

Annual family income: Annual income refers to the total earning of a farmer and the members of his family both from agriculture and other socially acceptable means such as business, service etc. during a year expressed in Takes.

Credit received: Credit received was the total amount of credit in Takes, a farmer received during the past one year from various sources for agricultural purposes.

Agricultural input availability: The things that are needed in agriculture can be obtained easily by the farmers.

Risk orientation: Risk orientation means the degree to which a farmer is oriented towards risk and uncertainty and the courage of facing problem as well in farming.

Economic motivation: Economic motivation means the occupation success in terms of profit maximization and the relative values placed by the farmers on economic ends.

Knowledge: Knowledge is operationally defined for the purpose of this investigation as 'those behaviors and test situations, which emphasized the remembering either by recognition or recall of ideas, material or phenomenon'. It refers to the amount of understood information possessed by the farmers on various technological aspects of modern pulse production.

Knowledge gap: Knowledge gap was the difference between the desired level of knowledge and the existing or actual level of knowledge of the farmers on the basis of the selected practices of modern pulse production at the time of interview, expressed in percent.

CHAPTER II

REVIEW OF LITERATURE

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REVIEW OF LITERATURE

The purpose of this chapter is to review the researches conducted in line of the major focuses of study. This study as already indicated, was undertaken to have an understanding of the knowledge gap of the growers in pulse production and the relationship and contribution of the selected characteristics of the farmers with their knowledge gap in pulse production. However, this chapter is divided into following sections:

2.1 Concept on knowledge of technological aspects
2.2 Concept and measurement of knowledge gaps
2.3 Knowledge gap and level of knowledge on recommendation of technologies
2.4 Relationship of the selected characteristics of the farmers with their technological knowledge gap
2.5 Review on constraints faced by the farmers
2.6 Conceptual framework of the study

2.1 Concept on knowledge of Technological Aspects

This section describes various technological aspects along with its basic and primary purposes.

2.1.1 Technological knowledge

The term "technology" comes from the Greek word "techno" meaning art and it signifies knowledge, capacity, or skill which an individual uses to produce a product and is being used widely in every day's life, but it lacks a universal definition. The word evolved centering the industrial revolution and used to mean only the industrial products. But later on, the concept and usage of the term has been extended to a greater extent. Some of the definitions are presented below:

According ILEIA (1991) technology refers to the combination of knowledge, inputs and management practices which are used together with the productive resources to give a desired output. It viewed agricultural technology as the means for boosting agricultural production and alleviating rural poverty especially in developing countries like Bangladesh. No development can be expected without the development, transfer and utilization of agricultural knowledge of technology.

Uehera (1989) defined knowledge of technology, as the application of science to produce desired outcomes.

Mallick *et al.* (1998) defined technology as the transformation of the acquired knowledge to production. In other words, the combination of all the management practices used for producing a crop is called technology.

According to Mahboob (1983) "technological knowledge refers to a commodity, a method or an idea for doing something."He mentioned the following characteristics of a good technological knowledge:

a. Potential for higher yield
b. Simple
c. Less risky
d. Quick growing
e. Early maturing
f. High market demand
g. Better quality
h. Less seed requirement
i. Better capability of utilizing soil nutrients
j. Pest resistance
k. Ability to withstand in unfavorable weather condition.

Gailbraith (1967) defined technological knowledge as a bundle of related techniques or the systematic application of scientific knowledge to practical work. An extension of the above definition of technology has been given by Solow (1957) and Brown (1966) who have described technology in the context of production function. According to them, technological change has occurred if the scale of parameters of production function changes. Brown (1966) defined abstract technology on the basis of the following characteristics.

a) Efficiency of the technology

b) Degree of economics of scale c) Degree of capital intensity

d) Ease in which the capital is substituted for labor.

2.1.2 Knowledge

Knowledge is a very broad term and after going through several dictionaries, encyclopaedia and number of concepts and definition suggested by Bloom *et al.* (1956) and English and English (1961), the term operationally may be defined for the purpose of this investigation as "those behaviors and test situations which emphasized the remembering either by recognition or recall of ideas, material or phenomenon".

2.2 Concept and measurement of knowledge gaps

The concepts and measurement of various types of knowledge gap as referred by several researchers are cited below:

2.2.1 Gap

Literally the term 'gap' is expressed in different ways but the general meaning remains same. Generally, it means some distance between two levels. Gap may be defined as the difference between an expectation and a reality. It is also expressed as the distance between what is and what ought to be i.e. the distance between a desired situation and an actual situation. According to Ray *et al.* (1996) gap means the difference between what was intended and what has been obtained or achieved. It is necessary to measure gaps for any process, behavioral aspects of individual, activities, or any performed jobs and the like.

2.2.2 Knowledge gap

Knowledge gap was measured as the difference between knowledge following recommendations and actual knowledge possessed by the clients at the time of interview.

2.2.3 Technological knowledge gap

Tantray and Dar (1996) measured technological knowledge gap between the recommended technologies and the adoption of these technologies in the field by the farmers. They also considered knowledge of farmers about the recommended package of practices of season in measuring technological knowledge gap.

According to Ray *et al.* (1996) technological knowledge gap has been defined as the proportion of gap in the adoption of practices to practices recommended, expressed in percentage.

Jha and Shaini (1994) measured technological knowledge gap as the proportion of gap of summation of potentiality score for selected practices of scientific cattle rearing and summation of the extent of adoption of selected practices by the respondents.

Ajore and Singh (1992) measured adoption gap as proportion of gap between, recommended package and adopted package.

Dangi and Intodia (1990) measured technological knowledge gap in terms of knowledge of the contact and follower farmers with respect to improved practices of major crops viz. wheat and cotton.

Pillai and Subramonian (1986) measured technological knowledge gap by using quotients as proportion of gap between recommended practices for the area in hectare and adopted practices for the area in hectare, expressed in percentage.

De and Bangarva (1986) mentioned that technological knowledge gap is the difference between what is recommended and what has actually been adopted expressed in percentage.

Dubey *et al.* (1981) defined technological knowledge gap as the difference between technology adopted and specific technology recommended

2.2.3 Technological knowledge gap

The research results measured in terms of technological knowledge gap are discussed below:

Dalvi *el al.* (2004) found the extent of technological knowledge gap made by the farmers in soyabean cultivation was 25.90 percent in plant protection measures, use of fertilizers 22.58 percent, use of farm yard manure/ compost 18.09 percent, seed treatment 17.33 percent and sowing of seeds 12.07 percent and the composite technological gap was 19.16 percent.

Das and Pal (2003) reported from his study that there was a large technological knowledge gap between the farmers practice and the research station practice in terms of transplanting date, harvesting date, and levels of N, P, and K application in adoption to recommended management practices for kharif rice in Cooch Behar, West Bengal, India.

Goswami et al. (2003) reported that high technological knowledge gap was observed in case of application of manure and fertilizers and use of pesticides in potato cultivation. However, majority of the farmers has medium technological knowledge gap.

Sharma *et al.* (2003) found a wide adoption gap, which was highest in use of micronutrients (99 percent). A wide gap was also observed between the potential and actual yield.

Verma *et al.* (2003) measured the extent of technological knowledge gap in groundnut production and the findings revealed that the overall technological gap was 39.44 percent.

Sube *et al.* (2002) measured practice-wise and overall technological knowledge gap in mushroom cultivation and maximum technological knowledge gap was found in the case of

compost preparation compared to other aspects of mushroom cultivation practices. However, the overall, technological knowledge gap was found to be 25.92 percent.

Gourav (2001) reported that the overall technological knowledge gap in tomato cultivation was 30.43 percent. He also mentioned that tomato growers had moderately high level of adoption about recommended tomato production technology. It was however, higher in case of improved varieties, agronomic practices and fertilizers use but poor in case of plant protection measures. A wide gap was noticed with respect to plant protection measures than the other components of tomato production technology.

Patel *et al.* (2001) reported from his study that majority of the farmers had a medium level adoption gap in farmers' adoption of sugarcane production technology.

Yadav *et al.* (2001) determined the level of technological knowledge gap regarding the use of nitrogenous fertilizers in major kharif crops (i.e. paddy and maize), and showed that majority of the paddy and maize growers had technological gap and used less than the recommended doses of nitrogenous fertilizers but the gap with respect to its time of application was of varying levels.

Thakral *et al.* (2001) studied the yield gaps between front line demonstrations and farmer's fields in mustard crop and reported that highest technological knowledge gap (2270 kg) was found in variety IAB- 8812.

Das *et al.* (2001) reported that the grain yield of both summer and kharif rice were higher in demonstration plots compared to farmers' practice resulting an average extension gap of 524 kg and 504 kg/ha respectively. Wide yield gaps were also recorded between the potential and demonstration yields (technology gap) of rice during both the seasons where as, the technology gaps were higher in kharif rice (725 kg/ha) compared to that of summer rice (704-kg). Barman and Pandey (2001) indicated that substantial technology adoption gaps in terms of irrigation, manuring and fertilization.

Barman, *et al.* (2000) determined technological knowledge gap in 'ahu' (autum) rice and showed that farmers by and large used less than 40 percent of the production input recommended for 'aus' rice.

Ingle *et al.* (2000) reported that the average adoption gap was 45.33 percent in cotton cultivation.

Rai *et al.* (2000) mentioned from his study that farmers had varying technological knowledge gaps. Farmers in the low category had high levels of technological knowledge gaps with regard to recommenced varieties, fertilizer use, time of fertilizer application, and intercultural practices for four crops: wheat, rice, arhar, and gram.

Singh and Kumar (2000) studied technological knowledge gap within rice production stations and indicated that there was a significant gap, in rice yield due to differential adoption of technology on all rice production stations.

Singh and Singh (1999) revealed a wide technological knowledge gap and recommended the need for training and transfer of technology to improve the productivity of hill farming.

Chand (1999) mentioned that majority (83 percent) of the respondents possessed medium to high technological knowledge gap. It was high in case of plant protection measures.

Yadav (1998) reported that the technological knowledge gap for application of phosphatic and potassic fertilizer was found to be hundred percent followed by nitrogenous fertilizer in both rabi (wheat) and kharif (maize and paddy) crops. The study also revealed that majority of the respondents had followed the recommended time for basal application in paddy and wheat cops, the gap with respect to the time of first split application was at varying levels. The gap was observed to be; hundred percent for time of second split of fertilizer in paddy and maize.

Singh and Kherde (1998) studied technological knowledge gap with respect to recommended dairy farming technology in the western dry region of Rajasthan and reported various degrees of technological knowledge gap.

Singh *et al.* (1998) studied technological knowledge gap in adoption of recommended wheat production practices by tribal farmers in Jaunsave Bhawan district of Uttar Pradesh, India and reported that the gap was 83 percent for six major components.

Nikhade *et al.* (1997) mentioned that technological knowledge gap with respect to important and complex practices such as rhizobium treatment, plant protection measures and fertilizer application were more than simple practices which involve low cost or no cost on output. Such findings were also supported by Singh and Mathur (1982), and Jaisal (1985). They also reported that the majority of the respondents belonged to medium technological gap in case of red gram (69.23), green gram (68.80), and bengal gram (75.20), where as almost equal percentage of respondents were observed in high and low technological knowledge gap categories in all three pulse crops.

Ajore and Singh (1996) mentioned that 89.00 percent of the farmers of the progressive district were in low adoption category, 4.00 percent in the medium category and 7.00 percent in the high adoption category of sodic soils, where as 1.00 percent of the farmers less progressive district was in low adoption gap category, 28 percent in the medium adoption gap category and 71 percent were in the high adoption gap category. He concluded that majority of the farmers of the progressive districts adopted more land reclamation technology of sodic soils which resulted in low adoption gap of the reclamation technology and majority of the farmers of less progressive districts were in high adoption gap category because their adoption in land reclamation technology was comparatively low. Singh and Singh (1997) also found similar findings of adoption gap in paddy, pea, soybean, and rape cultivation between adopted and non-adopted villages.

Gill and Shukla (1991) found that there was a wider technological knowledge gap in fertilizer application and plant protection measures.

Vasantakumar (1982) conducted a study in Coimbatore district of Tamil Nadu state of India and reported that majority of the small farmers and marginal farmers had low input gap (90.39 percent), moderate credit gap (74.01 percent) and low technological knowledge gap (83.28 percent) and he also mentioned that majority of the farmers had low gap regarding spacing, fertilization, and plant protection measures.

Dangi and Intodia (1990) reported that the contact farmers had more knowledge in comparison to the follower farmers, there was significant difference between the practices recommended and existing technological knowledge of the contact and follower farmers with regard to main areas of wheat and cotton cultivation, except for characteristics of the wheat varieties in respect of follower farmers which was not significant.

De and Bangarva (1986) reported that more than 75 percent gap in wheat production technology utilization was still existing on the farms of 75 percent farmers with regard to wheat in Jaipur districts.

Pillai and Subramonian (1986) from their study found that there existed 48.36 percent technological knowledge gap in integrated soil conservation practices in soil conservation area of Kerala.

Dubey *et al.* (1981) reported that overall technological knowledge gap was comparatively less in large and medium farmers than the small farm holders.

Babu and Sinha (1979) mentioned that there was a variation in the amount of knowledge about various components of technology held by the farmers as well as extension personnel. In case of farmers, the amount of knowledge held varied from 0 to 86 percent.

2.3 Knowledge gap and level of knowledge on recommendation of technologies

Knowledge of the farmers is a pre-requisite for adoption of improved farm technologies. High knowledge on improved farm technologies would lead to higher adoption possibly because knowledge has a power to move forward. There are some findings regarding this aspect.

Tornar and Sharma (2002) analyzed the soyabean production technology knowledge gap and showed that seed yield of soyabean under demonstration plots was higher. It was also indicated that the knowledge gap was reclused after the demonstrations in respect of all type practices except the plant disease control.

Barman *et al.* (2000) determined the knowledge gap on improved autumn rice cultivation and found that the majority of the farmers did not have adequate knowledge on production recommendations and more than half of the production recommendations were not known to them. The knowledge gap on complex practices like seed treatment, disease and insect pest management were much higher.

Ingle *et al.* (2000) reported that the knowledge gap of cotton growers was estimated to be 26 - 50 percent for 63.34 percent of the respondents, 51 - 75 percent for 33.33 percent of the respondents, 26 - 50 percent for 85 percent of the respondents and 51 - 75 for 15 percent of the respondents during two years of conducting the research.

Kashem and Hossain (2000) reported that `Matti 0 Manush' (Soil and Man), a television programme of Bangladesh Television ranked first among the 14 selected non formal education programme displayed from BTV, and remarked that there was big gap between BTV viewers and non-viewer farmers.

Kher and Patel (2000) mentioned that there were significant variations in the mean knowledge gaps among the five levels of extension personnel and farmers. As the chain of communication increased the knowledge gap also increased from higher to lower level. The

knowledge gaps observed were found to be 4.36, 11.8, 16, 85, 43.42, and 47.25 percent for ADAs, AEOs, VLWs, CFs, and NCFs respectively. They also mentioned that among the farmers level, there was significant difference between the knowledge gap of CFs and NCFs at 0.01 level of probability. The overall knowledge gap of technology among its ultimate users was found to be 47.25 percent.

Mande *et al.* (1999) reported that a maximum gap was observed in contact farmers followed by village extension workers. Similar trend was observed in case of time compatibility with need, mode of communication, experience reproducibility, fidelity, motivation, and relevance. Further data show that comparatively more gap was seen between contact farmers and subject matter specialist as far as group discussion was concerned. Similar trend was observed in case of method demonstration and empathy. Then it was clear that there was considerable gap between village extension worker and contact farmers' level.

Chand (1999) reported that the overall knowledge possessed by the farmers was moderate but it was found satisfactory in case of agronomic practices followed by improved varieties and fertilizer and irrigation but was found very poor in case of plant protection measure.

Pandhu (1988) found that an overwhelming majority of the respondents had medium level of knowledge about Kinnow cultivation.

Babu and Sinha (1979) discovered that there were variations in amount of knowledge about various components of rice cultivation held by farmers. The farmers had knowledge about plant protection practices in rice crop.

2.4 Relationship of the selected characteristics of the farmers with their technological knowledge gap

The selected characteristics of the farmers have been taken as the independent variables of the study. Literatures on the relationships of characteristics of the farmers with their knowledge gap are presented below:

2.4.1 Age and technological knowledge gap

Baruah *et al.* (1998) found significant positive relationship between age and technological knowledge gap.

Singh and Kherde (1998) found negative and insignificant relationship between age and technological knowledge gap of the farmers with regard to cattle rearing practice.

Ajore and Singh (1996) found significant positive relationship between age of the farmers and their adoption gap in reclamation of soils in progressive district but no relationship in less progressive district.

Jha and Shaini (1994) found that age of the tribal farmers was correlated with technological knowledge gap in cattle rearing practice but non-significant with the non-tribal farmers.

Banarva *et al.* (1993) concluded that age of the farmers and their technological gap in recommended groundnut production technology was positive and insignificantly correlated.

Singh *et al.* (1991) concluded that age of the citrus growers had a negative trend but not significant relationship with knowledge gap of citrus growers.

2.4.2 Education and technological knowledge gap

Gourav (2001) found that education of the farmers had negative and significant relationship with technological knowledge gap in tomato cultivation.

Barman *et al.* (2000) found that education of the farmers had a significant and negative correlation with technological knowledge gap.

Das *et al.* (1999) found that education of the farmers had a significant and negative association with adoption gap.

Chand (1999) found that education of the farmers had significant relationship with technological knowledge gap. Baruah *et al.* (1998) found a significant negative relationship between education of the farmers and their technology knowledge gap in rice cultivation.

Singh *et al.* (1998) found significant and negative relationship between education and technological knowledge gap of the farmers. Bangrava *et al.* (1993), Singh *et al.* (1991), Jha and Shaini (1994) reported similar relationship for groundnut production technologies, knowledge gap of citrus, and cattle rearing practices.

2.4.3 Farming experience and knowledge gap

Cacers (1981) and Jaime (1971) found significant relation between farming experience and adoption in their studies. Long farming experience helps in building confidence among the farmers and as such, technological gap might be less with the experienced farmers.

2.4.4 Farm size and technological gap

Patel *et al.* (2001) mentioned that there was a significant difference in technological knowledge gap between farmers with small and large holdings.

Gourav (2001) found that land holding of the farmers had negative and significant relationship with technological knowledge gap in tomato cultivation.

Singh *et al.* (1998) found significant negative relationship between farm size of the farmers and technology knowledge gap. Singh *et al.* (1991) reported similar relationship.

Ajore and Singh (1996) found significant negative relationship between farm size and adoption gap for progressive district but no relationship for less progressive district.

Jha and Shaini (1994) found a negative trend between farm size and technological knowledge gap in cattle rearing practices for both tribal and non tribal farmers.

Bangarva *et al.* (1993) found no relationship between size of holding and technological knowledge gap

2.4.5 Annual income and knowledge gap

Barman *et al.* (2000) found that annual income of the farmers had a significant and negative correlation with technological knowledge gap.

Ajore and Singh (1996) explored significant and negative relationship between net income and adoption gap of the farmers.

Jha and Shaini (1994) found significant and negative relationship between per capita income and technology knowledge gap of the farmers.

2.4.6 Credit received and knowledge gap

Haider *et al.* (2002) found positive and significant relationship between credit received and adoption of improved packages of transplanted aman rice production.

Ray *et al.* (1996) found no significant relationship between technological knowledge gap and outstanding credit of the farmers but a negative trend was observed.

2.4.7 Economic motivation and knowledge gap

Ajore and Singh (1996) found a significant and negative relationship between economic motivation and adoption gap in progressive and less progressive districts.

Nikhade *et al.* (1995) found significant and negative relationship between economic motivation and adoption gap.

2.4.8 Risk orientation and knowledge gap

Chand (1999) found that risk orientation of the farmers had significant relationship with technological knowledge gap.

Ajore and Singh (1996) showed significant and negative relationship between risk orientation and adoption gap in progressive and less progressive districts.

Nikhade *et al.* (1995) found significant negative relationship between risk preference and adoption gap of the cotton growers in respect of using manure, fertilizer application and plant protection measures, but no relationship for using seed rate.

2.5 Reviews on constraints faced by the farmers

Some studies relating to the constraints in cultivating various crops regarding improved technology were reviewed and presented below:

Singh *et al.* (2000) showed that lack of knowledge, non-availability of seed, and lack of time for the farmers to contact soil testing officials were the main reasons for the technological knowledge gap. Other reasons for technological gaps in rice cultivation include: hard surface of land, lack of resources, and engagement in social and other activities, under plowing technology, non-availability of water in time, costly irrigation, and lack of knowledge under puddling technology.

Rai *et al.* (2000) mentioned major constraints expressed by the farmers as: lack of information about suitable crop rotation and mulching techniques, and the delay in the delivery of services by the government agencies.

Venkatara *et al.* (1996) noticed that constraints faced by the farmers were poor resource base, low education, low social participation, lack of technical know-how, which led to retarding the process of adoption of recommended practices.

Vetriselven (1992) stated that inadequate knowledge, insufficient finance, irregular supply of inputs and lack of time and skill were some of the constraints expressed by farmers in groundnut cultivation.

Chandrakandan and Venkatram (1991) mentioned labor scarcity, inadequate water, high input price, lack of finance and pest and disease occurrence as constraints in the adoption of agro-technologies.

Rajagopal (1989) observed that economic factors such as cost of production, income and output level had grater influence on adoption of high yielding varieties of paddy compared to sociological factors. The problems expressed by farmers were lack of irrigation potential, non-availability of chemical fertilizers and institutional credit at appropriate time. Labor shortage during farm operations was also observed as one of the problems.

Oberoi & Moorti (1989) and Bajaj (1989) found that lack of capital, costly inputs, non-availability of equipment and inputs in time, and non-availability of labors were the major constraints in the adoption of improved farm practices.

Gill *et al.* (1988) expressed that power and water crisis, untimely transportation, low plant population per unit, lack of proper fertilizer application, expensive weed control, diseases, pests and delayed harvesting were the major constraints responsible for low yields which increased the gaps between potential and average yields of paddy in Punjab.

Jaisal *et al.* (1988) reported that the major reason for non adoption of technologies were ignorance about technologies, non availability of production inputs at proper time, involvement of capital intensive technologies, poor financial resources, high cost of inputs and weaker linkages with extension agencies.

Arputharaj and Nair (1988) stated that difficulties faced by the farmers in banana cultivation were pest attack, damage due to wind and lack of finance.

Joshi (1986) observed that difficulties in spraying, ineffectiveness of chemicals as neighbors do not adopt, were the problems faced by the respondents in the adoption of improved farm practices of sugarcane.

Mishra *et al.* (1986) reported that socio-economic factors that may constraints rice production include low prices, marketing problems, farmers' low resource base, lack of irrigation potential and risk in production.

Siddara and Veerabhadraiah (1986) observed that lack of knowledge about fertilizers and lack of financial resources were the two main reasons for the non adoption of fertilizers.

Haque (1985) enlisted high price of inputs, lack of suitable plant protection measures; topography, water logging, lack of adequate irrigation , lack of adequate capital, money lender exploitation, absence of appropriate water management and non availability of quality inputs in time.

Reddy (1983) indicated that the foremost constraint of all farmers was the frequent failure of monsoon. The other constraints expressed by the small farmers were lack of facilities to

obtain credit, unawareness of the recommended practices, risks and uncertainty of returns involved in the adoption of practices recommended.

When the main reasons for non-adoption of paddy technology was studied by Arokoyo in 1982, it was noticed that lack of credit and labor, non availability of inputs, lack of sufficient information, and lack of knowledge were the main reasons for the same.

Vasantakumar (1982) reported several constraints faced by small and marginal farmers in Coimbatore district in India, which included high cost of cultivation, unpredictable price, untimely supply of inputs, lack of reliable recommendation given by officials, lack of subsidy, varying prices of inputs, poor quality and non availability of inputs, non availability of credit, complicated procedure and inadequate marketing facilities.

Barker (1979) referred to a new methodology developed by the International Rice Agroeconomic Network (IRAEN) which has the capacity to accurately determine the yield gap., the cultural practices, or input factors contributing to the gap, and the economically recoverable portion or the yield gap.

Barker *et al.* (1977) showed that the yield gap of paddy could be attributed to farmers' fertilizer practices, both in inadequate rates of application and incorrect timing of application. They also observed that rats, excessive rain and wind, flood and disease were the most important yield constraints to rice production in Philippines.

2.6 The conceptual framework the study

A well developed research project rests upon a rationally developed conceptual framework that usually composed of synthesis of related empirical evidences, a set of assumptions, principles, interrelationships between the concerned variables - all to lead the researcher for valid findings and finally to help her explain the observed phenomenon. Based on the related review of literature, consultation with the thesis supervisor, a conceptual framework was developed before the field work was accomplished. This framework is shown in Figure 1.

The major focus of the research is to identify whether or not pulse knowledge gap exists at the clients system level and to observe the factors that could relate or contribute to this

presumed gap. However, it is assumed that the gap, if exists at all, does not occur in a random fashion.

It is evident from the past studies that every occurrence or phenomenon is the outcome of a number of variables, which may be or may not be interdependent or interrelated with each other. In the other words, no single variable can contribute wholly to a phenomenon. Variables together are the cause and the phenomenon is effect and thus, there is effect relationship every where in the universe.

This study was conserved with the knowledge gap of the farmers in pulse production. Thus the knowledge of farmers for pulse production was the dependent variable and the selected characteristics of the pulse farmers were considered as the independent variables.

Knowledge gap of an individual may be affected through interacting forces of many characteristics in his surroundings. It was therefore, necessary to limit the characteristics, which include: Age, Education, Pulse production area, Farm Size, Farming experience, Annual income from, Credit received, Agricultural input availability, Economic motivation, and Risk orientation.

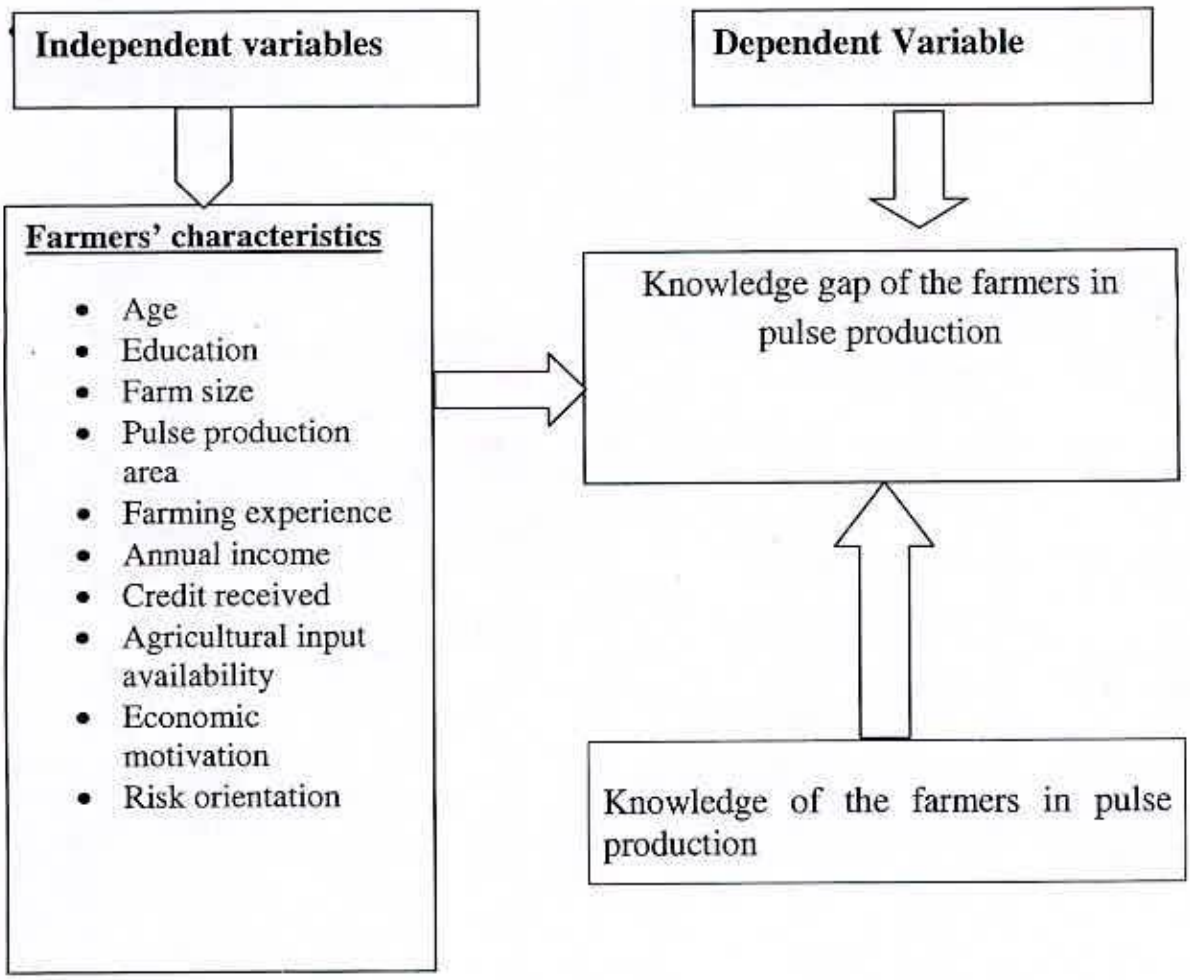

Figure 1. Conceptual framework of this study

CHAPTER III

METHODOLOGY

CHAPTER III
METHODOLOGY

Methods and procedures used in conducting research need very careful consideration. Methodology should be such that it enables the researcher to collect the valid information and to analyze the same property to arrive at correct decisions. The methods and procedures followed in conducting this research are described below:

3.1 Source of data:

3.1.1 Locale

Raghdi union of Muksudpur upazilla under Gopalgonj district was selected purposively as the study area. From the selected union, three villages were randomly selected namely, Charprosonnodi, Raghdi and Domrakandi as the study villages. A map of Gopalgonj district showing the study upazilla may be shown in Figure 2.

3.1.2 Population

The researcher prepared a list of the farmers of the selected three villages with the help of local Union Parisad Members, Chairmans, Assistant Agriculture Extension Officer (AAEO) and Upazila Agricultural Officer (UAO). After completing the list it was found that the total numbers of pulse growing farmers were 223 which constituted the population of the study.

3.1.3 Sample

By taking 50% of the population farmers, a total of 112 farmers were selected randomly as the sample of the study. The researcher also prepared a reserve list of 30 farmers to use them in case of non-availability of the respondents listed in the sample.

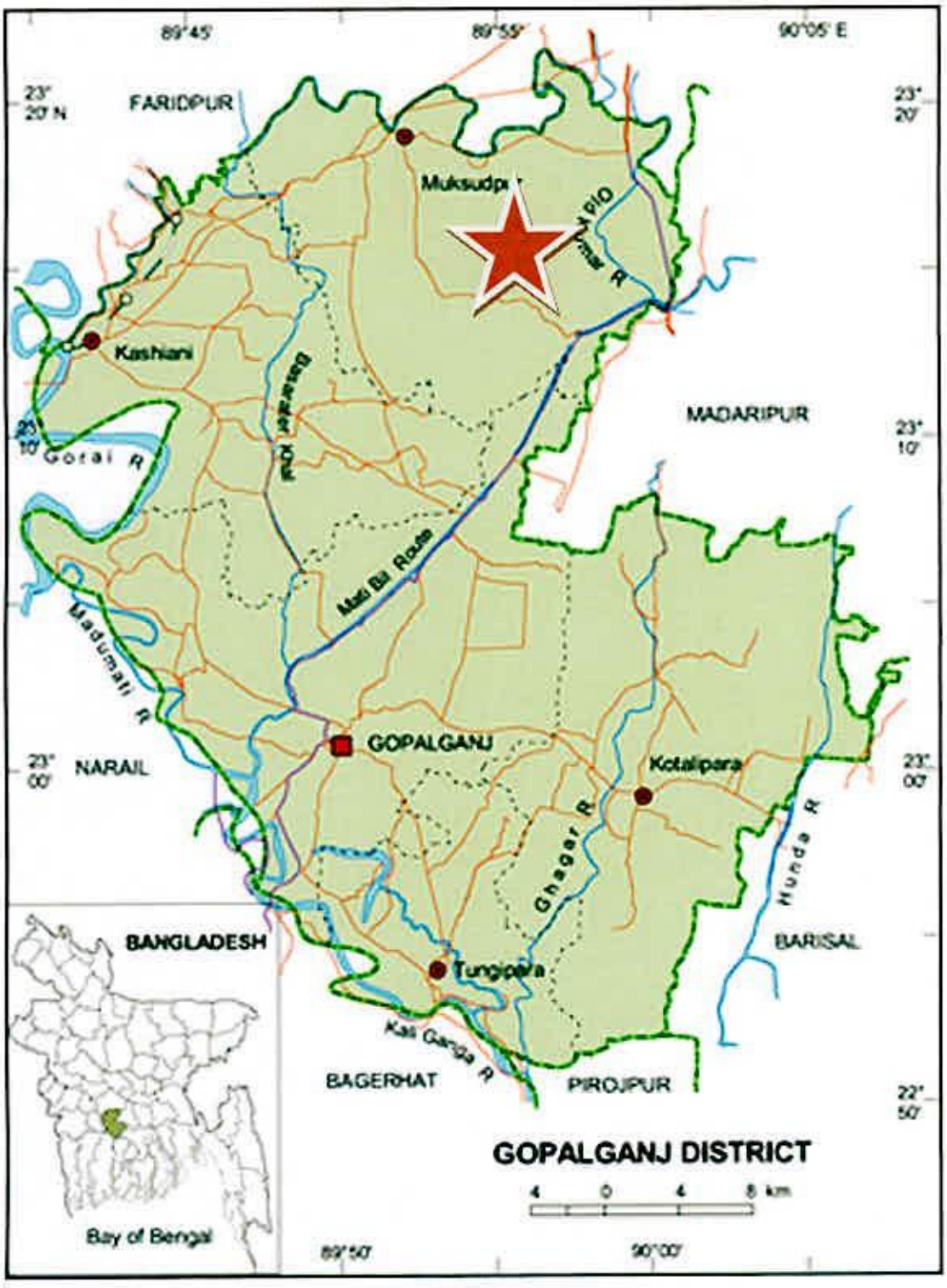

Figure2. A map of Gopalgonj District showing the study upazilla

Indicated the study upazilla

3.2 Instrument for collection of data

The researcher prepared an interview schedule with utmost care for collecting data from the respondent farmers. Objectives of the study were kept in view while preparing the interview schedule.

The interview schedule continued both open and closed form questions. Scales are developed for computing suitable scores in respect of knowledge gap of the farmers in pulse production of the farmers. The rough interview schedule was prepared by administering the same on several pulse farmers of Muksudpur upazilla under Gopalgonj district. The pretest was helpful to find out gaps and to locate faulty questions and statements. An alterations and adjustments were made in the schedule on the basis of experience of the pretest. The interview schedule was then cyclostyled in its final form for collection of data which may be shown in Appendix-A.

3.3 Measurement of variables

In order to conduct the study in accordance with the objectives, it was necessary to measure the selected variables. This section contains procedures for measurement of both independent as well as dependent variable of the study. The summarized operationalizations of the variables are shown in Table 2 with their measuring unit and discussed in the next pages.

Table2. Summarized operationalization of the variables of the study with measuring unit

Variables	Measuring unit	Operationalization
Independent Variables		
1. Age	Actual years	Direct question
2. Education	Schooling years	Direct question
3. Farm size	Hectares	Scale developed for the study with the help of DAE (1995)
4. Pulse production area	Hectares	Scale developed with the help of Akanda (2005) and BBS (2002)
5. Farming experience	Years of farming	Direct question
6. Annual family income	'000' Taka	Direct question
7. Credit received	'000' Taka	Scale developed for the study with the help of Akanda (2005)
8. Agricultural input availability	Scores	Scale developed for this study
9. Economic motivation	Scores	Scale developed for this study with the help of Akanda (2005)
10. Risk orientation	Scores	Scale developed with the help of Ali (2008)
Dependent variables		
Knowledge gap of farmers in pulse production	Scores	Scale developed for this study

3.3.1 Measurement of independent variables

It was pertinent to follow a methodological procedure for measuring the selected variables in order to contact the study in accordance with the objectives already formulated. The procedures for measuring the independent variables are described below:

3.3.1.1 Age

Age of a respondent was measured in terms of actual years from his birth to the time of interview. A score of one (1) was assigned for each year of age. No fraction of year was considered.

3.3.1.2 Education

Education was measured in terms of grades of education completed by an individual from his/her educational institutions. It was expressed in terms of successful year of schooling. A score of one (1) was assigned for each year of successful schooling completed. For example, if a respondent passed the S.S.C examination, his education score was given as 10, if he passes the final examination of class six, his education score was given as 6. If a respondent did not know how to read and write, his education score was given as '0' (zero). A score of 0.5 (half) was given to that respondent who could sign his/her name only or can read only.

3.3.1.3 Farm size

Farm size was measured for each respondent in terms of hectare by using the following formula:

Farm size = $A_1 + A_2 + {}^1/_2 (A_3 + A_4) + A_5$

Where, A_1= homestead area of the respondent

A_2= Own land under own cultivation

A_3= Area taken on borga system

A_4= Area given to others on borga system

A_5= Area taken from others on lease

3.3.1.4 Pulse production area

Pulse production area of a farmer was measured in terms of total area of land under pulse cultivation of that farmer. It was expressed in hectare.

3.3.1.5 Farming experience

Farming experience of a respondent was measured on the basis of yearly farming practice on agriculture by the respondent himself. For calculation of farming experience score, one (1) score was assigned for one year farming experience.

3.3.1.6 Annual family income

Total family income of a respondent was measured on the basis of total yearly earning from agriculture and other sources (service, business, daily labor etc.) by the respondent himself and other family members. For calculation of annual family income score, one (1) score was assigned for one thousand taka yearly income.

3.3.1.7 Credit received

Credit received by a respondent was measured on the basis of amount of money received by him from other individual or organization as loan. For calculation of credit received score, one (1) score was assigned for one thousand taka credit.

3.3.1.8 Agricultural input availability

Agricultural input availability score of a respondent was measured by asking him/her about availability of inputs on five selected items of agricultural production regarding use of seed, fertilizer, farm implements, pesticide, irrigation etc. For calculation of agricultural input availability score, a farmer was asked to give his/her opinion on how frequently the inputs were available (regularly, occasionally, rarely or not at all) against each of five inputs. A score of 3 was assigned for regularly, 2 for occasionally, 1 for rarely and 0 for not at all. Then agricultural input availability score of a farmer was computed by summing up his/her scores for the responses against all the five inputs. Thus, the possible agricultural input availability score of a farmer could range from 0 to 15, while 0 indicating the no availability of inputs and 15 indicating the highest level of input availability.

3.3.1.9 Economic motivation

Economic motivation of a farmer was measured by an 'economic motivation score' using a Likert type scale. The scale consisted of 10 statements (all positive) expressing some degree of economic profits or advantages. For measuring economic motivation score, a farmer was asked to give his opinion along a 5-point scale such as 'strongly agreed', 'agreed', 'no opinion', 'disagreed' and 'strongly disagreed' against each of the 10 statements. A score of 5 was assigned for 'strongly agreed', 4 for 'agreed', 3 for 'no opinion', 2 for 'disagreed' and 1 for 'strongly disagreed'. Then economic motivation score of a farmer was computed by summing up his/her scores for the responses against all the 10 statements. Thus, the possible economic motivation score of a farmer could range from 10 to 50, while 10 indicating the lowest level and 50 indicating the highest level of economic motivation.

3.3.1.10 Risk orientation

Risk orientation of a farmer was measured by the scale used by Ali (2008) with slight modification. The scale consisted of 10 statements (5 positive and 5 negative) expressing some degree of uncertainty or risk. For measuring risk orientation score, a farmer was asked to give his/her opinion against each of the 10 statements with 5 alternative responses as 'strongly agreed', 'agreed', 'no opinion', 'disagreed' and 'strongly disagreed' by assigning scores as 5, 4, 3, 2 and 1 respectively for positive statements and by reversed scoring system for negative statements. Then, the risk orientation score of a farmer was computed by summing up his/her scores for all the 10 statements. Thus, the possible risk orientation score of a farmer could range from 10 to 50, where 10 indicating the lowest level and 50 indicating the highest level of risk orientation.

3.3.2 Measurement of dependent variables

Knowledge gap of pulse growers was the dependent variable of the study. It was measured based on knowledge of the growers on pulse production. The knowledge of a farmer on pulse production was determined by computing a knowledge score based on a set of 20 questions regarding modern recommended variety, sowing time, fertilizer application, irrigation, disease, pest management, weed control. Each of the questions carried a full weight of 2. For each correct answer of a question a farmer received full weight of 2 and for wrong answer s/he received 0. However, for partial correct answer to a question s/he was given partial weight. Then, knowledge score of a farmer was obtained by adding together his/her weight for all the 20 questions. Thus, knowledge score of a farmer could range from 0 to 40, where 0 indicates very low knowledge and 40 indicates highest level of knowledge on pulse production.

For determining knowledge gap of a farmer, a knowledge gap index was computed on the deviation of his/her obtained score from the maximum possible knowledge score (40). This deviation was then expressed in percentage as the proportion to his/her maximum possible knowledge score as suggested by Singh *et al.* (1991). For better understanding, the formula for determining knowledge gap index is presented bellow:

$$KGI = \frac{Kp\text{-}Ko}{Kp} \times 100$$

Where as,

KGI = Knowledge Gap Index

Kp = Maximum possible score of a farmer (i.e. 40)

Ko= Obtained knowledge score by a farmer

Thus, the knowledge gap index could range from 0 to 100, where 0 indicated very low knowledge gap and 100 indicated the highest knowledge gap.

3.4 Constraints faced by the farmer in pulse production

In order to find out constraints faced by the farmer in pulse production a set of 11 constraints were administered to the respondents with four alternative responses as high, medium, low and not at all constraints by assigning scores as 3, 2, 1 and 0 respectively. In order to measure the severity of each of the constraints, the Constraints Faced Index (CFI) was determined by using the following formula:

$CFI = P_h x3 + P_m x2 + P_l x1 + P_n x0$

Where,

CFI= Constraints Faced Index

P_h = Percentage of farmers faced high constraints

P_m = Percentage of farmers faced medium constraints

P_l = Percentage of farmers faced low constraints

P_n = Percentage of farmers faced no constraints

The constraints faced index against each of the constraints ranged from 0 to 300 where 0 indicating not at all constraints and 300 indicates highest constraints. Rank order was then made based on descending order of constraints faced index.

3.5 Collection of data

The researcher collected data from the sample farmers through interview schedule. Before starting collection of data, the researcher met with the Sub Assistant Agriculture Officer (SAAO) of the concerned Block and Chairman of the concerned union in order to explain the objectives of the study and requested them to provide necessary help and co-operation in collection of data. The union parishad members and the local leaders of the area were also approached to render essential help. As a result of all these a good working atmosphere was created in the study area which was very helpful for collection of data by the researcher.

Data for this study were collected from the respondents of three villages by using the prepared interview schedule by the researcher herself. Before going to the respondents for interview they were informed earlier, so that they would be available in their respective area. The interviews were held individually in the house or farms of the respective respondent.

No serious problems were faced by the researcher in collecting data. It was not possible to collect from six farmers out of the selected 112 sample. They were not available for interview at the time of interviewing. The researcher collected data from the six pulse farmers using the reserve list. Collection of data took 30 days from 13 July, 2011 to 12 August, 2011.

3.6 Compilation of data

After complete of field survey, the collected data were coded, compiled, tabulated and analysis in accordance with the objectives. Qualitative data were quantified by means of suitable scoring technique and local units were converted into standard units. The responses of the respondent contained in the interview schedule were transferred to a master sheet in order to entering data in the computer. SPSS computer package was used for processing and analysis of data.

3.7 Categorization of the respondents

For describing the knowledge gap for pulse production, the respondents were classified into four categories, mainly no knowledge gap, low knowledge gap, medium knowledge gap and high knowledge gap on the basis of their knowledge gap in pulse production.

Categories were also developed in respect of each of the selected characteristics for describing the characteristics of the respondents. Nature of the data and mode of categorization prevailing in the social system guided the researcher in developing categories in respect of the selected characteristics. Procedures for categorization have been discussed while describing the grower's characteristics in chapter IV.

3.8 Hypothesis of the study

Defined by Goode and Hatt (1952), a hypothesis is, "a proportion which can be put to a test to determine its validity. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test". In studying relationships between variables research hypothesis are formulated which are state anticipated relationships between the variables. However, for statistical test, it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between the concerned variables. If a null hypothesis is rejected on the basis of statistical test, it is assumed that there is a relationship between the concerned variables.

The following null hypotheses were formulated to examine the relationships of the selected characteristics of the farmers with their knowledge gap in pulse cultivation.

"There is no relationship between selected characteristics of the farmers and their knowledge gap in pulse cultivation."

To find out the contribution of the selected characteristics of the farmers to their knowledge gap, the following null hypothesis was also formulated:
"There is no contribution between the selected characteristics of the farmers and their knowledge gap in pulse cultivation."

The selected characteristics of the farmers were age, education, pulse production area, farm size, farming experience, annual income, agricultural input availability, credit received, economic motivation and risk orientation.

3.9 Statistical treatment

The statistical measures used in describing the selected dependent and independent variables were frequency, percentage distribution, range, mean and standard deviation. Tables were used in presenting data for clarification of understanding.

In order to explore the relationships between knowledge gap of the farmers and the selected independent variables, Pearson's Product Moment Co-efficient of correlation (r) was measured. Five percent (0.05) level of significance was used as a basis for rejecting any null hypothesis. In order to explore the contribution of the selected characteristics of farmers to their knowledge gap, step wise multiple regressions were used. For determining severity of the constraints, rank order was made based on the descending order of the Constraints Faced Index (CFI).

CHAPTER IV

RESULTS AND DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSION

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

4.1 Selected Characteristics of the Pulse Farmers

This section deals with the characteristics of pulse growers which were assumed to be associated with the knowledge gap in pulse production. Different farmers possess different characteristics which are focused by his/her behavior. In this section ten characteristics have been discussed. The selected characteristics of the farmers were; age (years), education (schooling years) farm size (hectare), pulse production area (hectare), farming experience (years), annual family income ('000' taka), credit received ('000' taka), agricultural input availability (scores), economic motivation (scores), and risk orientation (score). Measuring unit, range, mean and standard deviations of those characteristics of pulse farmers were described in this section. Table 3 provides a summary profile of pulse farmers' characteristics.

Table 3. Characteristics profile of the respondents

Sl. No	Characteristics	Measuring unit	Range		Mean	Standard deviation
			Possible	Observed		
01	Age	Year	Unknown	25 - 62	42.71	9.38
02	Education	Schooling years	Unknown	0 - 14	5.20	3.96
03	Farm size	Hectare	Unknown	0.3 - 4.5	1.45	0.89
04	Pulse production area	Hectare	Unknown	0.2 - 1.62	0.49	0.31
05	Farming experience	Years	Unknown	7 - 50	25.25	10.71
06	Annual family income	'000'Taka	Unknown	45 - 600	137.16	90.29
07	Credit received	'000'Taka	Unknown	0 - 50	12.54	16.57
08	Agricultural input availability	Score	0-15	6 - 14	10.96	2.19
09	Economic motivation	Score	10-50	14 - 45	34.13	6.87
10	Risk orientation	Score	10-50	15 - 45	32.75	7.46

4.1.1 Age

Age of the respondents varied from 25 to 62 years, the average being 42.71 years with standard deviation of 9.38. According to their age, the respondents were classified into three categories as "young aged" (up to 35 years), "middle aged" (36- 50) and "old aged" (above 50 years). The distribution of the farmers according to their age is shown in Table 4.

Table 4. Distribution of the farmers according to their age

Categories (year)	Respondents	
	Numbers	Percent
Young (upto 35)	25	22.3
Middle aged (36-50)	60	53.6
Old (Above 50)	27	24.1
Total	112	100

Data represented in Table 4 indicate that majority (53.6 percent) of the respondents were middle aged as compared to 22.3 percent being young and 24.1 percent old. Findings again revealed that above three forth (75.9 percent) of the respondents were young to middle aged. Therefore, it could be said that decision regarding the farming practices in the study area are expected to be considerably influenced by the middle aged farmers.

4.1.2 Education

Education of the respondents ranged from 0-14 in accordance with year of schooling. The average education score of the respondents was 5.20 with a standard deviation of 3.96. On the basis of their education, the farmers were classified into five categories as shown in Table 5.

Table 5. Distribution of the farmers according to their education

Categories	Respondents	
	Number	Percent
Illiterate (0)	17	15.2
Can sign only (0.5)	17	15.2
Primary (1-5)	27	24.2
Secondary (6-10)	44	39.4
Above secondary (above 10)	7	6.3
Total	112	100

Data shown in the Table 5 indicate that majority (39.4 percent) of the farmers had secondary level of education compared to 15.2 percent illiterate, 15.2 percent could sign their name only, 24.2 percent had primary level education and only 6.3 percent had above secondary level of education.

Education helps the farmers to face the adverse condition and adjust with unfavorable condition through reading leaflets, booklets, books and other printed materials in this case. Education helps the farmers to broaden their outlook and expand mental horizon by helping them to develop favorable attitude, correct perception and knowledge about production technology of crops. Comparatively educated man is relatively more responsive to the technology and new innovation. The findings of this study, however,

indicate that 30.4 percent of the farmers were illiterate or could sign their name only which is supposed to face a great difficulty in adjusting with the unfavorable condition regarding knowledge gap for pulse production. Such consideration indicates the need for improving literacy level among the farmers for adjusting the knowledge gap about pulse production. Although 39.4 percent farmers had secondary education but they are engaged in production of rice and wheat in order to maintain food security. So, motivational program should lunch to make farmers' attention in pulse production.

4.1.3 Farm Size

Farm size of the respondents ranged from 0.3 hectare to 4.5 hectare with the mean of 1.45 and standard deviation of 0.89. On the basis of their farm size, the farmers were classified into three categories followed by DAE (1995) as shown in Table 6.

Table 6. Distribution of farmers according to their farm size

Categories (ha)	Respondents	
	Number	Percent
Small farm (0.2 – 1.0)	59	52.68
Medium farm (1.01 – 3.0)	44	39.29
Large farm (Above 3.0)	9	8.03
Total	112	100

Data presented in the Table 6 demonstrate that highest proportion (52.68 percent) of the farmers had small farm compared to 39.29 percent having medium farm and only 8.03 percent had large farm. The findings indicate that overwhelming majority (91.97 percent) of the farmers had small to medium farm size for pulse production. In Bangladesh most of the farmers live on below a subsistence level and this in one of the vital reasons for not adopting improved farming practices in their farm. So, local extension service should undertake motivational program to increase their production in future.

4.1.4 Pulse production area

Area under pulse production of the respondents varied from 0.2 to 1.62 hectare, the average being 0.49 ha with standard deviation of 0.31. The respondents were classified into three categories on the basis of their pulse production area as shown in Table 7.

Table 7. Distribution of farmers according to pulse production area

Categories (ha)	Respondents	
	Number	Percent
Small area (0.2 – 0.5)	85	75.9
Medium area (0.51 – 1.0)	17	15.2
Large area (Above 1.0)	10	8.9
Total	112	100

Data furnished in Table 7 specified that above three forth (75.9 percent) of the respondents had small area compared to 15.2 percent had medium area and only 8.9 percent had large area for pulse production. Therefore, it could be said that the choice of pulse production regarding the farming practices in the study area are expected to be considerably influenced by the small and medium land of the farmers for pulse production. So, they need comparatively cheaper technologies and target oriented special extension service for pulse production.

4.1.5 Farming experience

Computed scores of the farmers about farming experience ranged from 7 to 50 years with a mean of 25.25 and standard deviation of 10.71. On the basis of farming experience, the respondents were classified into three categories as follows in Table 8.

Table 8. Distribution of farmers according to their farming experience for pulse production

Categories (year)	Respondents	
	Number	Percent
Short farming experience (up to 10)	12	10.7
Medium farming experience (11-20)	39	34.8
Long farming experience (above 20)	61	54.5
Total	112	100

Data contained in Table 8 showing that most of the farmers (54.5 percent) had long farming experience, where as 34.8 percent had medium farming experience and 10.7 percent had short farming experience. Farming experience is helpful to increase

knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate decisions at the time of need. Overwhelming majority (89.3 percent) of the farmers had medium to long farming experience. But they were engaged in rice and wheat production in order to maintain food security, more economic benefit and more production.

4.1.6 Annual family income

Annual family income of the respondents ranged from 45 to 600 thousand taka. The mean was 137.16 taka and standard deviation was 90.29. On the basis of annual family income, the respondents were categorized into three groups as shown in Table 9.

Table 9. Distribution of farmers regarding annual family income

Categories ('000' taka)	Respondents	
	Number	Percent
Low income (up to 100)	54	48.2
Medium income (100.1-200)	43	38.4
High income (above 200)	15	13.4
Total	112	100

Data shown in Table 9 presented that the highest proportion (48.2 percent) of the respondents had low annual family income while 38.4 and 13.4 percent of the respondents had medium and high annual family income respectively. Akand (2005) also found more or less similar average of annual family income in his study.

The gross annual family income of a farmer is an important indicator of how much s/he can invest in his farming. Generally higher income encourages one's integrity to achieve better performance and to show his/her individual better status in the society. The higher income increases the risk taking capacity of the farmers' pulse production. Farmers with low income generally invest less in their farms. It is therefore, likely that a considerable portion of farmers may face difficulty in pulse production.

4.1.7 Credit received

Category of the respondents ranged from 0 to 50 thousand taka with a mean of 12.54 and standard deviation of 16.57. On the basis of their credit received, the farmers were classified into four categories as shown in Table 10.

Table 10. Distribution of farmers according to credit received

Categories ('000' taka)	Respondents	
	Number	Percent
No credit received (0)	60	53.6
Low credit received (1-15)	17	15.2
Medium credit received (16-30)	21	18.7
High credit received (above 30)	14	12.5
Total	112	100

Data presented in the Table 10 showed that highest proportion (53.6 percent) of the respondents (farmers) did not receive any credit where 15.2 percent received low credit, 18.7 percent received medium credit and 12.5 percent received high credit. It is a matter of fact that a considerable portion (46.4 percent) of the total respondents received credit.

4.1.8 Agricultural input availability

Agricultural input availability score of the respondents ranged from 6-14 against the possible range 0-15 with the mean of 10.96 and the standard deviation of 2.19. On the basis of agricultural input availability, the farmers were classified into three categories as shown in Table 11.

Table11. Distribution of the farmers according to agricultural input availability

Categories (score)	Respondents	
	Number	Percent
Low (6-9)	33	29.5
Medium (10-12)	47	41.9
High (above 12)	32	28.6
Total	112	100

Data shown in the Table 11 indicate that majority (41.9 percent) of the farmers had medium availability of agricultural input where 29.5 percent farmers had low and 28.6 percent had high agricultural input availability.

Inputs availability is the main condition for successful crop production and it helps the farmers for higher production. The findings of this study, however, indicate that 71.4 percent of the total respondents had low to medium agricultural input availability. Such consideration indicates the need for improving sufficient input supply for adjusting the adverse condition and successful pulse production.

4.1.9 Economic motivation

In terms of economic motivation, the respondents ranged from 14-45 in accordance with scoring system against the possible range of 10-50 with the mean of 34.13 and standard deviation of 6.87. On the basis of economic motivation, the farmers were classified into three categories as shown in Table 12.

Table 12. Distribution of the farmers according to economic motivation

Categories (score)	Respondents	
	Number	Percent
Low (10-23)	9	8.0
Medium (24-37)	61	54.5
High (38-50)	42	37.5
Total	112	100

Data shown in the Table 12 indicate that 54.5 percent of the farmers were medium economically motivated where as 37.5 percent were high and only 8.0 percent were low economically motivated. It means that majority (62.5 percent) of the respondents had low to medium economic motivation.

Economic motivation is a common factor for successful crop production and it influences the farmers for higher production. Most of the farmers are interested to maximize economic gain from farming. For maximizing economic gain they adopt and continue improved farming practices. Economic motivation is a positive force that helps

to form positive attitude of respondents towards farming practices. The findings of this study, however, indicate that only 8.0 percent had low economic motivation where 92.0 percent of the total respondents had medium to high economic motivation. Such consideration indicates that economic help is needed very much for successful pulse production.

4.1.10 Risk orientation

In terms of risk orientation, the respondents ranged from 15-45 in accordance with the scoring system against the possible range of 10-50 with the mean of 32.75 and standard deviation of 7.46. On the basis of risk orientation, the farmers were classified into three categories as shown in Table 13.

Table 13. Distribution of the farmers according to risk orientation

Categories (score)	Respondents	
	Number	Percent
Low (10-23)	15	13.4
Medium (24-37)	63	56.2
High (38-50)	34	30.4
Total	112	100

Data shown in the Table 13 indicate that majority (56.2 percent) of the farmers had medium risk orientation where as 30.4 percent had high and 13.4 percent had low risk orientation. Overwhelming majority (86.6 percent) of the respondents had medium to high risk orientation. Ali (2008) found more or less similar results in his study.

The farming activities of Bangladesh mostly depend on nature. In pulse production there remains some sort of risk and uncertainty and often hampered by natural calamities like frost, unwanted rain, pest infestation, etc. Farmers having ability to take high risk able to overcome these by applying the recommended technology. Risk orientation has a positive relationship with adoption of improved farming practices by the farmers. Farmers having high risk orientation may have high knowledge of recommended technology.

4.2 Knowledge gap of the farmers in pulse production

Knowledge gap of the respondents ranged from 20-75 percent in accordance with scoring system against the possible range of 0-100 percent with the mean of 41.48 and standard deviation (SD) of 14.29. On the basis of knowledge gap, the farmers were classified into three categories as shown in Table 14.

Table14. Distribution of the farmers according to their knowledge gap in pulse production

Categories (score)	Observed Range	Respondents		Mean	SD
		Number	Percent		
Low (0-33)	20-75	40	35.7	41.48	14.29
Medium (34-66)		63	56.3		
High (67-100)		9	8.0		
Total		112	100		

Knowledge gap for crop production is very harmful. In want of proper knowledge, crop production may failure totally. Data shown in the Table 14 indicate that majority (56.3 percent) of the farmers of the total respondents had medium knowledge gap while 35.7 percent had Low and 8.0 percent had high knowledge gap for pulse production. Findings again revealed that about two third (64.3 percent) of the respondents had medium to high knowledge gap in pulse production. In this study more than fifty percent of the respondents have medium knowledge gap in pulse production but still now pulse production area is decreasing day by day. Main reasons behind these are most of the respondents are engaged in boro rice production for maintaining food security. Some are engaged in wheat production. The production rate of boro rice is so high and farmers become more benefited from boro rice. Moreover, the price of wheat is increasing and production rate is more than that of pulse. So, farmers change their attitude towards wheat cultivation instead of pulse. The farming activities in Bangladesh are more or less nature dependent. Due to natural calamities like frost, unwanted rainfall, pest infestation etc and low production rate farmers show less interest to pulse production though they have enough knowledge in pulse production.

4.3 Relationships of selected characteristics of farmers with their knowledge gap in pulse production

As mentioned earlier, the 10 selected characteristics of the farmers were the independent variables of the study. The variables were age, education, farm size, pulse production area, farming experience, annual income, agricultural input availability, credit received, economic motivation and risk orientation. The dependent variable was knowledge gap of farmers in pulse production.

The purpose of this section is to examine the relationship of each of the independent variables with the dependent variable. Pearson's Product Moment Co-efficient of Correlation (r) was used to test a null hypothesis concerning relationship between any two variables concerned. Throughout the study 5% level of probability has been used as the basis for rejecting of any null hypothesis.

The computed value of co-efficient of correlation (r) showing the relationship between the independent variable and dependent variable has been presented in Table 15. Intercorrelation among all the variables has been shown in a coefficient matrix in Appendix B.

Table 15. Co-efficient of correlation showing relationship between selected characteristics of the farmers and knowledge gap in pulse production

(N = 112)

Dependent variable	Independent variable	Computer value "r"	Tabulated value of "r"	
			at 0.05 level	at 0.01 level
Knowledge gap of farmers in pulse production	1. Age	-0.348**	0.195	0.254
	2. Education	-0.514**		
	3. Farm size	-0.049 NS		
	4. Pulse production area	-0.150 NS		
	5. Farming experience	-0.372**		
	6. Annual family income	0.079 NS		
	7. Credit received	-0.035 NS		
	8. Agricultural input availability	0.075 NS		
	9. Economic motivation	-0.454**		
	10. Risk orientation	-0.207*		

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

4.3.1. Relationship between age of the farmers and their knowledge gap in pulse production

Computed value of the coefficient of correlation between age of the farmers and their knowledge gap in pulse production was found to be -0.348 as shown in Table 15. The following observations were found on the basis of computed value 'r':

Firstly, a negative relationship was found to exist between the concerned variables. Secondly, the computed value of 'r' ('r'= -0.348) was found to be greater than the table value (r= 0.254) with 110 degrees of freedom at 0.01 level of probability. Thus, statistically the relationship was significant.

Based on the above findings, the null hypothesis could be rejected and hence, the investigator concluded that there was negative significant relationship between age of the farmers and their knowledge gap in pulse production.

4.3.2 Relationship between education of the farmers and their knowledge gap in pulse production

Computed value of the coefficient of correlation between education of the farmers and their knowledge gap in pulse production was found to be -0.514 as shown in Table 15. The following observations were found on the basis of computed value 'r':

Firstly, a negative relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= -0.514) was found to be greater than the table value ('r'=0.254) with 110 degrees of freedom at 0.01 level of probability. Thus, statistically the relationship was significant.

Based on the above findings, the null hypothesis could be rejected and hence, the investigator concluded that there was negative significant relationship between education of the farmers and their knowledge gap in pulse production.

4.3.3 Relationship between farm size and their knowledge gap in pulse production

Computed value of the coefficient of correlation between farm size of the farmers and their knowledge gap in pulse production was found to be -0.049 as shown in Table 18. The following observations on the basis of computed value 'r' were found:

Firstly, a negative relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= -0.049) was found to be smaller than the table value ('r'=0.195) with 110 degrees of freedom at 0.05 level of probability. Thus, statistically the relationship was not significant.

Based on the above findings, the null hypothesis could not be rejected and hence, the investigator concluded that there was no significant relationship between farm size of the farmers and their knowledge gap in pulse production.

4.3.4 Relationship between pulse production area and their knowledge gap in pulse production

Computed value of the coefficient of correlation between pulse production area of the farmers and their knowledge gap in pulse production was found to be -0.15 as shown in Table 15. The following observations on the basis of computed value 'r' were found:

Firstly, a negative relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= -0.15) was found to be smaller than the table value ('r'=0.195) with 110 degrees of freedom at 0.05 level of probability. Thus, statistically the relationship was not significant.

Based on the above findings, the null hypothesis could not be rejected and hence, the investigator concluded that there was no significant relationship between pulse production area of the farmers and their knowledge gap in pulse production.

4.3.5 Relationship between farming experience of the farmers and their knowledge gap in pulse production

Computed value of the coefficient of correlation between Farming experience of the farmers and their knowledge gap in pulse production was found to be -0.372 as shown in Table 15. The following observations on the basis of computed value 'r' were found:

Firstly, a negative relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= -0.372) was found to be greater than the table value ('r'=0.254) with 110 degrees of freedom at 0.01 level of probability. Thus, statistically the relationship was negatively significant.

Based on the above findings, the null hypothesis could be rejected and hence, the investigator concluded that there was negative significant relationship between Farming experience of the farmers and their knowledge gap in pulse production.

4.3.6 Relationship between annual family income and their knowledge gap in pulse production

Computed value of the coefficient of correlation between Annual income of the farmers and their knowledge gap in pulse production was found to be 0.079 as shown in Table 15. The following observations on the basis of computed value 'r' were found:

Firstly, a positive relationship was found to exist between the concerned variables. Secondly, the computed value of 'r' ('r'= 0.079) was found to be smaller than the table value ('r'=0.195) with 110 degrees of freedom at 0.05 level of probability. Thus, statistically the relationship was not significant.

Based on the above findings, the null hypothesis could not be rejected and hence, the investigator concluded that there was no significant relationship between Annual income of the farmers and their knowledge gap in pulse production.

4.3.7 Relationship between Credit received and their knowledge gap in pulse production

Computed value of the coefficient of correlation between Credits received of the farmers and their knowledge gap in pulse production was found to be -0.035 as shown in Table 15. The following observations on the basis of computed value 'r' were found:

Firstly, a negative relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= -0.035) was found to be smaller than the table value ('r'=0.195) with 110 degrees of freedom at 0.05 level of probability. Thus, statistically the relationship was not significant.

Based on the above findings, the null hypothesis could not be rejected and hence, the investigator concluded that there was no significant relationship between Credit received of the farmers and their knowledge gap in pulse production.

4.3.8 Relationship between agricultural input availability of the farmers and their knowledge gap in pulse production

Computed value of the coefficient of correlation between Agricultural input availability of the farmers and their knowledge gap in pulse production was found to be 0.075 as

shown in Table 15. The following observations were found on the basis of computed value 'r':

Firstly, a positive relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= 0.075) was found to be lesser than the table value ('r'=0.195) with 110 degrees of freedom at 0.05 level of probability. Thus, statistically the relationship was not significant.

Based on the above findings, the null hypothesis could not be rejected and hence, the investigator concluded that there was no significant relationship between agricultural input availability of the farmers and their knowledge gap in pulse production.

4.3.9 Relationship between economic motivation of the farmers and their knowledge gap in pulse production

Computed value of the coefficient of correlation between Economic motivation of the farmers and their knowledge gap in pulse production was found to be -0.454 as shown in Table 15. The following observations were found on the basis computed value 'r':

Firstly, a negative relationship was found to exist between the variables. Secondly, the computed value of 'r' ('r'= -0.454) was found to be greater than the table value ('r'=0.254) with 110 degrees of freedom at 0.01 level of probability. Thus, statistically the relationship was negatively significant.

Based on the above findings, the null hypothesis could be rejected and hence, the investigator concluded that there was significant relationship between Economic motivation of the farmers and their knowledge gap in pulse production.

4.3.10 Relationship between risk orientation of the farmers and their knowledge gap in pulse production

Computed value of the coefficient of correlation between Risk orientation of the farmers and their knowledge gap in pulse cultivation was found to be -0.207 as shown in Table 15. The following observations on the basis of computed value 'r' were found:

Firstly, a negative relationship was found to exist between the concerned variables. Secondly, the computed value of 'r' ('r'= -0.207) was found to be greater than the table value ('r'=0.195) with 110 degrees of freedom at 0.05 level of probability. Thus, statistically the relationship was significant.

Based on the above findings, the null hypothesis could be rejected and hence, the investigator concluded that there was significant relationship between Risk orientation of the farmers and their knowledge gap in pulse production.

4.4 Contribution of the selected characteristics of farmers on their knowledge gap in pulse production

For this study ten characteristics of the respondent were selected and each of the character was treated as independent variables. The selected characteristics were age (x_1), education (x_2), land size (x_3), pulse production area (x_4), farming experience (x_5), annual family income (x_6), agricultural input availability (x_7), credit received (x_8), economic motivation (x_9) and risk orientation (x_{10}). Knowledge gap in pulse production (Y) was the only dependent variable of this study. Stepwise multiple regression analysis was done to find out the contribution of the selected characteristics of farmers on their knowledge gap in pulse production. The results of stepwise multiple regression analysis is described below:

Full model regression analysis was initially run with the 10 independent variables. But it was observed that the full model regression results were misleading due to the existence of interrelationships among the independent variables. Therefore, in order to avoid the misleading results and to determine the best explanatory variables, the method of step-wise multiple regressions was administrated and 10 independent variables were fitted together in step-wise multiple regression analysis. Table 16 shows the summarized results of step-wise multiple regression analysis with 10 independent variables on the respondents' knowledge gap in pulse production. It was observed that out of 10 variables only 3 independent variables namely education (x_2), farming experience (x_5) and economic motivation (x_9) were entered into the regression equation. The other seven variables were not entered into regression equation. The regression equation so obtained is presented below:

$Y= 78.158 - 0.439X_2 - 0.411 X_5 - 0.206X_9$

Table16. Summary of step wise multiple regression analysis showing the contribution of selected characteristics of the farmers on their knowledge gap in pulse production

Variables entered	Standardized Partial 'b' Coefficients	Value of 't' (with probability level)	Adjusted R^2	Increase in R^2	Variation explained in percent
Education (x_2)	- 0.439	-5.190(.000)	0.258	0.258	25.8
Farming experience (x_5)	- 0.411	-5.841(.000)	0.433	0.175	17.5
Economic motivation (x_9)	- 0.206	-2.439(.016)	0.458	0.025	2.5
			Total	**0.458**	**45.8**

Multiple R = 0.687
R-square = 0.472
Adjusted R-square = 0.458
F-ratio = 32. 237
Standard error of estimate = 10.523
Constant =78.158

The multiple R and R^2 values were found 0.687 and 0.472 respectively and the corresponding F-ratio was 32.237 which were significant at 0.000 levels. For determining unique contribution of each of the three variables the increase in R^2 value was determined on knowledge gap in pulse production. These three variables combinetly explained 45.8 percent of the total variation in knowledge gap of farmers in pulse production. Education alone contribute 25.8 percent of the variation followed by farming experience (17.5 percent) and economic motivation (2.5 percent) variation in knowledge gap of the farmers.

Table 16 showed that education, farming experience and economic motivation had significant contribution on knowledge gap in pulse production that mean the farmers who had more education, long farming experience and higher economic motivation were found to have less knowledge gap in recommended practices in pulse production and on this regards, some predictive importance has been briefly discussed below:

Education

Stepwise multiple regressions revealed that education of the respondents had significant negative influence on their knowledge gap. Education was by far found to be the most important negative contributor on knowledge gap in pulse production. Correlation matrix also showed that education of the respondents had significant negative relationship with their knowledge gap in pulse production (Appendix-B and Table 15).

Education helps the farmers to face the adverse condition and adjust with unfavorable condition through reading leaflets, booklets, books and other printed materials in this case. Education helps the farmers to broaden their outlook and expand mental horizon by helping them to develop proper attitude and correct perception to decrease knowledge gap about production technology of crops. An educated man is relatively more responsive to the technology, new innovation. S/he can easily contact with various extension agent and make frequent contact with other information sources, which make them able to acquire adequate accurate information. S/he has enough courage to take risk. The farmers who have no schooling, s/he is supposed to face a great difficulty in adjusting with the unfavorable condition regarding knowledge gap for pulse production. Such consideration indicates the need for improving literacy level among the farmers for adjusting the knowledge gap about pulse production.

Farming experience

From stepwise multiple regressions, it was found that farming experience of the respondent had significant negative contribution on their knowledge gap in pulse production and it was found to be the second important contributor. Correlation matrix also showed that farming experience of the respondents had significant negative relationship with their knowledge gap in pulse production (Appendix-B and Table 15).

A farmers having long farming experience will have less knowledge gap. Farming experience is helpful to increase knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate decisions at the time of need. So, it is not possible for all time to take appropriate decision for the farmers in pulse production due to their lack of skill, knowledge, etc.

Economic motivation

Stepwise multiple regressions showed that economic motivation of the respondents had significant negative contribution on their knowledge gap in pulse production and it was found to be the 3rd important contributor among the significant contributors. Correlation matrix also showed that economic motivation of the respondents had significant negative relationship with their knowledge gap in pulse production (Appendix-B and Table 15).

A farmers having high economic motivation would have less knowledge gap. Economic motivation of a farmer is one of the prerequisite conditions for improving farming behavior. An economic motivated person invests more for getting economic benefit from farming.

4.5 Comparative constraints faced by the farmers in pulse production

Comparative constraints faced index of farmers in 11 selected terms of pulse production were investigated in this study. It was considered necessary to have an understanding about the nature of constraints faced by the farmers in 11 selected constraints, namely (1) Lack of HYV seed, (2) High price of HYV seed, (3) Pest infestation rate increases due to heavy rainfall, (4) Inadequacy of credit against the demand, (5) Unavailability of credit in proper time due to complexity, (6) Low price of produced pulse, (7) Lack of knowledge on irrigation, (8) Lack of knowledge on fertilizer application, (9) Lack of knowledge on disease and pest control, (10) Field attacked by the cattle, (11) Theft of pulse from field. For this purpose, a Constraint Faced Index (CFI) was computed for each of the 11 constraints by using the formula mention in methodology chapter.

Constraint Faced Index (CFI) for any one of the selected 11 constraints could range from 0 to 300 where 0 indicated no constraint faced and 300 indicated highest constraint faced. Rank order was also made based on descending order of the CFI of the 11 selected constraints (Table 17).

Table 17. Rank order of 11 selected constraints faced by farmers in pulse production

Sl. No.	Constraints	Extents of problems				CFI	Rank Order
		High (3)	Medium (2)	Low (1)	Not at all (0)		
1.	Lack of HYV seed	66.96	30.36	2.68	0	264.28	1
2.	High price of HYV seed	65.18	30.36	4.46	0	260.71	2
3.	Lack of knowledge on disease and pest control	44.64	55.34	0	0	244.64	3
4.	Pest infestation rate increases due to heavy rainfall	21.43	65.18	13.39	0	208.04	4
5.	Lack of knowledge on fertilizer application	17.86	71.43	6.25	4.46	202.68	5
6	Lack of knowledge on irrigation	16.96	69.64	8.93	4.46	199.11	6
7.	Inadequacy of credit against the demand	26.79	47.32	17.86	8.03	192.86	7
8.	Unavailability of credit in proper time due to complexity	22.32	43.75	30.36	3.57	184.82	8
9.	Low price of produced pulse	13.39	38.39	42.86	5.36	159.82	9
10.	Field attacked by the cattle	0	22.32	40.18	37.5	84.82	10
11.	Theft of pulse from field	0	20.54	40.18	39.29	81.25	11

The CFI in the Table 17 indicates that the farmers faced highest constraint in lack of HYV pulse seed followed by high price of HYV seed, lack of knowledge on disease and pest control, pest infestation rate increases due to heavy rainfall. Theft of pulse from field ranked last. Rank order of other constraints may be shown in Table 17.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

5.1.1 Introduction

Pulse is an important crop in agriculture and plays an important role in the diet of people of Bangladesh. The importance of pulses in the dietary system of people of Bangladesh is often forgotten, pulses have been considered as a poor man's diet since those are the cheapest source of protein. They major pulses are khesari, lentil, chickpea, mungbean, fieldpea etc. Among these khesari, lentil, chickpea and fieldpea are grown during winter season and contribute about 80 percent of the total pulse. Most of the pulse crops are grown in a few districts. These are Faridpur, Pabna, Jessore, Rajshahi, Kustia Rangpur, Tangail and Kishoregonj.

The average national yields of all the pulse crops are quite low. Maximum possible yields can be achieved only farmers are well equiped with required knowledge and needed inputs and other relevant supports.

To make the pulse production profitable, it is necessary to involve farmers in production, planning and ascertain problem with regard to pulse production. It is therefore, necessary to raise our pulse production through increasing cropping intensity and introducing modern methods.

As such it has gained priority for the production of new technologies and in terms of research in pulses and onward transfer of those to the end-users. In Bangladesh, the modern and the HYV program was launched in the middle of 20th century. For the purpose the government of Bangladesh has established agricultural research system to generate appropriate technologies and also extension system to transfer these technologies at the farmer levels to increase production. At present different research organizations under National Agricultural Research System (NARS) have been working with a view to develop technologies in the field of agriculture. These research institutes are BARI, BINA, BSMRAU, BAU, etc. They develop a lot of modern varieties of different pulses and also develop different practices for production of these modern varieties. But at farmers level the yields of different varieties are not same as that of the

research stations because farmers do not follow the entire package of practices. As such there is large yield gap between the experimental stations and those of farmers' field.

To increase the production of pulses farmers need to adopt modern varieties as well as the appropriate practices as recommended.

5.1.2 Objectives

The main objective of this study is to find out the knowledge gap of the farmers in pulse production. However the specific objectives of the study are as follows:

1. To determine and describe the following characteristics of the pulse farmers:
    a. Age
    b. Education
    c. Farm size
    d. Pulse production area
    e. Farming experience
    f. Annual income
    g. Credit receipt
    h. Agricultural inputs availability
    i. Economic motivation
    j. Risk orientation

2. To determine the knowledge gap of the farmers in pulse production

3. To explore the relationship between the selected characteristics of the farmers and their knowledge gap in pulse production

4. To explore the contribution of the selected characteristics of the farmers on their knowledge gap in pulse production

5. To identify the problems faced by the farmers in pulse production

5.1.3 Findings

Selected characteristics of the farmers

Age: It was found that majority (53.6 percent) of the respondents were middle aged as compared to 22.3 percent being young and 24.1 percent old. Findings again revealed that above three forth (75.9 percent) of the respondents were young to middle aged.

Education: Data showed that majority (39.4 percent) of the farmers had secondary level of education as compared to 15.2 percent illiterate, 15.2 percent could sign their name only, 24.2 percent had primary level education and only 6.3 percent had above secondary level of education.

Farm Size: Data demonstrated that highest proportion (52.68 percent) of the farmers had small farm compared to 39.29 percent having medium farm and only 8.03 percent had large farm. The findings indicate that overwhelming majority (91.97 percent) of the farmers had small to medium farm size for pulse production.

Pulse production area: Data specified that above three forth (75.9 percent) of the respondents had small area compared to 15.2 percent had medium area and only 8.9 percent had large area for pulse production.

Farming experience: It was found that most of the farmers (54.5 percent) had long farming experience, where as 34.8 percent had medium farming experience and 10.7 percent had short farming experience.

Annual family income: Data presented that the highest proportion (48.2 percent) of the respondents had low annual family income where as medium and high annual family income by the respondents were observed by 38.4 and 13.4 percent respectively of the total respondents under the present study.

Credit received: It was found that highest proportion (53.6 percent) of the respondents (farmers) did not receive credit facility while 15.2 percent involved in low credit received, 18.7 percent involved in medium credit received and 12.5 percent involved in high credit received.

Agricultural input availability: Data indicated that majority (41.9 percent) of the farmers had medium availability of agricultural input where 29.5 percent farmers had low and 28.6 percent had high agricultural input availability.

Economic motivation: It was found that 54.5 percent of the farmers were medium economically motivated where as 37.5 percent were high and only 8.0 percent were low economically motivated. It means that majority (62.5 percent) of the respondents had low to medium economic motivation.

Risk orientations: It was found that majority (56.2 percent) of the farmers had medium risk orientation where as 30.4 percent had high and 13.4 percent had low risk orientation. Overwhelming majority (86.6 percent) of the respondents had medium to high risk orientation.

Knowledge gap of the farmers in pulse production

Knowledge gap of the respondents ranged from 20-75 in accordance with scoring. Here, the average knowledge score was 41.48 with a standard deviation of 14.29. Data indicated that majority (56.3 percent) of the farmers of the total respondents had medium knowledge gap while 35.7 percent had Low and 8.0 percent had high knowledge gap for pulse production. Findings again revealed that about two third (64.3 percent) of the respondents had medium to high knowledge gap in pulse production.

Relationships between selected characteristics of the Farmers and their knowledge gap in pulse production

Among the ten selected characteristics of the farmers, only five, namely farmers' age, education, farming experience, economic motivation and risk orientation had significant negative relationship with their knowledge gap. Other variables namely farm size, pulse production area, annual income, credit received and agricultural input availability of the farmer had no significant relationship with their knowledge gap in pulse production.

Contributions between selected characteristics of the farmers and their knowledge gap in pulse production

Out of the ten independent variables, only three variables namely education, farming experience and economic motivation of the farmers had significant contribution on their knowledge gap in pulse production as indicated by step-wise multiple regression analysis. These three contributory factors combinedly explained 45.8 percent of the total contribution.

Comparative constraints facing of selected items of pulse production

In order to compare the constraints faced by the farmers in 11 selected items of pulse production, a Constraint Faced Index (CFI) was computed for each item. Farmers faced highest constraints in 'lack of HYV pulse seed' followed by 'high price of HYV seed' and 'lack of knowledge on disease and pest control'. 'Theft of pulse from field' was the least constraints faced by the farmers.

5.2 Conclusions

Conclusions drawn on the basis of the findings of the study, the logical interpretation of findings and other relevant facts are stated below:

1. Majority (56.3 percent) of the farmers of the total respondents had medium knowledge gap while 35.7 percent had Low and 8.0 percent had high knowledge gap for pulse production. Findings again revealed that about two third (64.3 percent) of the respondents had medium to high knowledge gap in pulse production. Therefore, it may be concluded that there is necessity to reduce the knowledge gap of the farmers in pulse production.

2. Above three forth (75.9 percent) of the respondents were young to middle aged. Age of the farmers was negatively correlated with their knowledge gap in pulse production. So, it may be concluded that knowledge gap of the young to middle aged farmers should be decreased by increasing their knowledge in pulse production.
3. Education was negatively correlated with knowledge gap in pulse production and it had negative influence on knowledge gap in pulse production as indicated by stepwise multiple regression. Therefore, it may be concluded that by increasing

education level of the farmers, knowledge gap in pulse production could be decreased.

4. Farming experience of the farmers was negatively correlated with knowledge gap and it had also negative contribution on knowledge gap in pulse production. Therefore, it may be concluded that farming experiences of the farmers could be increased their knowledge as well as decrease their knowledge gap in cultivation different crops.

5. Majority (62.5 percent) of the respondent had low to medium economic motivation and Correlation analysis showed that economic motivation of the farmers had significant negative relationship with their knowledge gap in pulse production. Step wise multiple regression analysis also indicated that economic motivation of the farmers had significant negative contribution on their knowledge gap in pulse production. By motivational program the farmers could improve their agricultural knowledge. Therefore, it may be concluded that, knowledge gap in pulse production of the farmers could decreased by increasing their economic motivation.

6. Correlation analysis showed that risk orientation of the farmers had significant negative relationship with their knowledge gap in pulse production. It is quite logical that the farmers having more orientation towards risk could acquire agricultural knowledge easily in a larger scale. Therefore, it may be concluded that risk orientation of the farmers was helpful for reduction of knowledge gap in pulse production.

7. Among 11 selected problems in pulse production faced by the pulse farmers, lack of HYV pulse seed ranked first followed by high price of HYV seed and lack of knowledge on disease and pest control. Therefore, it may be concluded that there is necessity to reduce different problem of the pulse farmers based on the severity of problems.

5.3 Recommendations

5.3.1 Recommendations for policy implication

On the basis of findings and conclusions following recommendations were drawn:

1. Two third (64.5 percent) of the pulse farmers had medium to high knowledge gap in pulse production. Therefore, it may be recommended that attempts should be taken by the concerned extension providers like Department of Agricultural Extension (DAE) to decrease the knowledge gap of the farmers by providing necessary training and motivational campaign.

2. Age of the farmers was negatively correlated with their knowledge gap in pulse production. Therefore, it may be recommended that training programmes and motivational campaign should be taken especially for the young and middle aged farmers to increase their knowledge and decrease their knowledge gap in pulse production.

3. Education was negatively correlated with knowledge gap in pulse production and it had negative influence on knowledge gap in pulse production as indicated by stepwise multiple regression. Therefore, it may be recommended that attempts should be taken to increase education level of the farmers by establishing adult training center which ultimately could decrease their knowledge gap in pulse production.

4. Farming experience of the farmers was negatively correlated with knowledge gap and it had also negative contribution on knowledge gap in pulse production. Therefore, it may be recommended that modern pulse cultivation techniques should be provided to the farmers specially to the short experienced pulse farmers, to decrease their knowledge gap in pulse production.

5. Economic motivation and risk orientation of the farmers had significant negative relationship with their knowledge gap in pulse production. Step wise multiple regression analysis also indicated that economic motivation of the farmers had significant negative contribution on their knowledge gap in pulse production. Therefore, priority should be given by the concern authorities for

enhancing economic motivation and risk orientation of the farmers through demonstrations, field days, formal training and meeting orientation.

6. Pulse farmers faced several problems in pulse production. Therefore, it may be recommended that attempts should be taken to minimize those problems by giving the priorities based on the severity of the problems.

5.3.2 Recommendations for further study

1. Findings of the study need to be varied by undertaking similar research in other pulse growing zones of the country.

2. Only overall knowledge gap of farmers in pulse production was considered under the present study. Further research is needed to determine knowledge gap on specific practices.

3. The study was conducted in Muksudpur Upazilla under Gopalgonj District. Similar studies might be carried out in other area of Bangladesh.

4. This study investigated the relationship and contributions of 10 characteristics of the farmers to/on their knowledge gap in pulse production. Further research is needed to explore the effects of other characteristics of the farmers.

5. Like pulse, oil seed production is also decreasing. So, similar research should be conducted at different oil seed growing zones of the country.

6. All constraints affect the performance of the farmers. There is need for undertaking research on the various constraints faced by the farmers which affect their performance.

CHAPTER VI

REFERENCES

CHAPTER VI

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APPENDIX- A

Department of Agricultural Extension and Information System
Sher-e-Bangla Agricultural University
Dhaka

Interview schedule on

"Knowledge Gap of the Farmers in Pulse Production"

Serial No: .....

Name of respondent: .....

Village: .....

Upazilla: ..... **District: .....**

Please answer the following questions:

1. Age: What is your present age? Ans: .....years

2. Education: Please state your level of education
a. Can not read or write
b. Can sign only
c. I did not go to school but my level of education would be equivalent to .....class
d. I passed .....class or equivalent class

3. Farm size: Please indicate the area of land under your possession

Sl. No.	Types of land	Land size	
		Local unit	Hectare
1.	Homestead		
2.	Own land under own cultivation		
3.	Leased in		
4.	Leased out		
5.	Shared in		
6.	Shared out		
	Total		

4. Pulse production area: Please mention the total area of land under pulse production .....ha

5. Farming experience: Please state the duration of your direct involvement in farming. .....years

6. Annual family Income: Please indicate the income of your family from different sources in the last year

Sl. No.	Sources of income	Montly income(TK)	Yearly income(TK)
1.	Agriculture		
2.	Livestock		
3.	Fisheries		
4.	Poultry		
5.	Service		
6.	Business		
7.	Others (please specify)		
Total			

7. Credit receipt: Please provide your credit receiving information on the following table

Sources of credit	Amount (tk)
1. Bank	
2. Village money lender	
3. NGO (mention name)	
4. Relatives	
5. Others (if any)	
Total	

8. Agricultural Input availability: Please give your information about following inputs availability

Inputs	Regularly	Occasionally	Rarely	Not at all
1. Availability of HYV pulse seeds				
2. Availability of fertilizer				
3. Availability of pesticide				
4. Availability of farm implement				
5. Irrigation facilities				

9. Economic motivation: Please give your opinion in respect of the following statements

No	Statement	Extent of agreement				
		Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1.	I use improved farming practice because adoption of improved farming practices is a must for getting increased crop production.					
2.	The adoption of improve farming practices has increased my financial solvency and social status as well.					
3.	A farmer should work towards larger yields and economic profit.					
4.	We should take the opportunity by adopting improved farming practices, because marketing of agricultural commodity has been widened to national and international level.					
5.	A farmer should try any new farming idea, which may earn him more money					
6.	The most successful farmer is one who makes greater profit.					
7.	The adoption of improved farming practices has created job opportunity in the rural area.					
8.	A farmer should grow cash crops to increase monetary profit for home consumption.					
9.	Now a days investment in farming is really profitable, so I want to make profit by making investment in farming.					
10.	It is difficult to young cultivators to make good start unless he is provided with economic assistance.					

10. Risk orientation: Please indicate your opinion in respect of the following statements

Sl. No	Statement	Extent of agreement				
		Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1.+	A farmer who is willing to take risk than the average farmers usually does better financially.					
2.+	A farmer should grow more crops to avoid greater risk instead of growing one or two crops.					
3.-	I think a farmer will be looser if he adopts new and uncertain technology.					
4.-	It is better for a farmer to adopt new farming method after most others have used them with success.					
5.+	I want to adopt new farming method though it has risk and uncertainity.					
6.-	It is good for a farmer to take risks when he knows his chance of success is fairly high.					
7.+	Trying a new method in farming by a farmer involves risk but it should be appreciated.					
8.-	Farmers should be satisfied with what they have than taking risk.					
9.+	One cannot prosper in life without taking risk. I agree with this statement					
10. +	A farmer should take risk if he wants to develop his economic status.					

11. Knowledge: Please answers the following questions regarding pulse production

Sl. No.	Question	Answer	Total score	Obtained score
1.	What is the meaning of recommended modern variety of pulse?		2	
2.	Name two modern varieties of Lentil & Mungbean.		2	
3.	Name two modern varieties of Khesari & Mash.		2	
4.	Mention the recommended planting time of lentil.		2	
5.	Mention the recommended planting time of khesari.		2	
6.	Mention the recommended planting time of mash.		2	
7.	Mention two disadvantages of late sowing of pulse.		2	
8.	Why farmers apply less amount of urea fertilizer in pulse production?		2	
9.	Mention two functions of phosphorus fertilizer.		2	
10.	Mention the recommended dose of TSP for modern variety of pulse cultivation		2	
11.	Mention the recommended dose of MP for modern variety of pulse cultivation.		2	
12.	Mention two benefits of weed control.		2	
13.	Mention the appropriate time to keep pulse field weed free.		2	
14.	What do you mean by integrated pest management?		2	
15.	What is the proper time for pesticide application?		2	
16.	Mention two harmful effects of pesticide application.		2	
17.	Mention the appropriate dose of insecticide to control aphid.		2	
18.	Mention two harmful insect in pulse field.		2	
19.	When irrigation is needed in pulse production?		2	
20.	Why less amount of irrigation is necessary in pulse production?		2	
	Total		40	

12. Please mention the level of constraints faced by you in pulse production

Sl. No.	Constraints	Extents of problems			
		High	Medium	Low	Not at all
1.	Lack of HYV seed				
2.	High price of HYV seed				
3.	Pest infestation rate increases due to heavy rainfall				
4.	Inadequacy of credit against the demand				
5.	Unavailability of credit in proper time due to complexity				
6.	Low price of produced pulse				
7.	Lack of knowledge on irrigation				
8.	Lack of knowledge on fertilizer application				
9.	Lack of knowledge on disease and pest control				
10.	Field attacked by the cattle				
11.	Theft of pulse from field				

Thank you for your kind co-operation

Signature of interviewer

Date.....

APPENDIX- B: Correlation

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	Y
X_1	1										
X_2	-.112	1									
X_3	-.101	.086	1								
X_4	-.129	.142	.738**	1							
X_5	.901**	-.095	-.106	-.117	1						
X_6	-.243**	.174	.460**	.404**	-.233*	1					
X_7	-.180	.270**	.322**	.472**	-.203*	.205*	1				
X_8	-.034	.194*	.369**	.351**	-.118	.555**	.374**	1			
X_9	-.096	.555**	-.023	.039	.012	.151	.095	.003	1		
X_{10}	-.289**	.422**	.000	.055	-.284**	.143	.089	.090	.408**	1	
Y	-.348**	-.514**	-.049	-.150	-.372**	.079	-.035	.075	-.454**	-.207*	1

$NS_{Non\text{-}Significant}$

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

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

X_1 =	Age	X_6 =	Annual family income
X_2 =	Education	X_7 =	Credit received
X_3 =	Farm size	X_8 =	Agricultural input availability
X_4 =	Pulse production area	X_9 =	Economic motivation
X_5 =	Farming experience	X_{10} =	Risk orientation
		Y =	Knowledge gap of farmers in pulse production