FARMERS' PERCEPTION ON CAUSES AND CONSEQUENCES OF RICE BLAST DISEASE AT DUMURIA UPAZILA OF KHULNA DISTRICT

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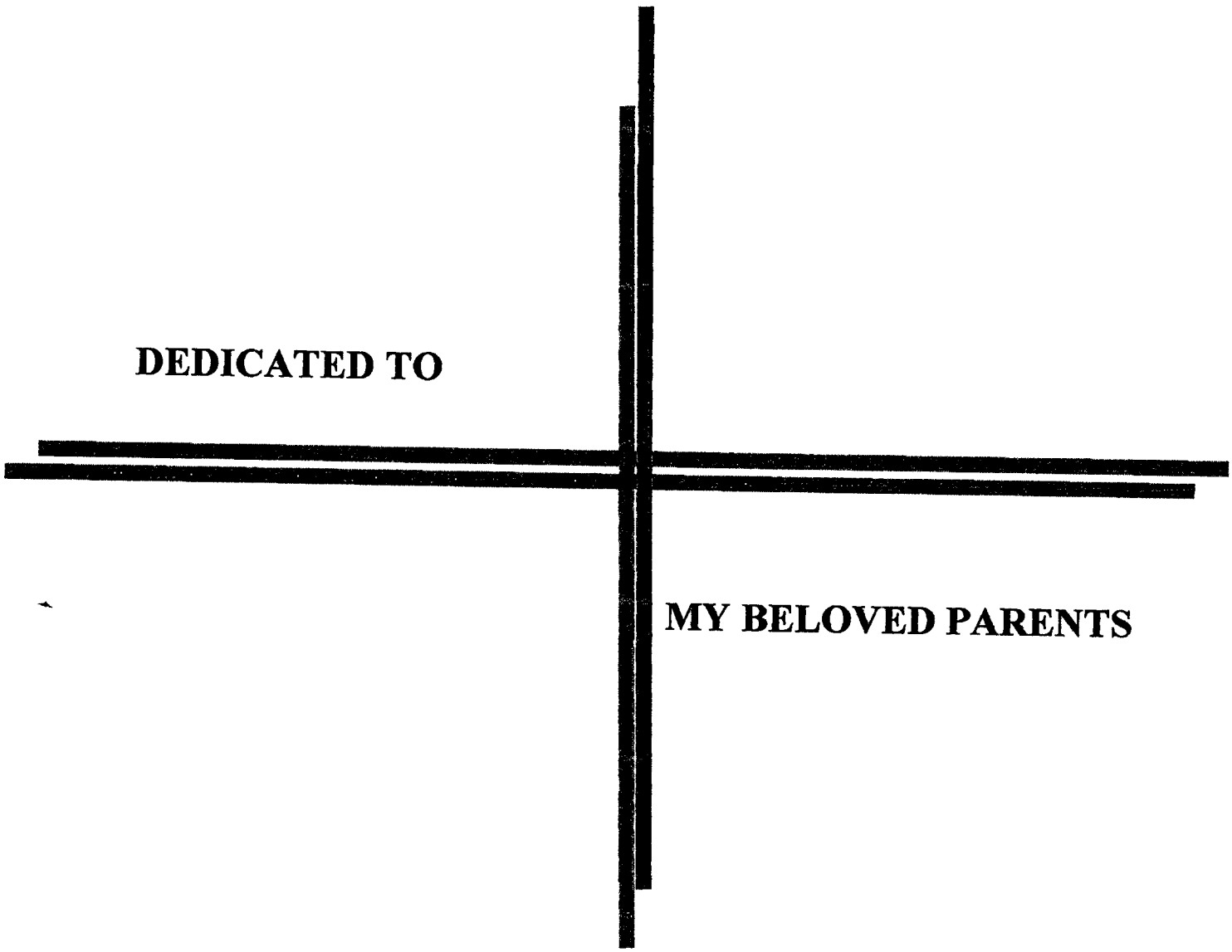
ABSTRACT

Rice blast is the most destructive disease to rice production globally. Blast is caused by the fungus *Pyricularia oryzae.* The main objective of this study was to determine the farmers' perception on causes and consequences of rice blast disease in Atlia union of khulna district. Data were collected from randomly selected 105 respondents of three villages namely Maltia, Nornia and Atlia of Dumuria upazila under Khulna district through personal interview by the researcher herself using an interview schedule during 15 March to 8 April, 2018. Farmers' perception regarding the causes and consequences of rice blast diseases were the dependent variable and the eleven selected characteristics of the respondents considered as the independent variables of the study. The respondent farmers had more clear perception on consequence of rice blast disease than its causes. Three-fourth (75.2%) of the respondents had moderately clear perception followed by less clear perception (14.3%) and high clear perception (10.5%) on causes of rice blast disease. Most significant or important cause of rice blast was the climatic condition while the less significant cause was DAE members did not providing any information. Three-fourth (75.2%) of the respondents had moderately clear perception followed by high clear perception (13.3%) and less clear perception (11.4%). The main consequence of rice blast disease caused in yield reduction while the consequence was least due to cutting off the blast-infected leaf blades significantly rescues the stunted growth of leave. There exist insignificant relationships between the selected characteristics of the farmers and their perception on the causes of rice blast disease. Among 11 selected characteristics of the respondents only educational qualification, farm size, organizational participation, annual income, extension contact, cosmopoliteness showed a significant positive relationship with their perception on consequences of rice blast disease.

Key words: Farmers Perception, Causes and Consequences, Rice Blast Disease

DEDICATION



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CHAPTER I

INTRODUCTION

1.1 General background

Rice (Oryza sativa *L.*) is a staple food for half of the world's population (Tobias et al., 2012). It provides 21% of global human per capita energy and 15% of per capita protein (IRRI, 2002). It has been ranked consistently, since 2008, as the second most important food and agricultural commodity in the world, with a mean trade value of $182 billion per annum (FAO, 2013).

The centre of origin of rice is believed to be South-East Asia (*Oryza sativa*) and Africa (*Oryza glaberrima*) with some of the rice producing countries being China, Myanmar, India, Japan, United States, Italy and Brazil although the original parental species of rice are native to South-East Asia and certain parts of Africa (Oko et al., 2012). Its supply must double by 2050 to keep up with food demand from population growth (FAO, 2009).

Calories from rice are particularly important in Asia, especially among the poor, where it accounts for 50-80% of daily caloric intake (IRRI, 2001). As expected, Asia accounts for over 90% of the world's production of rice, with China, India and Indonesia producing the most 85% of the rice that is produced in the world is used for direct human consumption (IRRI, 2002).

It is central to Bangladesh's economy, accounting for nearly 20% of gross domestic product (GDP) and providing about one-sixth of the national income of Bangladesh (Timothy and Khandaker , 2013).

Almost all of the 13 million farm families of the country grow rice (BRKB, 2017). Over 5,000 hectares of boro cropland in southern, mid-Northern and northern regions were damaged by the neck blast disease caused by the fungi *Pyricularia oryzae* (teleomorph as *Magnaporthae oryzae*) (Sun, 2017). *Pyricularia oryzae* the fungus responsible for rice blast and invaded all rice growing areas. Virulent genotypes regularly emerge and causing rapid resistance breakdowns (Saleh, et al., 2014).

Blast disease is caused by *Magnaporthe oryzae (*synonym of *Pyricularia oryzae)* which is also known as rice blast fungus, rice seedling blight, rice rotten neck, oval leaf spot of graminea, blast of rice, pitting disease, Johnson's spot and rye grass blast. It has been ranked among the most important rice diseases. This pathogen infects all developmental stages and all organs of the rice plant (Le et al., 2010). It has been recognized in 85 rice-growing countries (Wang et al., 2014).

Incidence and severity of blast disease is increasing especially in the Boro season. In recent years, in Bangladesh, frequency of blast occurrence has increased with invasion into new areas (north and northwest parts of the country). The most popular and mega varieties BRRI dhan29 and BRRI dhan28 are recognized highly susceptible to blast disease (Anonymous, 2011).

Blast disease is one of the most devastating rice diseases worldwide, causing large yield losses each year and is a threat to global rice security (Li et al., 2011). Due to this disease, destroys abundant rice to feed more than 60 million people for one year and economic losses over 70 billion of a dollar (Scheuermann et al., 2012). The disease occurs almost everywhere rice is grown, and accounts for annual losses of 10 – 30% in rice production (Skamnioti and Gurr, 2009).

Moreover, all local and improved aromatic rice varieties grown in wet season are vulnerable to neck blast (Ali and Fukuta, 2010). For blast disease management at field level chemical control is mainly practiced and other options particularly water management is mostly difficult to practice (IRRI, 2013).

Rice blast is, therefore, a remarkable economic and humanitarian problem. However, climatic changes accompanying with the global warming could prompt its spread in to other parts around the world (Kohli et al., 2011).

Knowledge about the geographic distribution and frequency of a virulence genes will contribute towards the development of rice varieties carrying different resistance genes. Management of rice blast is difficult because the pathogen is seed borne (Hubert et al., 2015).

A management strategy incorporating the use of resistant cultivar, suitable planting date, and fungicide need to be considered for the effective and sustainable control of the blast disease. The efficacy of a particular fungicide to control the blast disease could vary from season to season or place to place (Nasruddin and Amin, 2013).

The disease is particularly destructive to upland rice crops produced without irrigation. Many rice scientists consider blast to be the most important disease of rice worldwide. This is because the disease is widely distributed in 85 countries and can be very destructive when environmental conditions are favorable. Disease occurrence and severity vary by year, location, and even within a field depending on environmental conditions and crop management practices. Yield loss estimates from other areas of the world have ranged from 1% to 50%. The fungus can infect and produce lesions on most of the shoot (Jeffrey and Ryan, 2016).

Khan et al., (2014) reported that most of the cultivars popular in Bangladesh, including aromatic rice varieties, in both rainfed and irrigated lowlands were highly susceptible to blast.

Breeding rice cultivars resistant to blast disease is the most ecofriendly and economic approach to managing the disease. However, because of the continuous generation of new pathogenic races, cultivars released as resistant have often shown high levels of susceptibility within a few years of their release (Zhou et al., 2007).

One of the largest impediments to increased rice production is the presence of rice blast which directly decreases rice yields and indirectly increases production costs (Skamnioti and Gurr, 2009). Rice blast is one of the most frequent and costly rice diseases in temperate rice-growing regions worldwide (Wang and Valent , 2009).

Yield loss from blast infections depends on varietal susceptibility, the degree of infection, and the timing of fungicide application. Some yield losses associated with blast outbreaks have reached 50% or more (Khush and Jena, 2009) and the cost of mitigating those blast outbreaks via fungicide application can reach over \$70 ha^{-1}.

Many scientists have identified many causes and consequences of rice blast in the country. But we don't know whether the farmers' perceptions are clear of the issues i.e.; the causes of rice

blast and/or its consequences. Considering these points in view the present study was under taken to study the perception of the farmers on causes and consequences of rice blast.

1.2 Statement of the problem

Rice (*Oryza sativa* L.), is one of the main world staple food crops. It is an important food crop for more than one third of the world population (Zhao et al., 2011). Rice blast, caused by the fungus *Pyricularia oryzae* Cavara has been identified as one of the major rice cultivation constraints worldwide (Wang et al., 2015).The blast fungus is capable of infecting rice at any stage of the host life cycle.

Rice blast is favoured by particular air and soil temperatures, relative humidity (RH), hours of continuous leaf wetness (LW), degree of light intensity and duration and timing of dark periods, all of which have been considered as very important for disease development. Since the farmers do not enough perception on causes and consequences of rice blast disease due to lack of adequate knowledge, consciousness and skills, they are not able to manage rice blast disease. Farmers often do not understand when rice blast affects in their field. After blast outbreak they understand blast affected in their field.

Farmers contact DAE (Department of Agricultural Extension) members for minimizing rice blast disease. DAE members provide many suggestions and tips but sometimes cannot control this disease. This disease creates serious harm to the crops. To manage this disease high amount of money is needed but farmers cannot provide this cost. This is why the rice yield usually reduced.

For this reason, it necessary to arrange timely training programs to acquire necessary knowledge and skill in rice blast disease. It is essential to reduce the excessive use of N fertilizers, to reduce use of blast susceptible cultivars, regular contact with DAE members, all-time aware about weather condition (windy and foggy weather in the morning, dew on the leaf, drizzle, etc.)

In view of the above background and facts the present study entitled "Farmers Perception on causes and consequences of rice blast disease at Dumuria Upazila of Khulna district" was undertaken.

Analyzing the issue from farmers' perspective, this study was specifically designed to find out the answer to the following questions:

i. What are the personal, social, economic and psychological characteristics of the farmers and how they are related with their perception on causes and consequences of rice blast disease?

ii. What is the farmers' perception on causes and consequences of rice blast disease?

iii. How much knowledge do the farmers have about rice blast disease?

In order to answer the above mentioned research questions the present study entitled "Farmers' Perception on Causes and Consequences of Rice Blast Disease at Dumuria Upazila of Khulna District" was undertaken.

1.3 Research Objectives

Meaningful, accurate and obtainable objectives are an important role to achievement in all kinds of research. In view of above cited facts, the present study will be conducted with the following specific objectives

1. To determine and describe some selected characteristics of the rice growing farmers.
2. To assess the farmers' perception on causes and consequences of rice blast disease.
3. To explore the relationship between selected characteristics of the farmers' and their perception regarding the causes and consequences of rice blast diseases.

1.4 Assumption of the Study

"An assumption is the supposition that an apparent fact or principle is true in the light of the available evidence" (Goode and Hatt 1945). The following assumptions were in the mind of the researcher while conducting the study:

i. The respondents of the study area were capable of furnishing all available information stated in the interview schedule accurately.

ii. Information furnished by the respondents included in the sample was representative of the all respondents.

iii. The researcher who acted as an interviewer was well adjusted to the social and environment of the study area.

iv. The data collected by him from the respondents were free from bias and hesitation.

v. The responses furnished by the respondents were reliable and valid.

1.5 Limitations

The study was confined to a selected area i.e., three villages of Atlia union of Dumuria upazila under Khulna district. There were many characteristics of the respondents but only eleven were selected for the study. The researcher had to depend on the data furnished by the selected respondents.

i. The study was conducted in only three villages Maltia, Nornia and Atlia of Dumuria upazila under Khulna district. Thus the finding may not represent the real scenario of whole country due to the widespread variation in nature and cultivation of rice crops from one place to another and one social system to another.
ii. Only few characteristics were taken into consideration for investigation in this study.
iii. The interview schedule was prepared in English but was translated into mother tongue while taking data.

1.6 Definition of the terms

In this study the selected independent variables are-

1.6.1 Age: The age of a respondent refers to the period of time in years from his birth to the time of interview on the basis of his response.

1.6.2 Educational qualification: Level of educational qualification of a respondent refers to the desirable change in skill, knowledge, and attitude in an individual through the experience of reading, writing and other related activities.

1.6.3 Family size: Family size refers to the actual number of member in the family of the respondent including himself, his wife, children and other dependent members.

1.6.4 Farm size: Farm size refers to the respondent's area of ownership and area under rice cultivation in hectare.

1.6.5 Experience: It refers to the experience of respondents in rice cultivation.

1.6.6 Organizational participation: It refers to the involvement of the respondents in different organizations within a specific period of time as general member/executive member/ an officer etc.

1.6.7 Annual family income: It refers to total earning of the respondents from agricultural and other sources (livestock, fisheries, services, business, others) during a year sources. It was expressed in thousand taka.

1.6.8 Extension contact: It refers to use different mass media such as TV, radio, contact with peer group, DAE officers and other agricultural agents.

1.6.9 Cosmopoliteness: It refers to the orientations or exposure of the respondent external to his social system.

1.6.10 Agricultural training: It refer to the total number of days that a respondent received training in his entire life from different organization such as Govt. or Non-Govt under different training programs. Duration of this training and who are sponsoring agency of this training are determined.

1.6.11 Knowledge: Literally, knowledge means knowing on what ones know about a subject, fact, person etc. Here agricultural knowledge was the extent of basic understanding of the respondent in different aspects of agricultural subject matters. It includes the basic understanding of the use of different agricultural activities i.e. crops, livestock and fisheries etc.

CHAPTER II

REVIEW OF LITERATURE

This Chapter deals with the review of past researches related to the present study. The reviews are expressed based on the objectives of the study. The researcher made effort to review the previous research works related to the present study. The literatures of available studies have been briefly discussed in this chapter followed by the conceptual framework of the present study.

2.1 Reviews on Rice Blast Disease

Zhang and Xie, (2014) said that rice is the most significant food crops for mankind because it feeds more than half (50%) of the world population. Although rice production has increased significantly worldwide in the past decades, still it is inadequate to cope with the ever-increasing global demands.

2.1.1 History of rice blast

Two generic names have been used for the blast fungus, *Pyricularia* and *Dactylaria* and both were established by Saccardo in 1880. Cavera (1891) first described a species of *Pyricularia* on rice and named it as *P. oryzae*. Hori (1898) compared the Japanese blast fungus with American specimen referred to as *Pyricularia grisea* and maintained that *P. grisea* produced 3-5 conidiophores from a stoma, each conidiophores bearing many conidia while *P. oryzae* produced only one conidiophore with one conidium at its apex. Asuyama (1965) stated that *P. grisea* is the earliest name given to this group of fungi and, therefore, should be used according to the rules of nomenculature. The names *P. grisea* and *Dactylaria grisea, P. oryzae* and *D. oryzae* have all been used at various times by different workers. The pathogen belongs to sub-division Deuteromycotina, class Hyphomycetes, order Moniliales and family Dematiaceae.

Rice blast caused by *Pyricularia grisea* (Cooke) Sacc.[Perfect stage *Magnaporthe griseais* considered as one of the most important diseases of rice (*Oryza sativa L.*) because of its wide distribution and destructiveness under favourable conditions resulting in serious losses in yield (Ou, 1985). The disease was first reported as 'rice fever disease' in China by Soong ying-shin (Manibhushanrao, 1994).

Later on, In the United States of America, the disease was recorded in South Carolina as early as in 1876 and was perhaps the first to call, it 'blast', a name appropriate to the damage it causes (Metcalf 1906). Now, the disease is reported to affect the rice crop in approximately 85 countries of the world (Gilbert et al., 2004). Bangladesh has experienced several epidemic outbreaks of blast disease since 1980 (Ahmed et al. 1985; Shahjahan 1994).

Khan et al., (2014) reported that most of the cultivars popular in Bangladesh, including aromatic rice varieties, in both rainfed and irrigated lowlands were highly susceptible to blast.

Couch et al., (2002) said that blast can be found on the rice plant from the seedling stage to maturity. The leaf blast phase occurs between the seedling and late tillering stages.

Dean et al., (2005); Khan et al., (2014); Talbot et al., (2003) said that, it is a trans-boundary disease, travels through the air from one region to the other, one country to another country. Infected seed may act as a carrier too. The favourable weather is low night temperature (conversely higher day temperature), unusually windy and foggy weather in the morning, dew on the leaf, drizzle, etc. Outbreaks of the disease are a recurrent problem and are extremely difficult to control in all rice-growing regions of the world, including Bangladesh.

2.1.2 Yield loss due to rice blast

Rice crop at all stages of its growth from seedling to about three weeks before harvest is susceptible to the attack of disease (Hemmi and Yokogi 1927). The extent of losses varies with severity of the disease, stage of the crop and the affected plant part. Several rice blast epidemics have occurred in different parts of the world, resulting in yield losses ranging from 50 to 90 % of the expected crop (Agrios 2005).

This disease has caused significant yield losses in many rice growing countries of the world. Losses of grains to the tune of 75 % has been reported in India (Padmanabhan 1974), 50 % in Philippines (Awodera and Esuruoso 1975) and 40% in Nigeria (Ou 1985). In Nepal, the disease caused 10-20% yield reduction in susceptible varieties, but in severe cases yield reduction had gone up to 80% (Manandhar et al., 1992). In Brazil, rice blast has been considered to be one of the major yield constraints in both irrigated and upland ecosystems (Prabhu and Morais 1986). In Korea Republic between 1983 and 1992, major outbreaks of leaf blast occurred on 62,000-

193,000 ha annually. Zeng et al., (2009) found that under favourable conditions, rice blast can be the most important rice disease in China, Japan and the USA, causing severe damage to rice yields.

Talbot et al., (2003) found that rice blast disease is one of the most devastating fungal diseases of plants. Each year up to 30% of the rice harvest is destroyed by rice blast, which causes a foliar leaf spot disease that can also spread in to the neck, stems and panicle of rice plants where it can cause severe reductions in the grain yield.

Devi and Sharma, (2010) reveal that moderate field infections can cause approx. 50% grain yield reductions. It has been estimated that *P. oryzae* destroys rice grain each year that would feed 60 million people.

Piotti et al., (2005) reported that rice blast causes economically significant crop losses annually and causes yield loss as high as 70–80% when pre-disposition factors favor epidemic development. Jamal et al., (2012) informed that several rice blast epidemics have occurred in different parts of the world, resulting in heavy yield losses in these areas ranging from 50 to 90 % of the expected crop.

Séré et al., (2011) said that blast epidemic causes complete loss of seedling in nursery and epidemics in the field. Outbreak of this disease is a serious and recurrent problem and it is extremely difficult to control in all rice growing regions of the world, including Bangladesh. Rice blast is a widespread and destructive disease that can result in yield losses of up to 100%.

Odjo et al., (2014) said that rice blast disease in bangladesh will therefore continue to be a leading constraint to rice production and will limit efforts aimed at increasing rice productivity. Greer et al., (2001) also said that it can cause severe yield losses where environmental conditions are favourable for disease development.

Blast is a major disease in Bangladesh on dry seedbeds and sandy soils (Miah et al., 1985). Although upland rice is more susceptible than lowland rice, Teng (1994) considered that, overall,

rice blast causes more yield loss in cool-season tropical and temperate lowland rice because the latter (lowland rice) is responsible for 93% of world production.

2.1.3 Symptomatology

Rice blast can infect most of the rice plant with the exception of the roots. Symptoms can be either lesions or spots. Lesions/spots shape, colour and size vary depending on varietal resistance, environmental conditions and the age of the lesions (Ou 1985).

Manandhar (1996) said that the pathogen attacks all the above ground parts of the plant including leaves, nodes, panicles and seed. It is also found on the leaf sheath, rachis, joints of the culm and even on the glume. It is broadly classified into three types, leaf, collar and neck blasts.

2.3.1 Leaf blast symptoms

Under field conditions symptoms were observed on leaves. On leaves, symptoms appeared first as minute brown spots which later became spindle shaped lesions with pointed ends at both sides. The centre of lesions was generally grey and showed distinct brown margins. Under favourable weather conditions, the lesions enlarge and coalesce leading to withering of the whole leaf (Manibhushanrao 1994).

Tebeest et al., (2007) reported that the symptoms on leaves may vary according to the environmental conditions, age of the plant, and level of resistance of the host cultivars. On susceptible cultivars, lesions may initially appear gray-green and water-soaked with a dark green border which expand rapidly to several centimeters in length often becoming light tan in color with necrotic borders. On resistant cultivars, lesions often remain small in size (1-2 mm) and brown to dark brown in color. Similar symptoms on leaves were observed by Manibhushanrao (1994) and Tebeest et al., (2007).

2.3.2 Collar/ nodal blast symptoms

Nodal blast symptoms were reported by Padmanabhan (1974) and Manibhushanrao (1994) which appear at the junction of the leaf and the stem sheath. Symptoms of infection of the collars

consist of a general area of necrosis at the union of the two tissues. Collar infections can kill the entire leaf and may extend a few millimetres into and around the sheath. The fungus produces abundant spores on these lesions. Similar symptoms on nodes/collar were observed by Padmanabhan (1974), Manibhushanrao (1994) and Tebeest et al., (2007).

2.3.3 Panicle/ neck blast symptoms

Panicle/ neck blast is the most destructive phase of the disease and is found at the reproductive and ripening stage of the crop. Symptoms of neck blast are characterized by infection at panicle base Bonman et al., (1991).The node immediately below the ear is infected and become dark brown to black in colour, the symptom is called neck infection. The infection may be confined to the neck region or the individual branches of the panicle may also be infected and turned brown to black. The infected panicles often break and fall off, or the whole inflorescence may break off at the rotten neck. The grains on the panicle with infected neck are mostly chaffy and this phase is responsible for maximum reduction in yield Padmanabhan, (1974) and Manibhushanrao (1994). Similar symptoms on panicle/ neck were observed by Padmanabhan, (1974), Manibhushanrao, (1994) and Tebeest et al., (2007). In farmers' fields, neck blast is considered more destructive than leaf blast, because it is more closely tied to yield losses Zhu et al., (2005).

2.1.4 Host range

Kumar and Singh, (1994) reported that *Pyricularia grisea* is parasitic on number of host plants belonging to the family Gramineae which includes cereals and grasses such as *Oryza sativa, Eleusine coracane, Eleusine indica, Digitaria sanguinalis, Pennisetum typhoides, Echinochloa colonum.*

Urashima et al., (2007) reported that *Pyricularia grisea* is pathogenic on more than 80 graminaceous host plants.

Yamagashira et al., (2008) reported twenty eight *Pyricularia* isolates from two wild foxtails i.e. green foxtail (*Setaria viridis*) and giant foxtail (*Setaria faberii*) in Japan.

Although rice is main host, *P. grisea* is also reported on the following plants:

Agropyron repens, Agrostis palustris, A. tenuis, Alopecurus pratensis, Andropogon sp., Anthoxanthum odoratum, Arundo donax, Avena byzantina, A. sterilis, A. sativa, Brachiaria mutica, Bromus catharticus, B. inermis, B. sitchensis, Canna indica, Chikushichloa aquatica, Costus speciosus, Curcuma aromatica, Cynodon dactylon, Cyperus rotundus, C. compressus, Dactylis glomerata, Echinochloa crus-galli, Eragrostis sp., Eremochloa ophiuroides, Eriochloa villosa, Festuca altaica, F. arundinacea, F. elatior, F. rubra, Fluminea sp., Glyceria leptolepis, Hierochloe odorata, Holcus lanatus, Hordeum vulgare, Hystrix patula, Leersia hexandra, L. japonica, L. oryzoides, Lolium italicum, L. multiflorum, L. perenne, Muhlenbergia sp., Musa sapientum, Oplismenus undulatifolius, Panicum miliaceum, P. ramosum, P. repens, Pennisetum typhoides, Phalaris arundinacea, P. canariensis, Phleum pratense, Poa annua, P. trivialis, Saccharum officinarum, Secale cereale, Setaria italica, S. viridis, Sorghum vulgare, Stenotaphrum secundatum, Zea mays, Zingiber mioga, Z. officinale,and Zizania latifolia. Thus these plants can also serve as alternate hosts of *P. grisea*. The role of these host plants in the rice blast disease cycle remains subject of controversy (Borromeo et al. 1993). This controversy is mainly explained by the genetic diversity of the fungus, the hosts and the variation in experimental conditions. Many research workers demonstrated that although *M. grisea* can infect a wide range of plant hosts, some strains are species and even cultivar specific (Valent and Chumley 1991, Borromeo et al. 1993).

2.1.5 Disease development and Epidemiology

Rice blast is favoured by particular air and soil temperatures, relative humidity (RH), hours of continuous leaf wetness (LW), degree of light intensity and duration and timing of dark periods, all of which have been considered as very important for disease development.

Kohli et al., (2011) said that most severe blast disease occurs when more than a few days of continuous rains and average temperatures between 18–25°C during the flowering stage of the crop followed by sunny, hot and humid days. Transmission of *M. oryzae* from rice seeds to seedlings has already been recognized in different countries Long et al., (2001).

Khush et al., (2009) said that today, the disease affects all rice growing areas around the world. Blast is known to affect rice in all agro ecologies, but rice grown under dry land conditions is known to be more susceptible to the disease.

Blast disease can spread with wind-borne spores and is fit to travel miles from region to region or field to field. In some fields, more than one race can prevail increasing the complexity of the host-pathogen relationships. The fungus is known to infect rice plants starting at the seedling stage and damage leaves, stems, peduncles (necks), panicles, seeds, and even roots.

Rice blast is a polycyclic disease depending on favourable weather conditions. The pathogen survives winter as mycelium or conidia on diseased rice stubble, seed or in living plants. Under temperate growing climate, the primary inoculum (conidia) is thought to mainly originate from overwintered rice straw and infected rice seeds. Conidia are transported by wind/water and infect rice.

TeBeest et al., (2007) reported that environmental conditions that favour the outbreak and spread of blast disease are mainly moderate temperatures (24-28 °C), periods of high humidity, and high levels of available nitrogen.

Wilson and Talbot, (2009) reported that blast may also attack the panicle and rot the neck, thereby leading to loss of the entire panicle or prevention of grain filling and maturation. Seeds may also be contaminated and become sources of new infection.

Many experiments have shown that a high nitrogen supply is likely to favour heavy blast infection compared to phosphorus or potassium supply. Reports suggest that application of required amount of quick-acting nitrogenous fertilizer like ammonium sulfate for an entire season was found to cause severe blast disease.

2.1.6 Farmers' perception on rice blast disease

Rice blast (*P.oryzae*) is a fungal disease that occurs in all the rice growing areas of the county. The fungus can infect rice plants at any growth stage. This disease attacks all the parts of the crop growing above the soil. In lowland rice, blast disease can attack at all stages of growth.

Even in rice seeds have started to infected blast disease, whereas to attack blast disease attacking phase of seeding until the phase of the harvest, because its growth is very fast. Then farmers may never find a case when rice stay enters the flowering phase sudden attacked by blast disease which causes rice grains are not filled. Rice blast disease was considered to be the most serious problems for the farmers across the three village clusters. Climatic condition might rank as the 1st most important problem. Severe blast epidemics are usually associated with foggy weather in the morning, dew on the leaf and drizzle. It is the 2nd most important problem. Rice cultivation and utilization are mainly influenced by the socio-economic conditions of farm households, and the consumption behavior of urban dwellers. The problems of rice blast associated with rice production in Bangladesh are closely linked to the climate of the region and the agricultural training of the farmers.

2.2 Reviews on farmers' perception on causes and consequences of rice blast

Scientists or researchers have identified many causes and consequences of rice blast which have been presented in section 2.1 of this chapter. But there are almost no literature related to farmers' perception on causes and consequences of rice blast. However, some of the literatures related to farmers' perception on other relevant issues are presented below:

2.2.1 Studies related to perception

Adeola (2012) undertook a study on perception of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The results indicate that an overwhelming majority (85%) of the farmers had low to medium level of perception; while only 15% of the farmers had high perception regarding environmental effects of pesticides use in vegetable production.

Afique (2006) reported that most (97.5%) of the respondent rural women had favorable perception while a few (2.5%) had moderately favorable perception of the benefits of agricultural model farm activities of Sabalamby Unnayan Samity (SUS).

Ahmed (2003) conducted a study on "Impact of shrimp farming on socio-economic, agriculture and environmental conditions in Paikgacha upazila of Khulna district". In his study he stated farmers' perception regarding impact of shrimp farming on socio-economic agriculture and

environmental conditions. He found that majority (61%) of the respondents had moderately clear perception while 24 and 15% respondents had less and highly clear perception regarding impact of shrimp farming on socio-economic agriculture and environmental conditions. respectively.

Chakraborty (2002) undertook a study on Sub Assistant Agriculture Officers' (former BS) perception of changes from mono rice culture to diversified crop cultivation. He found that majority (68.0%) of them had high perception and one-tenth (10.0%) had low perception of changes.

Fardous (2002) stated that most (95.5%) of the farmers perceived the forestry development activities as moderately positive to highly positive effect of village and farm forestry program activities, while the rest (4.5%) perceived in a less positive way.

Islam (2005) reported that majority (57.8 %), of the farmers had high perception followed by moderate perception (41.4%) and less perception (0.8%) about causes of monga. On the other hand, most (91.4 %) of them had high perception compared to moderate perception (8.6%) and none had less perception about remedies of monga in Kurigram district.

Kabir (2002) reported that majority (65.0%) of the farmers had moderately favorable perception on the effect of Barind Integrated Area Development Project (BIADP) towards environmental upgradation where only 16.0 and 19.0% of them had low and highly favorable perception respectively on this issue.

Kabir and Rainis (2012) stated a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. The Results indicate that an overwhelming majority (86.1 %) of the farmers had low to medium level of perception while only (13.9%) farmers had high perception regarding adverse effects of pesticides on environment.

Majlish (2007) undertook a study on perception of participant women on social forestry program of BRAC. The findings indicate that majority (59.0%) of the respondents had favorable perception while 30.0% and 11.0% of them had moderately favorable and unfavorable perception of social forestry program respectively.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. The Results reveal that more than half (54%) of the farmers perceived that organic products are superior to inorganic one.

Roy (2009) showed a study on farmers' perception of the effect of IPM for sustainable crop production. The Results revealed that majority (55.0%) of the respondents had favorable perception while about one-fourth (23.75%) and one-fifth (21.25%) of them had low favorable and medium favorable perception respectively.

Sayeed (2003) conducted a study on farmers' perception on benefits from using manure towards Integrated Nutrient Management (INM) for sustainable crop production. He reported that majority (56.7 %) of the farmers had less favorable perception on benefits of using manure towards INM for sustainable crop production, while the rest (43.3%) had favorable perception of this issue.

Sharmin (2005) conducted her study on rural women's perception of benefits of involvement in Income Generating Activities (IGAs) under a Non-government Organization (NGO) and she showed that most (91%) of the respondents had medium perception of benefit of involvement in IGAs under a NGO, while about one-tenth (9%) had high perception of this issue.

2.2.2 Studies regarding relationship between farmers' perception on causes and consequence of rice blast

There are no studies directed related to relationship between farmers' perception on causes and consequences of rice blast disease. However some research finding on other issues but related to perception are reviewed in this section.

2.2.1 Age and perception

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by the farmers in Ogbomoso, Nigeria. He found that age had a significant influence on the farmers' perception.

Afique (2006) reveled that there was no significant relationship between the age of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Ahmed (2003) showed that age of the respondents had negatively significant relationship with perception regarding impact of shrimp farming on socio-economic, agriculture and environmental conditions in Paikgacha upazila of Khulna district.

Islam (2005) showed that age of the farmers had no significant relationship with their perception of causes and remedies of Monga in Kurigram district.

Islam (2000) reveled that age of farmers had no significant relationship with their perception of the harmful effect of agro-chemical with regard to environmental pollution. Hossain (2000) and Parveen (1995) obtained similar result in their studies.

Kabir (2002) revealed that the perception of farmers on the effects of integrated area development project towards environmental upgradation. The study showed that there was no significant relationship between age and perception of environmental upgradation. Similar finding was obtained by Fardous (2002) in his study.

Majlish (2007) revealed a study regarding perception of participant women on social forestry program of BRAC. The study showed that the relationship between age and perception of social forestry program was negatively significant.

Pal (2009) conducted a study on the perception of organic farmers regarding introduction of ICT in organic farming. He showed that age had no significant relationship with farmer's perception.

Roy (2009) conducted that age had no significant relationship with farmer's perception.

Sayeed (2003) stated that age had no significant effect but negative relation with their perception of benefit from using manure towards INM for sustainable crop production by the farmers. Chowdhury (2001) and Alom (2001) found similar type of findings in their respective studies.

Sharmin (2005) reveled that age of the rural women had no significant relationship with the perception of benefits of involvement in IGAs under a NGO.

Uddin (2004) conducted a study on perception of sustainable agriculture. The findings indicated that age of the respondents had negative significant relationship with their perception of sustainable agriculture.

2.2.2 Educational qualification and perception

Adeola (2012) conducted a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study showed that education had a significant influence on the farmers' perception.

Afique (2006) showed that negatively significant relationship between personal education of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Snmity (SUS).

Ahmed (2003) reveled that educational qualification of the respondents had positively significant relationship with perception regarding impact of shrimp farming on socio-economic, agriculture and environmental conditions in Paikgacha upazila of Khulna district.

Alom (2001) reveled that education of farmers had a significant and positive relationship with their perception of Binamoog-5 as a summer crop.

Fardous (2002) showed a significant positive relationship between education of the farmers' and their perception of the forestry development activities of Village and Farm Forestry Program (VFFP) towards sustainable forestry development.

Kabir and Rainis (2012) revealed a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. They found that education had a significant influence on the farmers' perception.

Majlish (2007) showed that the relationship between education of participant women and their perception of social forestry program of BRAC was positively significant.

Majydyan (1996) and Sarker (1999) and Islam (2001) found similar type of result. But, Kashem did not find any relationship between education of farmers and their perception about benefit of using Indigenous Technical Knowledge (ITK).

Pal (2009) revealed a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study revealed that education had a positive significant influence on the farmers' perception.

Roy (2009) found that education had a negative significant relationship with farmer's perception.

Sayeed (2003) conducted that the education of the respondents had significant positive relationship with their perception from using manure towards Integrated Nutrient Management (INM) for sustainable crop production.

Sharmin (2005) conducted that personal education of the rural women had significant positive relationship with their perception of benefits of involvement of IGAs under a NGO.

Uddin (2004) revealed that the level education of the farmers had a significant positive relationship with their perception of sustainable agriculture.

2.2.3 Experience in rice farming and perception

Ahmed (2003) showed that farming experience of the respondent had negatively significant relationship with their perception regarding impact of shrimp farming on socio-economic agriculture and environmental conditions in Paikgacha upazila of Khulna district.

2.2.4 Extension contact and perception

Afique (2006) mentioned that there was no significant relationship between extension media exposure of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Majlish (2007) showed that the relationship between extension media contact of participant women and perception of social forestry program of BRAC was non-significant.

2.2.5 Agricultural training exposure and perception

Afique (2006) conducted that there was no significant relationship between training exposure of the rural women and their perception of benefits of involvement in agricultural model farm project activities of Sabalamby Unnayan Samity (SUS).

Fardous (2002) stated that training exposure of the farmers was significantly correlated with the perception of the respondents of VFFP towards sustainable forestry development.

Kabir (2002) showed that training experience of the farmers had a significant positive relationship with their perception of the effects of BIADP on environmental upgradation.

Kabir and Rainis (2012) mentioned a study on farmers' perception on the adverse effects of pesticides on environment: the case of Bangladesh. They showed that training had a significant influence on the farmers' perception.

Majlish (2007) found from her study that the relationship between training experience of participant women and perception of social forestry program of BRAC was positively significant.

Pal (2009) mentioned a study on the perception of organic farmers regarding introduction of ICT in organic farming. The study stated that training received had a positive significant influence on the farmers' perception.

Roy (2009) reveled that training received had a positive significant relationship with farmer's perception.

Sharmin (2005) found from her study that training exposure of the rural women had no significant relationship with their perception of benefits of involvement in Income Generating Activities (IGAs) under a NGO.

Uddin (2004) from his study stated that farmers' training exposure had a significant positive relationship with their perception of sustainable agriculture.

2.2.6 Farmers' knowledge of rice cultivation and perception

Adeola (2012) revealed a study on perceptions of environmental effects of pesticides use in vegetable production by farmers in Ogbomoso, Nigeria. The study revealed that farming knowledge had a significant influence on the farmers' perception.

Hossain (2000) showed farmer's knowledge and their perception of Binadhan-6 in the Boro season. The findings of the indicated no relationship between farmers' agricultural knowledge and their perception on Binadhan-6.

Islam (2001) found that agricultural knowledge of farmers had positive significant relationship with their perception of the impact of non-formal education on agricultural development.

Kabir (2002) mentioned that agricultural knowledge had significant positive relationship with the perception on the effect of Barind Integrated Area Development Project (BIADP) regarding environment.

Majlish (2007) revealed her study regarding perception of participant women on social forestry program of BRAC. She found from her study that the relationship between knowledge on tree plantation and perception of social forestry program of BRAC was positively significant.

Roy (2009) conducted that knowledge on IPM practices had a positive significant relationship with farmer's perception.

Uddin (2004) stated his study on farmers' perception of sustainable agriculture. He found that knowledge of environment friendly farming had significant and positive relationship with their perception of sustainable agriculture.

2.3 Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. The conceptual framework of Townsend, J. C. (1953) was kept in mind while framing the structural arrangement for the dependent and independent variables. The present study tried to focus on farmers' perception on causes and consequences of rice blast

2.3.1 The conceptual framework of the study

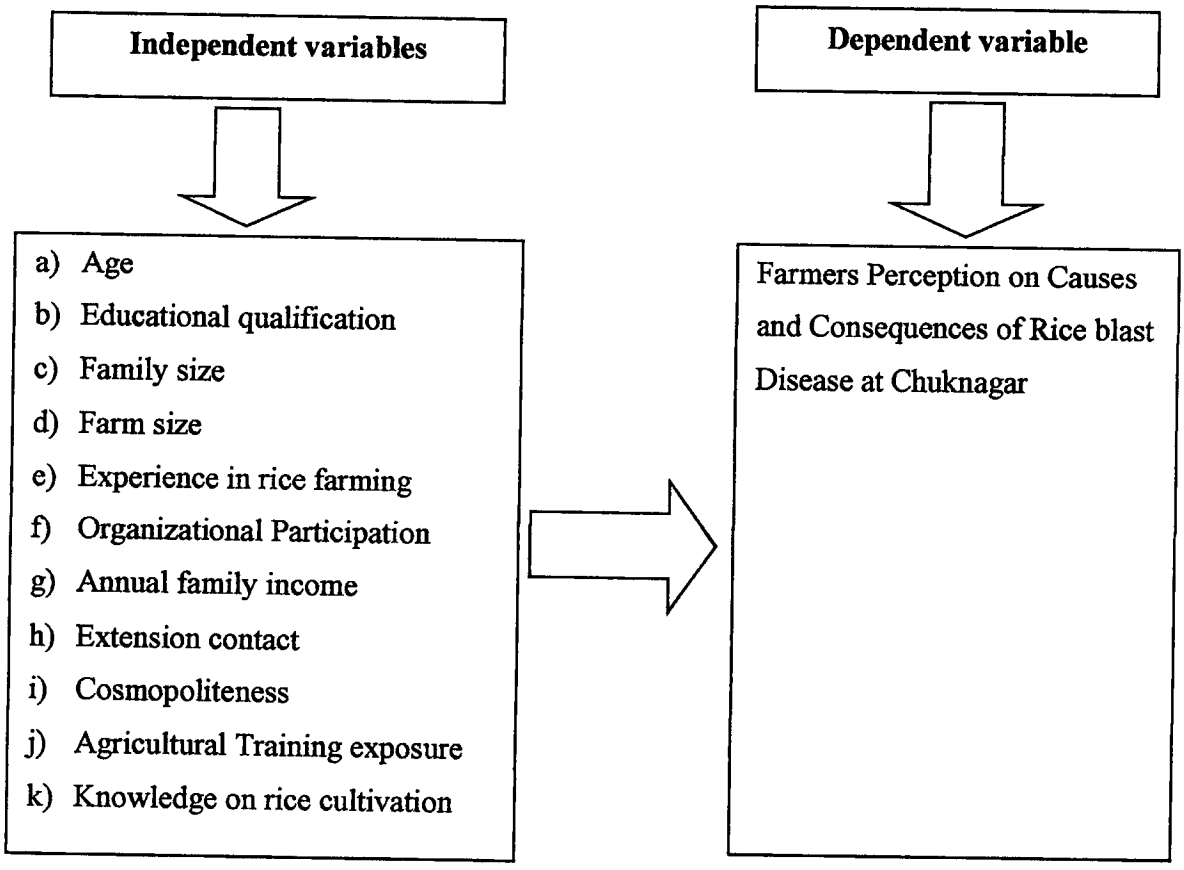

Fig. 2.3.1. The conceptual framework of the study

CHAPTER III

METHODOLOGY

In any scientific research, methodology plays an important role. Research methodology is a systematic way of solving any research problem. Appropriate methodology enables to researcher to collect valid and reliable information and analyze the information properly. It can be understood as a technique of studying how research is done. Research procedures followed in conducting this study are presented in this chapter.

3.1 Research Design

This study is based on descriptive and diagnostic research design. It was designed to study the farmers' perception on causes and consequences of rice blast.

3.2 Locale of the Study

The study was conducted purposively selected in three villages namely Maltia, Nornia, and Atlia of Atlia union in Dumuria upazilla under Khulna district.

3.3 Population and Sampling Design

All the rural farmers of selected three villages who were involved in the cultivation of rice constituted the population of the study. The total list of farmers was prepared with the help of local Sub-Assistant Agriculture Officer (SAAO) and the local people of the concerned areas. The list comprised of 1284 farm families at the three selected villages in Atlia Union who were involved in rice cultivation. Only 8.2% (i.e; 105 farmers) of the farmers' were selected randomly to from the sample. Thus the sample size stood 105.

Table 3.3 Distribution of population in the study area

Union	Village	Population	Sample
Atlia	Atlia	85	60
	Nornia	583	30
	Maltia	616	15
Total		1284	105

3.4 Research Instrument for Data Collection

An interview schedule was used as the research instrument in order to collect information from the respondents. The interview schedule was prepared considering the objectives of the study. It was used to collect valid and reliable information from the respondents. The interview schedule contained both open and closed form of questions. Considering the selected characteristics of the respondents, easy, simple, direct questions and different scales were included in the schedule to obtain necessary information. The schedule was prepared and necessary corrections, alterations and modifications were made before final correct of data.

3.5 Methods and Time of Data Collection

The data were collected through personal interview by the researcher herself during 15 March to 8 April, 2018. To get valid and accurate information, the researcher made all possible efforts to explain the purpose of the study to the respondents. Interviews were conducted with the respondents in their houses and sometimes in their field. While starting interview with any respondent, the researcher first established rapport with respondent and explained the objectives of the study by using local language as far as possible. As a result the respondents furnish proper responses to the questions and statements without hesitation. The questions were clarified whenever any respondent had difficulties in understanding properly. Excellent cooperation was received from the respondents and other people of the study areas. Some difficulties were faced by the researcher in collecting data in this field. Before data collection Sub Assistant Agricultural Officer (SAAO) of the concerned block of Dumuria upazila extended necessary help and cooperation in connection with data collection.

3.6 Variables of the Study

In this chapter, the investigator looked into the literature to widen his understanding about the nature and scope of the variables involved in the research study. A variable is any characteristic which can assume varying or different values in successive individual cases (Ezekiel and Fox, 1959). A well-organized research contains at least two important variables, *viz.* an independent and a dependent variable. An independent variable is that factor which is manipulated to

ascertain the relationship to an observed phenomenon. A dependent variable varies as the experiment introduce, removes or varies with the independent variables (Townsend, 1953).

3.6.1 Selection and Measurement of Independent Variables

The selected characteristics of respondents were the independent variables viz. age, educational qualification, family size, farm size, experience in rice farming, organizational participation, annual family income, extension contact, cosmopoliteness, agricultural training exposure and knowledge on rice cultivation. In accordance with the objectives it was necessary to measure the eleven selected independent variables.

3.6.1.1 Age

The age of a respondent was measured in terms of actual years from his birth to the time of interview on the basis of their response. A score of 1 was assigned for each year of one's age. This variable appears in item no. 1 in the interview schedule (Appendix- I). Based on age, the respondents were classified into following categories (Table3.1).

Table 3.1 Categories of the respondents according to their age

Categories	Score (Year)
Young aged	≤ 35
Middle aged	36-50
Old aged	>50

3.6.1.2 Educational qualification

The educational qualification of a respondent was measured in terms of year schooling. It was expressed in scores. For example, a score, of 5 was assigned for passing primary, 10 for passing S.S.C, 12 for passing H.S.C, 14/15 for graduation (pass course) and 15/16 for passing Honors (graduate). If a respondent did not know how to read and write and can sign name, his educational score was as 0 and 1 respectively. This variable appears in item no. 2 in the interview schedule (Appendix-I). Based on educational qualification, the respondents were classified into following categories:

Table 3.2 Categories of the respondents according to their educational qualification

Categories	Score (Schooling Year)	Duration
Illiterate	0	0
Primary	1-5	5
Secondary	6-10	10
Higher Secondary	11-12	12
Above Higher Secondary (Graduate)	13-16	16

3.6.1.3 Family size

The family size of the respondent was measured on the basis of the number of family members who were eating and living together. This variable has been shown in the question no. 3 of the interview schedule (Appendix I). For example, if a respondent had five (5) members in his family then the family size score was five (5). Based on family size, the respondents were classified into different categories as shown in (Table 3.3).

Table 3.3 Categories of the respondents according to their family size

Categories	Score
Small sized family	<4
Medium sized family	4 -6
Large sized family	>6

3.6.1.4 Farm Size

Farm size was measured as the total area having full benefits of his farm on which he continued his farming operations during the period of study. It included homestead, cultivated area owned by a farmer, area taken from or given to others on borga, area taken from or given to others on lease. The farm size of the respondents was measured in terms of hectare using following formula on the basis of cultivated area in hectare, using following formula (Ahmed, 2011).

$A=A_1+A_2+1/2(A_3+A_4)+A_5+A_6$

Where,

A = Farm size (hectare)

A_1 = Homestead area

A_2 = Owned land under own cultivation

A_3= Owned land other cultivation

A_4 = Other land under own cultivation

A_5= Others land on leased basis

A_6= Others

Actual size of the farm was considered as the score. The data were first recorded in local unit i.e, bigha, decimal, katha etc. and then converted to hectare. This variable appears in item no. 4 in the interview schedule (Appendix-I). Based on farm size, respondents were classified into following categories according to DAE (1999) as shown in (Table 3.4).

Table 3.4 Categories of the respondents according to their farm size

Farm size categories	Area (ha)
Land less	<0.02
Marginal	0.02-0.20
Small	0.21-1.00
Medium	1.00-3.00
Large	>3.00

Source: (DAE, 1999)

3.6.1.5 Experience in rice farming

The experience of a farmer means the experience he gained directly by performing various rice cultivation activities and it was expressed in years i.e. a score of one was given for each year of experience. The questions to measure the experience of the respondents has been presented in the interview schedule (Appendix-I). The respondents were classified into following categories (Table 3.5).

Table 3.5 Categories of the respondents according to their experience in rice farming

Category	Score (Year)
Low experience	≤10
Medium experience	11-20
High experience	>20

Farmers were also asked to mention the rice varieties they have cultivated in their field.

3.6.1.6 Organizational Participation

Organizational participation of the respondent was measured according to the nature of participation to different organizations as no participation, general member, executive member and executive officer were considered and a score of 0, 1, 2 and 3 were assigned respectively. This variable appears in item no. 6 (Appendix-I). A number of 6 organizations were incorporated in the interview schedule. The respondents were asked to indicate their nature of participation in those 6 organizations. Scores assigned for nature of participations of respondents in an organization in following manner.

Nature of participation	Score
No involvement	0
General member	1
Executive member	2
Executive officer	3

Organizational participation score of a respondent was determined by adding his scores for participation in all 6 organizations. Thus the organizational participation score ranged from "0 to 18". Hence, "0" indicates no participation and "18" indicate highest participation. Based on organizational participation score, the respondent were classified into different categories as shown in (Table 3.6).

Table 3.6 Categories of the respondents based on organizational participation

Categories	Score(No. of organization)
No Participation	0
Low participation	1-6
Medium participation	7-12
High participation	>12

3.6.1.7 Annual family income

The annual family income of a respondent was measured on the basis of total yearly earnings from different sources such as agriculture, livestock, fisheries, business etc. by the respondent and other family members. In calculating the family income of a respondent as well as his/her family members (earned from different sources) were added together to obtain total family income of a respondent. This variable appears in item no. 7 in the interview schedule (Appendix-I). Annual income was calculated in Bangladeshi taka (BDT) on the basis of the total yearly earning by asking direct question. The annual family income was compared with the national average income. The respondents were classified into three categories according to their annual income as shown in (Table 3.7).

Table 3.7 Categories of respondents according to annual family income

Categories	Taka(BDT)
Low income	≤ 1,20,000
Medium income	1,20,001-1,80,000
High income	>1,80,000

3.6.1.8 Extension contact

In this study, the extension media contact of the respondents was referred to his level of communication to different persons as DAE officers, NGO officers, input dealers, neighbor/relatives and so on. Besides, their participation on peer group contact, listening radio, TV, reading leaflet, newspaper, talking over mobile phone etc. A 5 point scale such as never, seldom, sometimes, often and regularly used to determine the extent of contact with different extension media. Here score "0" has been used for never, score "1" has been used for seldom,

score "2" has been used for sometimes, score "3'' has been used for often, and score "4" has been used for regular contact with extension media. The lowest score could be "0" and highest score could be "24". When 0 indicates no contact and 24 indicates highest extension contact. This variable appears in item no. 8 in the interview schedule (Appendix-I). Based on extension contact media score of the respondent were classified into different categories as shown in (Table 3.8).

Table 3.8 Categories of respondents according to extension contact

Categories	Scores
No contact	0
Low contact	1-9
Medium contact	10-18
High contact	>18

3.6.1.9 Cosmopoliteness

Cosmopoliteness of the respondent was measured by the frequencies of visitation externally to outside of his own social system. The respondent was asked to mention the number of visits made in four different places in terms of never, seldom, sometimes and a score of 0, 1, 2 and 3 was assigned against the rating scale respectively. The cosmopoliteness of a respondent was determined by adding the total responses against 4 places of visit. The score could ranged from 0 to 12. Where 0 indicate no cosmopoliteness and 12 indicate very high cosmopoliteness. This variable appears in item no. 9 in the interview schedule (Appendix-I). The respondents were classified into four categories according to their cosmopoliteness as shown in (Table 3.9).

Table 3.9 Categories of the respondents according to their cosmopoliteness

Categories	Score
No cosmopoliteness	0
Low cosmopoliteness	1-4
Medium cosmopoliteness	5-8
High cosmopoliteness	9-12

3.6.1.10 Agricultural training exposure

The score of training exposure was computed in the following manner:

Training Score = Σ (N×D)

Where, N =Number of training, D = Duration.

Duration of training exposure score was assigned in the following way:

No training = 0

1 to 7 days of training = 1

8 to 14 days of training = 2

15 to 21 days of training = 3

Table 3.10 Categories of respondents according to their agricultural training exposure

Categories	Score
No training experience	0
Low training experience	1-7
Medium training experience	8-14
High training experience	15-21

3.6.1.11 Knowledge on rice cultivation

To measure the knowledge of the respondent on rice cultivation of farmers, five questions were asked to each of the farmers. The questions covered different aspects on rice cultivation. Each question was assigned by "2" marks. If a farmer can answer all of those questions s/he will get "10" marks. If s/he could not answer any of the questions s/he will get "0". For partially correct answer fraction of marks was given to those respondents. So the range pertains to 0 to 10. Zero (0) indicating no knowledge while 10 indicating the highest level of knowledge. This variable appears in item no. 11 in the interview schedule (Appendix-I). Based on agricultural knowledge, the respondents were classified into three categories as shown in (Table 3.11).

Table 3.11 Categories of the respondents according to their knowledge on rice cultivation

Categories	Score
No Knowledge	0
low Knowledge	1-4
Medium Knowledge	5-8
High Knowledge	>8

3. 7 Farmers' perception on causes and consequences of rice blast (Dependent variable)

To measure farmers' perception on causes and consequences of rice blast. A number of 10 statement for each of the causes and consequences were included under item no.12 of the interview schedule (Appendix 1)

A 5 point rating scale such as strongly agree, agree, undecided, disagree and strongly disagree was assigned against each of the statements related perception and a score of 5,4,3,2 and 1 was assigned against each of the scales respectively. The respondents were asked to express their perception about causes and consequences of rice blast. The perception score of a respondent was determined by summing up all the scores obtained by the respondent against the all statements. The perception score of the respondents could ranged from 10 to 50 where 10 indicate less clear perception and 50 indicate highly clear perception for each of causes and consequences.

Based on the perception score, the respondents were also classified into three categories as shown in the (Table 3.8).

Table 3.7.1 Categories of respondents according to their perception score on causes of rice blast

Categories	Score
Less Clear Perception<($\bar{X}$-Sd)	< 30.91
Moderately Clear Perception ($\bar{X}$-Sd to $\bar{X}$+Sd)	30.91-38.09
Highly Clear Perception>($\bar{X}$+Sd)	>38.09

To compare the perception of the respondents regarding the selected statements a Farmers' Perception Index (FPI) will be calculated by using the following formula:

$$FPI = N_{sa} \times 5 + N_a \times 4 + N_u \times 3 + N_{da} \times 2 + N_{sda} \times 1$$

Where,

FPI = Farmers' Perception Index

N_{sa} = Number of respondents rated the statement as strongly agree

N_a = Number of respondents rated the statement as agree

N_u = Number of respondents were undecided to rate the statement

N_{da} = Number of respondents rated the statement as disagree

N_{sda} = Number of respondents rated the statement as strongly disagree

Farmer perception index is the ratio of observe cause perception score to possible cause perception index and multiple by 100. It was calculated with the following formula:

$$\text{Farmer perception index} = \frac{\text{Observed perception score on causes}}{\text{Possible perception score on causes}} \times 100$$

Table 3.7.2 Categories of respondents according to their perception score on consequences of rice blast

Categories	Score
Less Clear Perception < ($\bar{X}$-Sd)	<36.03
Moderately Clear Perception ($\bar{X}$- Sd) to ($\bar{X}$+Sd)	36.03 to 42.33
Highly Clear Perception>($\bar{X}$ +Sd)	>42.33

To compare the perception of the respondents regarding the selected statements farmers' Perception Index (FPI) will be calculated by using the following formula:

$$FPI = N_{sa} \times 5 + N_a \times 4 + N_u \times 3 + N_{da} \times 2 + N_{sda} \times 1$$

Where,

FPI = Farmers' Perception Index

N_{sa} = Number of respondents rated the statement as strongly agree

N_a = Number of respondents rated the statement as agree

N_u = Number of respondents were undecided to rate the statement

N_{da} = Number of respondents rated the statement as disagree

N_{sda} = Number of respondents rated the statement as strongly disagree

Farmer perception index is the ratio of observe consequences perception score to possible cause perception index and multiple by 100. It was calculated with the following formula:

$$\text{Farmer perception index} = \frac{\text{observed perception score on consequence}}{\text{possible perception score on consequence}} \times 100$$

Here,

FPI = Farmer perception index

CPS = Consequences perception score

CPI = Consequences perception index

3.8 Data processing and analysis

The collected data were coded, compiled, tabulated and analyzed in accordance with the objectives. The qualitative data were transferred into quantitative data by appropriate scoring techniques. The local units were converted into standard units. Data analysis was done by using a micro computer with Statistical Package for Social Science (SPSS) version 20. Non parametric measuring scales such as nominal and ordinal scales were used for transferring data for different levels of measurement. Statistical measures such as number, percentage, mean, standard deviation, range, rank order etc were used in the interpretation of descriptive data. In order to find out the relationship between selected characteristics of the farmers' and their perception on the causes and consequences of rice-blast diseases, Spearman's Rank-Order Correlation Co-efficient (ρ) was computed.

CHAPTER IV

RESULTS AND DISCUSSION

In this chapter, the findings of the study and logical interpretation of the results have been presented carefully, computed, analyzed and tabulated according to the objectives of the study. This chapter is divided into three sections. In the first section, the selected characteristics of the farmers have been presented. In the second section, farmers' perception on causes and consequences of rice blast disease are presented. Finally, in the third section, the relationship between selected characteristics of the farmers' and their perception on the causes and consequences of rice blast diseases have been discussed.

4.1 Selected Characteristics of the Respondents and Related Factors

4.1.1 Age

The age of the respondents ranged from 16 to 65 years, with a mean of 46.21 and standard deviation of 12.42. Based on their age, the farmers were classified into three categories namely young aged (≤35), middle aged (36-55), and old aged (>50) as shown in Table 4.1

Table 4.1 Distribution of the respondents according to their age

Categories	Score (Year)	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Young	≤35	26	24.8	46.21	12.42	16	65
Middle aged	36-50	39	37.1				
Old	>50	40	38.1				
Total		105	100				

Data furnished in Table 4.1 indicate that the of the respondents were old aged (38.1) as compared to middle aged (37.1 %) and young aged (24.8 %) old. It means that middle and old aged people were more interested to rice cultivation in their field.

4.1.2 Educational qualification of the respondents

The education score of the respondents ranged from 0 to 16 with mean and standard deviation of 6.22 and 4.04 respectively. Based on their educational score, the farmers were classified into four categories namely illiterate, primary level, secondary level and higher secondary level, undergraduate level as shown in Table 4.2. Based on their educational score, the farmers were classified into five categories namely illiterate (0), having primary education (1-5), secondary education (6-10), higher secondary education (11-12), undergraduate (13-16) as shown in (Table 4.2).

Table 4.2 Distribution of the respondents according to educational qualification

Categories	Score(Year of schooling)	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Illiterate	0	18	17.1	6.22	4.04	0	16
Primary	1-5	41	39				
Secondary	6-10	32	30.5				
Higher secondary	11-12	08	07.6				
Undergraduate	13-16	06	05.7				
Total	>16	105	100				

Data presented in the Table 4.2 demonstrate that highest proportion (39 %) of the respondents had primary to secondary level of education followed by secondary (30.5%), illiterate (17.1%), higher secondary (07.6%), and undergraduate (05.7%). The respondents those who had primary level of education they are more involved in rice cultivation.

The result also showed that if the farmer had more educational status then he had a more positive and favorable perception about on causes and consequences of rice blast disease. Hence, it is expected that education is one of the most important factors in determining the extent of farmers' perception on causes and consequences of rice blast disease.

4.1.3 Family Size

The family size ranged from 2 to 9 with mean and standard deviation of 4.96 and 1.62 respectively. Based on their family size scores, the respondents families were classified into

three categories namely small (<4), medium (4-6) and large (>6). The distribution of the respondents according to their family size is shown in (Table 4.3).

Table 4.3 Distribution of the respondents according to their family size

Categories	Score (Year)	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Small	<4	18	17.1	4.96	1.62	2	9
Medium	4-6	74	70.5				
Large	>6	13	12.4				
Total		105	100				

The data contained in Table 4.3 indicate that majority (70.5%) of the respondents belonged to the medium sized family while about one-fourth (17.1%) and a few (12.4%) of the respondents belonged to small sized family and large sized family respectively. The data almost similar to family size (4.96) in the study area was higher than the national average of (4.85) (BBS, 2015).

4.1.4 Farm size of the respondents

The observed farm size scores of the farmers varied from 0.02 to 2.34 hectares (ha.). The average farm size was 0.48 ha with the standard deviation was 0.40. Based on the farm size, the respondents were classified into three categories (according to DAE, 1999) such as landless, marginal, small, medium and large farmers as shown in (Table 4.4).

Table 4.4 Distribution of the respondents according to their farm size

Categories	Score (ha)	Respondents (105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Landless	<0.02	0	0	0.48	0.40	0.02	2.34
Marginal	0.02-0.20	24	22.9				
Small	0.21-1	71	67.6				
Medium	1-3	10	9.5				
Large	>3	0	0				
Total		105	100				

The Table 4.4 shows that majority (67.6%) of the respondents possessed small farm size compared to 22.9% and 9.5% of them having marginal and medium farm size respectively. That means most of the farmers having small farm size. None of the respondents belong to landless and large farm categories.

4.1.5 Experience in rice farming

Experience in rice farming of the respondents ranged from 5 to 40 with mean and standard deviation of 19.70 and 10.60 respectively. Based on their experience in rice farming, the respondents were classified into three categories such as low experience, medium experience and high experience (Table 4.5)

Table 4.5 Distribution of the respondents according to their experience in rice farming of the respondents

Categories	Score (Year)	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Low experience	≤10	38	36.2				
Medium experience	11-20	25	23.8				
High experience	>20	42	40	19.70	10.60	5	40
Total		105	100				

The data presented in Table 4.5 indicate that two fourth (40 %) of the respondents had high experience as compared to low experience (36.2%) and medium experience (23.8%). The experiences in rice farming of the respondents are considered to be an important factor to develop and solve the various rice disease problems.

Table 4.5.1 Rice varieties cultivated by the respondents in the study area

Name of varieties	Respondent (N=105)		Rank
	Citation	Percentage (%)	
BRRI dhan28	103	98.09	1st
Hera 19	30	28.57	2nd
Hera 2	20	19.05	3rd
SL-8	18	17.14	4th
Aftap	8	7.62	8th
Tejgor	17	16.19	5th
Shokti	10	9.52	6th
Vitti	9	8.57	7th
Basmati	4	3.81	9rd

Data presented in the Table 4.5.1 reveal that out of the 105 respondent farmers 103 (98.09%) farmers' cultivated BRRI dhan28 variety but in smaller quantities they cultivated Hera 19, Hera 2, SL-8, Aftap, Tejgor, Shokti, Vitti and Basmati. Farmers highly cultivated BRRI dhan28 as the main variety. The other varieties were cultivated in very small portions of land compared to BRRI dhan28. All the farmers who cultivated BRRI dhan28, cited that it is very petable for consumption as well as price concern. BRRI dhan28 fetches higher market prices compared to the other varieties. But now a day's BRRI reported that most of the fields under BRRI dhan28 were affected by the disease while some BRRI dhan29, BRRI dhan50, BRRI dhan61, BRRI dhan63 and some other varieties were affected by the blast diseases.

4.1.6. Organizational participation of the respondents

The observed organizational participation score of the farmer ranged from 0 to 2 against the possible range of 0-12 with a mean of 0.27 and standard deviation of 0.55. The distribution of the respondents according to organizational participation score is presented in Table 4.6.

Table 4.6 Distribution of the respondents according to their organizational participation

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
No participation	0	83	79	0.27	0.55	0	2
Low participation	1-6	22	21				
Medium participation	7-12	0	0				
High participation	>12	0	0				
Total		105	100				

The data presented in Table 4.6 indicate that most (79%) of the farmers did not participated in any organization. On the other hand, one fourth (21%) of the farmers had low organizational participation. None of the farmers had medium and high participation. Organizational participation helps an individual to find out their own problems and solutions. A great majority of the farmers in the study area had no organizational participation. The study revealed that, most of the farmers had no interest to participation in different types of organization. This might be due to that their education level was so low and they felt hesitate to participate in any organization. They were busy in earning their livelihood. So most of the farmers were disinterested to participate in organizations.

Table 4.1.7 Annual family income of the respondents

Annual family income of the respondents ranged from 20,000 to 7,80,000 BDT with a mean of 106958.4 BDT and standard deviation of 1096958.46 The distribution of the respondents according to their annual family income is shown in (Table 4.7).

Table 4.7 Distribution of respondents according to annual income of their family

Categories	Scores (BDT)	Respondents (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Low income	≤1, 20,000	68	64.8	128305 (Annual national average =1610$)	106958.27	20,000	7,80,000
Medium income	1,20,001-1,80,000	22	21				
High income	>1,80,000	15	14.3				
Total		105	100				

Data presented in Table 4.7 reveal that the majority (64.8%) of the respondents had low income while about one fifth (21%) had medium income and 14.3% had high income. It indicates that the economical condition of the farmers is not satisfactory. Majority (64.8%) of the farmers are of low income category. They live under the poverty line. The average annual income (1, 28,305 BDT) of the respondents is below than that of the annual national average (1610$~1,33,581.7 BDT; www.daily nayadiganta.com November 15, 2017) .

Table 4.1.8 Extension contact of the respondents

The extension contact scores of the farmers ranged from 1 to 19 with a mean of 7.86 and standard deviation 3.28. The distribution of the respondents according to their obtained extension contact scores is shown in (Table 4.8).

Table 4.8 Distribution of the respondents according to their extension contact

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Low contact	1-9	82	78	7.86	3.28	1	19
Medium contact	10-18	22	21				
High contact	>18	1	1				
Total		105	100				

Data presented in the Table 4.8 reveal that most (78%) of the farmers had low extension contact as compared to medium (21%) and high (1%) contact. The finding has disagreement with the finding of Akhter and Shiduzzaman (2017). They found that majority (58.4%) of the respondents had medium contact with extension media while about two fifth (41.6%) of the respondents belonged low and very low extension contact group.

4.1.9 Cosmopoliteness of the respondents

Cosmopoliteness scores of the respondents ranged from 0 to 5 with a mean of 0.5 and standard deviation of 1.10. The distribution of respondents according to their cosmopoliteness is shown in (Table 4.9).

Table 4.9 Distribution of respondents according to cosmopoliteness

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
No	0	79	75.2				
Low	1-4	24	22.9				
Medium	5-8	2	1.9	0.5	1.10	0	5
High	9-12	0	0				
Total		105	100				

Data contained in the Table 4.9 reveal that about three-fourth (75.2%) of the respondents had no cosmopoliteness compared to low (22.9%) and medium cosmopoliteness (1.9%). None of the respondent showed higher cosmopolite behavior.

4.1.10 Agricultural training exposure of the respondents

Training exposure scores of the respondents ranged from 0 to 21 with an average score of 1.38 and standard deviation being 3.52. On the basis of trainings exposure the received respondents were grouped into four categories as shown in (Table 4.10).

Table. 4.10 Distribution of the respondents according to their agricultural training exposure of the respondents

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
No training	0	60	57.1				
Low training	1-7	42	40				
Medium training	8-14	0	0	1.38	3.52	0	21
High training	15-21	3	2.9				
Total		105	100				

Data presented in the Table 4.10 reveal that that majority (57.1%) of the respondents had no training on agriculture, two fifth (40%) of the respondents had low training and a few (2.9%) of the respondents had high training. None of the respondent had medium training. Akhter and Shiduzzaman (2017) found almost similar findings on the issues.

4.1.11 Knowledge of the respondents on rice cultivation

Knowledge about rice cultivation score of the farmers was computed on the basis of their knowledge about rice cultivation with five questions each having 2 marks for correct answer. Their score ranged of 5 to 10 against the possible range from 0 to 10. Their average was 7.67 and standard deviation was 0.87. Table 4.11 represents the distribution of the farmers according to the knowledge on rice cultivation.

Table 4.11 Distribution of respondents according to knowledge on rice cultivation

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Low Knowledge	1-4	1	1				
Medium Knowledge	5-8	94	89.5				
High Knowledge	>8	10	9.5	7.67	0.87	3	10
Total		105	100				

Data presented in Table 4.11 indicate that most (89.5%) of the respondents had medium knowledge followed by high knowledge (9.5%) and only a very few (1%) respondent had low of knowledge. The finding of Akhter and Shiduzzaman (2017) found almost similar findings of the study.

4.12. 1 Farmers' perception on causes of rice blast disease

The perception score of the respondent varied from 25 to 45 with a mean and standard deviation of 34.50 and 3.59, respectively. On the basis of perception score the respondents were classified into three categories which is presented in Table 4.12.

Table 4.12.1 Distribution of respondents according to their perception on causes of rice blast disease

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Less clear perception <($\bar{X}$-Sd)	< 30.91	15	14.3				
Moderately Clear Perception ($\bar{X}$-Sd to $\bar{X}$+Sd)	30.91 to 38.09	79	75.2	34.50	3.59	25	45
Highly Clear Perception >($\bar{X}$+Sd)	>38.09	11	10.5				
Total		105	100.00				

Data presented in Table 4.12.1 indicate that three-fourth (75.2%) of the respondents had moderately clear Perception followed by less clear perception (14.3%) and high clear perception (10.5%) on causes of rice blast disease. This might be due to blast is introduced very recently in the study area. The findings of the study have harmony with the findings of Ahmed (2003). He found that majority (61%) respondent had moderately clear perception followed by less clear perception (24%) and high clear perception (15%).

4.12.1.a Relative position (rank order) of the statements related to farmers' perception on causes of rice blast disease

Data presented in Table 4.12.1.a indicate that the most significant or important of cause of rice blast was the climatic condition while the less significant cause was DAE members did not providing any information when any field was blast affected.

4.12.1. a Relative position (rank order) of the statements related to farmers' perception on causes of rice blast disease

Sl. No.	Statement	Degree of agreement							
		Strongly agree (5)	Agree(4)	No opinion (3)	Disagree (2)	Strongly Disagree (1)	Obtained CPS	CPI (%)	Rank (CPS)
1	It attacks at all stages of the crop	(35×5) 175	(70×4) 280				455	86.67	3rd
2	Its symptoms appear on leaves and nodes	(20×5) 100	(85×4) 340				440	83.81	4th
3	It travels through the air one region to the other	(10×5) 50	(46×4) 184	(93×3) 279	(20×2) 40		361	68.76	7th
4	Infected seed may act as a carrier too	(1×5) 5	(7×4) 28	(14×3) 42	(36×2) 72	(47×1) 47	194	36.95	9rd
5	The climatic conditions are responsible for this disease	(88×5) 440	(17×4) 68				508	96.76	1st
6	The low and high temperatures (windy and foggy weather in the morning, dew on the leaf, drizzle, etc.)are favourable for this disease	(55×5) 275	(50×4) 200				475	90.48	2nd
7	More irrigation or dry conditions are responsible for this disease	(15×5) 75	(51×4) 204	(25×3) 75	(7×2) 14	(7×1) 7	375	71.43	6th
8	DAE members did not providing any information when you are blast affected			(1×3) 3	(12×2) 24	(92×1) 92	119	22.67	10th
9	Misleading information regarding rice blast caused the outbreak	(7×5) 35	(78×4) 312	(7×3) 21	(6×2) 12	(7×1) 7	387	73.71	5th
10	The rich farmers applied an excessive nitrogen fertilizer in their field, which caused this disease	(28×5) 140	(18×4) 72	(3×3) 9	(2×2) 4	(54×1) 54	279	53.14	8th

4.12.2. Farmers' perception on consequence of rice blast disease

The perception score of the respondent varied from 28 to 47 with a mean and standard deviation of 39.18 and 3.15, respectively. On the basis of perception score, the respondents were classified into three categories which is presented in (Table 4.12.2).

Table 4.12.2 Distribution of respondents according to their perception on consequences of rice blast disease

Categories	Score	Respondent (N=105)		Mean	SD	Range	
		Number	Percentage (%)			Min	Max
Less clear perception <($\bar{X}$-Sd)	<36.03	12	11.4				
Moderately Clear Perception ($\bar{X}$-Sd to $\bar{X}$+Sd)	36.03 to 42.33	79	75.2	39.18	3.15	28	47
Highly Clear Perception >($\bar{X}$ + Sd)	>42.33	14	13.3				
Total		105	100				

Data presented in Table 4.12.2 indicate that three-fourth (75.2%) of the respondents had moderately clear perception followed by high clear perception (13.3%) and less clear perception (11.4%). The might be due to that the consequence is more visible than that of causes. The findings of the study have some dissimilarity with the findings of Ahmed (2011). He found that majority (61%) respondent had moderately clear perception followed by less clear perception (24%) and high clear perception (15%).

From the findings of the study it could be concluded that the perceptions of the most (89.5%) of the respondents had moderately to less clear perception on causes of rice blast disease.

On the other hand most (88.5%) of the respondent had moderately to highly clear perception on consequence of the same.

4.12.2.a Relative position (rank order) of the statements related to farmers' perception on consequences of rice blast disease

Data presented in Table 4.12.2.a indicate that the main consequence of rice blast disease caused in yield reduction while the consequence was least due to cutting off the blast-infected leaf blades significantly rescues the stunted growth of leave.

Table 4.12.2.a Relative position (rank order) of the statements related to farmers' perception on consequences of rice blast disease

Sl. No.	Statement	Degree of agreement							
		Strongly Agree (5)	Agree (4)	No opinion (3)	Disagree (2)	Strongly disagree (1)	Obtained CPS	CPI (%)	Rank (CP S)
1	Rice blast causes yield reduction	(60×5) 300	(45×4) 180				480	91.43	1st
2	Severe attack can completely destroy rice nurseries and crops at the tillering stage	(9×5) 45	(83×4) 332	(2×3) 6	(8×2) 16	(3×1) 3	402	76.57	6th
3	Leaf attack stunts plants and reduces the number of bearing panicles and the weight of individual grains	(55×5) 275	(50×4) 200				475	90.47	2nd
4	It can affect all above ground parts of a rice plant such as leaf, parts of panicle etc.	(47×5) 235	(58×4) 232				467	88.95	3rd
5	Blast infection causes stunted growth of rice seedlings	(36×5) 180	(68×4) 272		(1×2) 2		454	86.48	5th
6	Cutting off the blast-infected leaf blades significantly rescues the stunted growth of leave	(1×5) 5	(12×4) 48	(84×3) 252	(6×2) 12	(2×1) 2	319	60.76	10th
7	Blast is capable of causing very severe losses in farmers' fields up to 100%	(41×5) 205	(64×4) 256				461	87.81	4th
8	Blast disease caused serious economic loss to you and you are indebted	(19×5) 95	(86×4) 344				439	83.62	7th
9	Due to the incident of rice blast you became reluctant in rice cultivation	(34×5) 170	(28×4) 112			(43×1) 43	325	61.90	9rd
10	The soil became infected and rice blast is appearing every year now	(29×5) 145	(31×4) 124	(1×3) 3	(14×2) 28	(30×1) 30	330	62.86	8th

4.13 Relation between the selected characteristics of the farmers and their perception on the causes and consequences of rice blast diseases

Coefficient of correlation was computed in order to explore the relationship between the selected characteristics of the farmers' and their perception regarding the causes and consequences of rice blast diseases.

The selected characteristics of the farmers constituted independent variables and farmers' perception on causes and consequences of rice blast disease constituted the dependent variable of the study. In this section relationship between twelve selected characteristics (independent variables) of the farmers and dependent variable i.e, farmers' perception on causes and consequences of rice blast disease. Spearman Rank Correlation Coefficient was used. The results of the coefficient of correlation indicating the relationship between the selected characteristics of the respondents and their farmers' perception on causes and consequences of rice blast disease are shown in (Table 4.9).

Table 4.13 Relation between the selected characteristics of the farmers' and their perception on the causes and consequences of rice blast diseases

Characteristics (Independent variable)	Dependent variable	
	Cause	Consequence
Age	-0.095	0.087
Educational qualification	-0.002	0.224*
Family size	0.022	0.165
Farm size	0.165	0.248*
Experience in rice farming	-0.173	0.051
Organizational participation	0.013	0.210*
Annual family income	-0.066	0.244*
Extension contact	0.068	0.350**
Cosmopoliteness	0.124	0.257**
Agricultural training exposure	-0.101	0.044
Knowledge on rice cultivation	-0.002	0.011

NS= Non-significant ** Correlation is significant at the 0.01 level (2-tailed) * Correlation is significant at the 0.05 level (2-tailed)
SRCC = Spearman Rank Correlation Coefficient.

Data presented in Table 4.13 show that there existed insignificant relationships between the selected characteristics of the farmers and their perception on the causes of rice blast disease.

Data presented in Table 4.13 also show that among 11 selected characteristics of the respondents only educational qualification, farm size, organizational participation, annual income, extension contact, cosmopoliteness showed a significant positive relationship with their perception on consequences of rice blast disease. It means that the higher perception of the farmers are the educational qualification, farm size, organizational participation, annual income, extension contact, cosmopoliteness on consequences of rice blast disease. Akhter and Shiduzzaman (2017) found positive significant relationship between only farmers training on vermicompost and their perception regarly beneficial effects and limitation on vermicompost.

CHAPTER V
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The present study was initiated with the purpose mainly to determine farmers' perception on causes and consequences of rice blast disease. The study was conducted in purposively three villages namely Multia, Atlia and Nornia of Atlia union under Dumuria upazila of Khulna district. Data were collected from randomly selected 105 respondents of the study area during 15 March to 8 April, 2018 by using a pre-tested structured interview schedule. Data were collected on some of the selected characteristics such as age, educational qualification, family size, farm size, experience in rice farming, organizational participation, annual family income, extension contact, cosmopoliteness, agricultural training exposure, and knowledge on rice cultivation and farmers perception on causes and consequences of rice blast disease.

5.1.1 Respondents' Characteristics and Related factors

In the study area, old and middle aged farmers were (38.1%) and (37.1%) respectively, while (24.8%) of them were young aged. It means that old aged as compared as middle aged people of that locality were more interested to rice cultivation in their field. Majority (39%) of the farmers possessed primary education while (30.5%) and (17.1%) had secondary education and illiterate respectively. Whereas (07.6%) and (05.7%) had higher secondary and undergraduate.

Majority (70.5%) of the respondents had medium sized family compared to small sized (17.1%) and large sized (12.4%) family. More than half (67.6%) of the respondents were small farmers followed by marginal (22.9%) farmers and medium (9.5%) farmers. There were no landless and large farmers. Highest proportion (40%) of the respondents were high experienced in rice cultivation followed by medium experience (23.8%) and (36.2%) respondents had low experience. Majority (79%) of the respondents had no organizational participation compared with low (21%) participation. There were no medium and high organizational participants. Whereas minimum and maximum duration of an organizational participation ranged from 0 to 7 with a mean of 1.04 and standard deviation of 1.9. Majority (64.8%) of the respondents had low

income while (21%) had medium income. Only (14.3%) of the respondents had high income. Most (78.1%) of the respondents had low extension contact compared to medium (21%) and high (1%) extension contact. Three-fourth (75.2%) of the respondents had no cosmopoliteness compared to low (22.9%) and high (1.9%) cosmopoliteness. None of respondents belonged to no contact categories. More than half (57.1%) of the respondents had no training on rice cultivation. However, more than one third (40%) of the respondents had low training on rice cultivation. (2.9%) of the respondents had high training. None of the respondent had medium training experience on rice cultivation. Majority (89.5%) of the respondents had medium agricultural knowledge followed by high (9.5%) and low (1%) agricultural knowledge.

5.1.2 Farmers' perception on causes and consequences of rice blast disease

The respondent farmers had more clear perception on consequence of rice blast disease than its causes.

5.1.2.1 Farmers' perception on causes of rice blast disease

Three-fourth (75.2%) of the respondents had moderately clear Perception followed by less clear perception (14.3%) and high clear perception (10.5%) on causes of rice blast disease. Most significant or important of cause of rice blast was the climatic condition while the less significant cause was DAE members did not providing any information when any field was blast affected.

5.1.2.2 Farmers' perception on consequences of rice blast disease

Three-fourth (75.2%) of the respondents had moderately clear perception followed by high clear perception (13.3%) and less clear perception (11.4%). The main consequence of rice blast disease caused in yield reduction while the consequence was least due to cutting off the blast-infected leaf blades significantly rescues the stunted growth of leave.

5.1.2 Relationship between selected characteristics of the farmers and their perception regarding the causes and consequences of rice blast diseases

Out of eleven independent variables age, educational qualification, experience, annual family income, agricultural training and knowledge showed a negative insignificant relationship with their causes of rice blast diseases. Whereas, educational qualification, farm size, organizational participation, annual family income, extension contact, cosmopoliteness of the respondents showed a significant positive relationship with their consequences of rice blast diseases. The rest characteristics did not show any significant relationships with perception.

5.2 Conclusions

i. The respondent farmers had more clear perception on consequence of rice blast disease than its causes.

ii. Three-fourth (75.2%) of the respondents had moderately clear Perception followed by less clear perception (14.3%) and high clear perception (10.5%) on causes of rice blast disease. Most significant or important cause of rice blast was the climatic condition while the less significant cause was DAE members did not providing any information.

iii. Three-fourth (75.2%) of the respondents had moderately clear perception followed by high clear perception (13.3%) and less clear perception (11.4%). The main consequence of rice blast disease caused in yield reduction while the consequence was least due to cutting off the blast-infected leaf blades significantly rescues the stunted growth of leave.

iv. There exist insignificant relationships between the selected characteristics of the farmers and their perception on the causes of rice blast disease. Among 11 selected characteristics of the respondents only educational qualification, farm size, organizational participation, annual income, extension contact, cosmopoliteness showed a significant positive relationship with their perception on consequences of rice blast disease.

5.3 Recommendations

5.3.1 Recommendations for policy implication

i. The major cause of rice blast was climatic condition. So it is recommended that farmers should be aware of the climatic condition and they take necessary steps when blast affects their field.

ii. GOs and NGOs should take necessary motivational program to motivate farmers to cultivate blast tolerant (BRRI dhan69, BRRI dhan74 etc.) rice varieties.

iii. DAE and other agriculture related organizations should organize necessary training program about rice blast disease so that farmers get clear concept about blast disease and become encouraged farmers to cultivate blast tolerant varieties.

iv. Concerned authority should supply more credit to the farmers, who had low family income, so that they can invest more money in rice cultivation.

v. Initiatives should be taken to make necessary inputs available at proper time before and after in blast affected areas.

5.3.2 Recommendations for Further Research

i. The study was conducted in one selected union (Atlia) of Dumuria upazila under Khulna district. A single study is not sufficient to have all information for proper understanding of the issue under consideration. Similar research should be conducted by the researchers in other areas of the country to get a clear concept of the whole country.

ii. Further study will be conducted to minimize the loss of crop yield and creates awareness among the farmers about causes and consequences of rice blast diseases.

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APPENDIX I
ENGLISH VERSION OF THE INTERVIEW SCHEDULE
AGROTECHNOLOGY DISCIPLINE
KHULNA UNIVERSITY
KHULNA

Farmers Perception on Causes and Consequences of Rice blast Disease at Dumuria Upazila of Khulna District

Statement of the purpose and confidentially

This interview schedule will be used to collect information to be used only for academic research purpose, and will maintain utmost confidentiality of personal information

Sample No: ☐ **Date:** / /2018

Name: .....

Village: ....

Union: .....

Upazila: .....

District: .....

1. **Age (years):**

2. **Educational qualification(years):**

0	No	
1-5	Primary	
6-10	Secondary	
11-12	Higher secondary	
13-16	Honours	
>16	Above	

3. **Family size (number of members):** ☐

4. **Farm size** (Actual area ownership (ha) : ☐

5. **Experience in rice farming:**

A. Do you cultivate rice seed? Yes ( ) / No ( )

B. If yes, how many years?

C. If yes, then tell the name of rice variety you cultivated in last five years:

Serial	Year	Name of the rice variety
a	2013	
b	2014	
c	2015	
d	2016	
e	2017	

6. Organizational participation:

A. Are you involved in any organization? Yes ( ) / No ( )

B. If yes, then answer the following questions:

Sl. No.	**Name of the organization (non-political)**	**Extent of involvement**				**Duration (year)**
		No involvement (0)	General Member (1)	Executive member (2)	Executive officer (3)	
a	Youth organization					
b	Farmer club					
c	Committee (Mosque/Temple/Church /Mondir)					
d	Institutional organization (Other than NGO and GO)					
e	NGO maintained					
f	GO maintained					

7. Annual family income:

Sl. No.	**Sources**	**Thousand (Tk)**
a	Agriculture	
b	Livestock	
c	Fisheries	
d	Business	
e	Services	
f	Others	

8. Extension contact:

Sl. No.	Media	Extension contact				
		Never(0)	Seldom (1)	Sometimes(2)	Often(3)	Regularly (4)
a	Peer group contact	Not even once in a month ( )	1-3 times/month ( )	4-6 times/month ( )	7-9 times/month ( )	>9 times/month ( )
b	DAE officers (eg.SAAO)	Not even once in a month ( )	1-2 times/month ( )	3-4 times/month ( )	5-6 times/month ( )	6 times/month ( )
c	NGO persons	Not even once in a month ( )	1-2 times/month ( )	3-4 times/month ( )	5-6 times/month ( )	6 times/month ( )
d	Input dealers (eg.Fertilizer dealers)	Not even once in a month ( )	1-2 times/month ( )	3-4 times/month ( )	5-6 times/month ( )	>6 times/month ( )
e	Neighbor/ relatives	Not even once in a month ( )	1-3 times/month ( )	4-6 times/month ( )	7-9 times/month ( )	>9 times/month ( )
f	Radio/TV/ Leaflets/ Newspaper/ Mobile phone	Not even once in a month ( )	1-2 times/month ( )	3-4 times/month ( )	4-5 times/month ( )	>6 times/month ( )

9. Cosmopoliteness: Degree of visitation in the following places

Places	Degree of visitation			
	Never (0)	Seldom (1)	Sometimes (2)	Often (3)
Other villages	0 ( )	1 times/ week ( )	2 times/ week( )	3 times/ week( )
Upazilla HQ	0 ( )	1 times/ month( )	2 times/ month( )	3 times/ month( )
District HQ	0 ( )	1 times/ 2month( )	2 times/ 2 month( )	3 times/ 2 month( )
Capital city	0 ( )	1 times/ 6month( )	2 times/ 6 month( )	3 times/ 6 month( )

10. Agricultural training:

A. Did you received any training on agriculture? Yes ( ) / No ( );

If yes, please mention the following information:

Sl. No.	Name of training	Duration	Sponsoring agency
a			
b			
c			
d			
e			

11. Knowledge on rice cultivation:

Sl. No.	Items	Full Marks(2)	Marks obtained
a	What type of variety is suitable for rice cultivation?		
b	How amount of irrigations are needed for rice cultivation?		
c	Name two important diseases of rice		
d	Name two important insect/pest of rice		
e	Which fertilizers are used for rice cultivation		
	Total marks		

12. Farmers' Perception on Causes and Consequences of Rice blast Disease

Causes

Sl. No.	Statement	Degree of agreement				
		Strongly agree (5)	Agree (4)	No opinion (3)	Disagree (2)	Strongly disagree (1)
1	It attacks at all stages of the crop					
2	Its symptoms appear on leaves and nodes					
3	It travels through the air from one region to the other					
4	Infected seed may act as a carrier too					
5	The climatic conditions are responsible for this disease					
6	The low and high temperatures(windy and foggy weather in the morning, dew on the leaf, drizzle, etc.) are favourable for this disease					
7	More irrigation or dry conditions are responsible for this disease					
8	DAE members did not providing any information when you are blast affected.					
9	Misleading information regarding rice blast caused the outbreak					
10	The rich farmers applied an excessive nitrogen fertilizer in their field, which caused this disease					