

# Final Report

on

**Consulting Service for Conducting Pest Risk Analysis (PRA)  
of Rice (both Production and Storage Level) in Bangladesh**



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## ABBREVIATIONS AND ACRONYMS USED IN THE REPORT

AAEO	Assistant Agriculture Extension Officer
AAO	Additional Agriculture Officer
AEO	Agricultural Extension Officer
BB	Bacterial blight
BFR	Bacterial foot rot
Bl	Blast
BLB	Bacterial leaf blight
BLS	Bacterial leaf streak
BPH	Brown Plant hopper
BRRI	Bangladesh Rice Research Institute
CIG	Common Interest Group
CPS	Crop Production Specialist
CRDS	Center for Resource Development Studies Ltd
CW	Case worm
DAE	Department of Agriculture Extension
DD	Deputy Director
DF	Damsel fly
DIP Rules	Destructive Insects and Pest Rules
ECC	Ear- cutting caterpillar
FC	Field cricket
FFS	Farmers Field School
Fsmt	False smut
GH	Grass hopper
GLH	Green Leaf hopper
GS	Grain spot
HCL	House of consultants Ltd
HYV	High Yielding Variety
ICM	Integrated Crop Management
IPPC	International Plant Protection Convention
IPM	Integrated Pest Management
ISPM	International Standards for Phytosanitary Measures
LBB	Lady bird beetle
LHGH	Long horned grasshopper
NBLS	Narrow brown leaf spot
LSc	Leaf scald



MB	Mealy bug
PB	Pink borer
PC	Phytosanitary Certificate
PPS	Plant Protection Specialist
PPW	Plant Protection Wing
PQ	Plant Quarantine
PRA	Pest Risk Analysis
PSO	Principal Scientific Officer
QSSP	Quarantine Services Strengthening Program
RB	Rice bug
RH	Rice hispa
RLF	Rice leaf folder
RS	Research Station
SAAO	Sub Assistant Agriculture Officer
SAPPO	Sub Assistant Plant Protection Officer
SB	Stem borer
ShB	Sheath blight
ShR	Sheath rot
SO	Scientific Officer
SR	Stem rot
SSO	Senior Scientific Officer
StB	Stack burn
Tg	Tungro
TOR	Terms of Reference
UAO	Upazila Agriculture Officer
Uf	Ufra
WBPH	White backed plant hopper
WLH	White leaf hopper
WM	Whorl maggot
YSB	Yellow stem borer

## Executive Summary

The Plant Protection Wing of Department of Agriculture Extension under the Ministry of Agriculture is now implementing a project on Quarantine Services Strengthening Program (QSSP) for upgradation of laboratory facilities and capacity building of quarantine related personnel. In the Project an Assignment was included to conduct Pest Risk Analysis (PRA) of Rice, listing of Quarantine Pests and Pest Risk Analysis of imported hybrid rice seed. The authority identified 50 upazilas under 20 rice growing districts such as Rangpur, Dinajpur, Bogra, Naogaon, Rajshahi, Pabna, Sirajgonj, Jessore, Khulna, Jhenaidah, Barisal, Faridpur, Tangail, Sherpur, Mymensingh, Kishoregonj, Netrokona, Habigonj, Comilla and Chittagong. There were two to four upazilas under each district for field survey and data collection on insect pests and diseases of rice.

Rice is generally grown in three seasons namely Aus, Transplanted Aman (T. Aman) and Boro. All information were collected considering the three seasons except field data collection which was done on standing Boro crop during March 28 to April 8, 2011. There were five teams each having two Field Researchers with Bachelor/Masters in Agriculture.

The study was undertaken through several approaches such as interview of farmers, DAE/BIRRI personnel, Scanning of reports, Internet searching, information collection from the personnel of Plant Protection Wing of DAE and collection of insect pests and disease data from the standing Boro crop field. From each upazila 10 farmers were interviewed. The Questionnaire and Formats were developed for the use of farmer's interview, field data collection and interview of DAE/BIRRI personnel. The collected information and data were compiled, analyzed, interpreted and finally processed for the preparation of the report.

The quarantine insect pests and diseases were determined based on recorded insect pests and diseases of rice by BIRRI and DAE and information collected through internet searching. The hybrid rice seeds are mostly imported from China, India and the Philippines, these three countries were considered in determining the quarantine insect pests and diseases of hybrid rice in Bangladesh.

Study reports showed that 266 insect species have been identified as pests of rice of which 20-32 species were considered as important insect pests. Altogether 32 diseases have so far been reported to occur on rice in Bangladesh. Among them 10 were considered as major.

There were eight species of insect pests causing economic damage to rice in storage condition and they are rice meal moth, rice weevil, red grain beetle, confused flour beetle, saw toothed beetle, angoumois grain moth, Khapra beetle and lesser grain borer. Different kinds of storage moulds were found associated with stored seeds and they are the species of *Aspergillus*, *Penicillium*, *Rhizopus* and *Chaetomium*. Among them *Aspergillus* spp. are the most predominant specially *Aspergillus flavus* and *A. niger*.

Management of field insect pests and diseases as well as storage insect pests and moulds were described in detail in the report.

Seven species of insects have been recorded as pests of hybrid rice in Bangladesh and they are brown plant hopper, yellow stem borer, striped stem borer, green leaf hopper, rice leaf folder, rice mealy bug and gall midge. So far seven pathogens are found associated with hybrid rice seed, Among these three namely bacterial leaf blight, blast and bakanae were the

most devastating. Management of insect pests and diseases of hybrid rice is described in the report.

Study reports showed that in 20 selected districts the cropped area under rice is 5116233.5 ha of which the area under hybrid rice is 393044.5 ha. The season wise area of both hybrid and inbreds are shown in the report.

Rice varieties grown in 20 selected districts in three seasons including hybrids were recorded. It appeared that in Aus season, the total number of varieties was 83, of which 31 were HYVs; in T.Aman season, the total number was 122, of which 39 were HYVs, and in Boro season, the total number was 82, of which 41 were HYVs. The total of 85 hybrid rice varieties were grown in 20 districts.

The information collected through interview of DAE/BRRI personnel and also data collected from the field of 20 districts showed that 18 insect pests were recorded and they were Stem borer (SB), Brown plant hopper (BPH), Leaf folder (LF), Ear cutting caterpillar (ECC), Rice bug (RB), Grass hopper (GH), Gall midge (GM), Short horned grass hopper (SHGH), Case worm (CW), Green leaf hopper (GLH), Mealy bug (MB), Rice hairy caterpillar (RHC), White backed plant hopper (WBPH), Leaf roller (LR), Long horned field cricket (LHFC), Rice thrips (RT), Rice hispa (RH), Rice swarming caterpillar (RSC) and Whorl maggot (WM).

Similarly 12 diseases were reported to occur. These include Bacterial leaf blight (BLB), Bacterial leaf streak (BLS), Bakanae (Bk), Blast (Bl), False smut (Fsmt), Foot rot (FR), Leaf scald (LSc), Root rot (RR), Sheath rot (ShR), Stem rot (SR), Tungro (Tg) and Ufra (Uf).

The farmers' information from 20 selected districts is elaborated in the report. In each district there were 2-4 upazilas and under each upazila, 10 rice farmers were interviewed on different aspects. The age of the interviewed farmers varied from 17-85 years, the majority having fifties. Education level included no formal education to higher secondary level. The farming experience had wide variation, having one year to 60 years. Many of the interviewed farmers are the members of different farmers clubs especially IPM, ICM, CIG with the exception of Sadar upazila of Rangpur, Pabna, Jessore, Jhenaidah and Faridpur districts, Nagarkanda, Modhupur and Putia upazilas where none were member of any club. A total number of 302 farmers had training on rice production; only the farmers of four upazilas namely Baghmara, Tanor, Sadar (Faridpur) and Potia had no training on rice production.

Rice stem borers are widely distributed in Bangladesh, India, China, the Philippines, Nepal and many other rice growing countries of the world. Brown plant hoppers, White-backed plant hoppers are also widely distributed in Bangladesh and other countries. Green leaf hopper, Gall midge, Mealy bug, Leaf folder, Rice Case worm and Orange headed leaf hopper are also distributed widely in different countries including Bang; adesh. Rice hispa is a serious pest and widely distributed in Bangladesh, India, Pakistan, China, Taiwan but not available in the Philippines. Rice thrips, Earcutting caterpillar, Swarming caterpillar, Armyworm and Mole cricket are distributed in Bangladesh, the Philippines, India and other Asian countries, Australian continents and African countries.

Most of the diseases of rice has worldwide distribution or at least distributed throughout the Asian countries. Diseases those have wide distribution are Bacterial leaf blight, Bacterial leaf streak, Bacterial brown stripe, Bacterial grain rot, Blast, Sheath blight, Sheath rot, Bakanae,

Brown spot, Stem rot, Leaf scald, Narrow brown leaf spot, Sheath spot, Leaf smut, Minute leaf spot, Stack burn, Grain red blotch, False smut, Kernel bunt, Tungro. Diseases so far not found in Bangladesh are Bacterial stripe, Bacterial sheath rot, Sheath brown rot, Udbatta, Downy mildew, Dwarf, Stripe, Hoja blanka, Black streaked dwarf, orange leaf, Transitory yellowing, Grassy stunt, Ragged stunt, Mosaic, Gall dwarf, Bunchy stunt, Chlorotic streak.

The quarantine insect pests of rice in the Philippines include brown plant hopper, *Nilaparvata lugans*, green leaf hopper, *Nephotettix virescens*, *N. nigropictus*, *N. malayanus* and zigzag leaf hopper, *Recilia dorsalis*, rice striped borer, *Chilo suppressalis* dark headed borer, *C. polychrysus*, gold fringed stem borer, *C. auricilius*, white stem borer, *Scirpophaga innotata*, yellow stem borer, *S. incertulas*, and pink borer *Sesamia inferens*, rice ear cutting caterpillar, *Mythimna separata*, rice swarming caterpillar, *Spodoptera mauritia*, army worms, *S. exempta*, *S. exigua* rice bugs, *Scotinophara coarctata* and *S. lurida*. In China Rice water weevil, *Lissorhoptrus oryzyophilus* and granary weevil, *Sitophilus granarius* are two quarantine pest of rice. In India American rice stalk borer, *Diatraea saccharalis*, Yellow headed borer, *Diatraea centrella*, Greater grain borer, *Prostephanus truncatus*, granary weevil, *Sitophilus granarius*, Smaller strain grain weevil, *S. sasakii* and confused flour beetle *Tribolium confusum* are the quarantine rice insect pests.

In Bangladesh, Army worm (*Spodoptera littoralis*), striped borer, Whorl maggot (*Hydrellia sassakii*) and Rice water weevil (*Lissorhoptrus oryzyophilus*) are the quarantine insect pests of rice.

The quarantine diseases of the Philippines are *Pyricularia oryzae*, the causal agent of blast disease, *Xanthomonas oryzae* pv. *oryzae*, *Xanthomonas oryzae* pv. *oryzicola* the causal agents of Bacterial leaf blight and Bacterial leaf streak and *Aphelenchoides besseyi*, the causal organism of white tip disease of rice.

The quarantine pathogens for China include *Ditylenchus angustus*, *Xanthomonas oryzae* pv *oryzae*, *Xanthomonas oryzae* pv *oryzicola* and *Rhizoctonia solani* the causal agents of Ufra, BLB, BLS and Sheath blight disease respectively. No information is available on quarantine diseases in India.

Considering the presence or absence of any disease in Bangladesh and also the pathotype variations 11, diseases are identified as quarantine diseases for Bangladesh. The diseases are Udbatta, Downy mildew, Blast, Bacterial leaf blight, Bacterial leaf streak, Sheath brown rot, Dwarf, Stripe, Grassy stunt and Ragged stunt.

Pest Risk Analysis (PRA) consists of three stages such as initiating the process for analyzing risk, assessing pest risk and managing pest risk. Initiating the process involves identification of pests or pathways for which the PRA is needed. Pest risk assessment determines whether each pest identified as such, or associated with a pathway, is a quarantine pest characterized in terms of likelihood of entry, establishments, spread and economic importance. Pest risk management involves developing, evaluating, comparing and selecting options for reducing the risk. All the three stages were elaborately discussed in the report. The quarantine insect pests and diseases of rice were also identified and included in the report with causal organisms and status. The report included the pest risk management of quarantine pests of rice with specific approaches and methods in detail. It is now, necessary to follow the recommended quarantine practices while importing hybrid rice seeds.

## 1.0 INTRODUCTION

Rice is the staple food for the 145 million people of Bangladesh (DAE 2011). During 2007-08 growing season rice was grown in 10.42 million ha of land and the total production was 28.929 million tons (BBS 2008). Modern rice varieties covered about 74% of the total rice area and yielded of clean rice during 2006-2007. Rice is generally grown in three seasons namely Aus, T. Aman and Boro. The highest area and production are in T. Aman season. The coverage of modern varieties in Boro season is 96%, 65% in T. Aman and 50% in T. Aus (BARC 2010).

The National Seed Board (NSB) of the Ministry of Agriculture, Govt. of Bangladesh officially released four hybrid rice varieties for import in the year 1998 an amount of 600 Metric tons (mt) of hybrid rice seed were imported in the cropping season of 1998-99, generally cultivated in Boro season. Since 1998-99 to 2009-10 a total of 75 hybrid rice varieties have been released out of which five from public sector. Bangladesh Rice Research Institute has developed three hybrids for Boro and one for T. Aman season. BADC has also introduced one hybrid rice variety namely SL-8H from the Philippines. The source of hybrid rice so far released and introduced in Bangladesh are from China, India and Philippines. A total of 7676.61 mt of hybrid rice seeds were used in the country of which 5646.00 mt were imported, while 2030.61 mt were locally produced (Nuruzzaman *et al.* 2010). The use of hybrid rice seeds in all the seasons i.e. Boro, T. Aman and Aus need to be geared up.

Two hundred sixty six insect species have been identified so far as pest of rice in Bangladesh (Islam *et al.* 2003). Of these 42 species are considered important insect pests in Bangladesh. These pests can cause severe damage to rice crop at different crop growth stages and extent of damage varies depending on the crop season and surrounding environment. Insect pest that can cause significant yield losses are stem borers, leaf hoppers and plant hoppers (which cause direct damage by feeding as well as by transmitting viruses), gall midge, a group of defoliating species (mainly lepidopterous) and a grain sucking bug complex that feeds on developing grains.

As changes have occurred in the insect pest complex of rice, several species once considered minor pests, have become major pests. The warm and humid environment in which rice is grown is conducive to the proliferation of insect pests. The average yield loss due to major insect pests, estimated as 24% in Aus, 18% in T. Aman and 13% in Boro season. Experimental plots protected from insects yielded more than 13% over unprotected plots.

Insect pests infest all parts and growth stages of the rice plant. Some are vectors of disease, which are also responsible for low yields of rice. Prevalence of insect pests varies with different cropping seasons, rice variety and location.

A tremendous increase in rice production has been occurred in the country since liberation. However, the country could not attain food self-sufficiency due to increasing population and decreasing cultivable land. Farmers in Bangladesh failed to harvest the potential rice yield

because of different biotic and abiotic factors, which sometimes results total loss in individual field. Among the biotic factors insect pests and diseases play a vital role for reducing the production. Although no crop loss assessment has been done in Bangladesh, it has been assumed from the long experience that diseases altogether contribute around 10% yield loss. The environmental condition of Bangladesh is very much favourable for the development and proliferation of different diseases of rice. So far, 32 diseases have been reported to occur on rice in Bangladesh caused by different groups of organisms like virus, mycoplasma, bacteria, fungi and nematodes (Miah *et al.* 1985, Miah & Shahjahan 1987; Anon. 2000; Anon. 2006). Among the 32 diseases 10 are of major concern to the growers. Major diseases are those, which have the potentiality to cause economically unacceptable damage to the crop. The extent of damage a disease may cause, however, depends on several factors like- continuation of favourable conditions, time of infection to the crop, degree of susceptibility of the host plant and aggressiveness of the pathogen. There is no permanent demarcation between major and minor diseases. In course of time the status of a disease may change. The factors influencing the change in disease status include change in variety; change in cultivation practices; change in environmental factors; change in pathogen and introduction of new race/strain of a pathogen.

At present major diseases include seven fungal diseases (Sheath blight, Blast, Stem rot, Bakanae, Brown spot, Sheath rot, Leaf scald); one bacterial (Bacterial leaf blight); one virus (tungro) and one nematode disease (ufra). Among the rest 15 fungal diseases five caused leaf diseases, four are associated with sheath diseases, two seedling diseases and four caused diseases to the grain/seed.

However, all these diseases do not occur throughout the year or location. There is seasonal variation on the occurrence and severity of different diseases.

Consequently most of the devastating diseases of rice are seed-borne. More than 50 micro-organisms have so far been recoded from rice seed by different workers in Bangladesh (Fakir & Ahmed 1976; Mia *et al.* 1979; Fakir 1982; Mia and Mathur 1983). Among the major fungal diseases blast, brown spot, bakanae, leaf scald, stem rot and sheath rot are seed-borne (Fakir & Ahmed 1976; Mia and Mathur 1983). There are contradictory reports regarding the seed-borne nature of *Xanthomonas oryzae* pv *oryzae*, the incitant of bacterial leaf blight disease. However, in recent studies this has been confirmed as a seed borne disease (Goto *et al.* 1987, Mew *et al.* 1987). *Xanthomonas oryzae* pv *oryzicola*, bacterial leaf streak pathogen is a seed-borne disease. Tungro, the only virus disease in Bangladesh is not seed-borne. Ufra nematode *Ditylenchous angustus* is not seed-borne but it could survive in the harvested seed up to 45 days. So, if fresh seed is used from ufra-infected field, the nematode may transmit with the seed. Another nematode *Aphelenchoides besseyi*, the incitant of white tip disease is seed-borne.

In recent years hybrid seeds are being introducing for cultivation from China and India. Hybrid varieties are known to be susceptible to most of the major diseases. So, it is assumed that wide cultivation of these varieties might change the status of some diseases and /or the existing

major diseases might aggravate further. Moreover, there is possibility of introducing new pests or new pathotype/biotype in the country that might create additional hazard to rice cultivation.

Plant Quarantine regulations in order to be effective have to be based on sound scientific principles. The biology and ecology of the organism against which quarantine measure is proposed to be enforced should be known. Besides it has to be determined whether: (a) in the absence of any quarantine measure, the organism is likely to be introduced into the country; (b) the event of its introduction whether the organism is likely to be established and cause damage of any consequence; (c) quarantine regulations can be framed on scientific lines and enforced satisfactorily; and (d) it is economical to introduce the legislative measure in terms of benefit likely to be derived. Biological, legal and economic aspects of the problem have to be clearly understood to place the measures on a sound footing.

International quarantine regulations which aim to prevent entry of new pathogenic organisms and insect pests may; (a) completely prohibit entry of certain plants or plant materials; (b) allow import of certain plants or plant materials if they are certified to be free from certain specific insect pests and pathogenic organisms, by a competent authority of the country of origin; and (c) allow entry of plants and plant materials provided they are accompanied by certificates of free from pests and diseases by the competent authority of the country of origin. The importing countries may also impose restrictions on the mode of transport (air, ship or postal mail), and wrapping materials (soils etc.). They also have the right to examine the materials before they can be allowed to be introduced, even if accompanied by the certificate from the country of origin. Fumigation or any other treatment may be enforced. For this purpose the plants and plant materials to be brought into a country need to be channelised through certain specific ports of entry.

The enforcement of legislative measures to check the entry of destructive diseases and insect pests from other countries can be successfully done through the cooperation of Governments of different countries. Almost every country of the world has passed Quarantine Acts with specific provisions. Mutual respect of the provision of the Act is necessary for the successful promulgation.

Pest Risk Analysis (PRA) consists of three stages namely initiating the process for analyzing risk, assessing pest risk and managing pest risk. Initiating the process involves identification of pests or pathways for which the PRA is needed. Pest risk assessment determines whether each pest identified as such, or associated with a pathway, is a quarantine pest characterized in terms of likelihood of entry, establishments, spread and economic importance. Pest risk management involves developing, evaluating, comparing and selecting options for reducing the risk.

## **2.0 METHODOLOGIES**

The project on “Pest Risk Analysis of Rice” was designed to collect the information on insect pests and diseases from 50 (Fifty) Upazilas of 20 (Twenty) districts as shown in Table 1 and in Figure 1.

In each upazila, ten farmers were selected and interviewed by using a structured questionnaire. The concerned Upazila Agriculture Officer (UAO), Sub-Assistant Agriculture Officer (SAAO) and the station-in-charge of Bangladesh Rice Research Institute (BRRRI) Regional Station were also interviewed and necessary information were collected by using a format. The Field Researchers also met the Deputy Director (DD), Department of Agriculture Extension (DAE) or Plant Protection Specialist (PPS) in absence of DD of the concerned districts and recorded their views on insect pests and diseases of rice in their areas.

Pest Risk Analysis (PRA) study refers to two major groups of plant menaces namely insect pests and diseases. An extensive program was chalked out to record insect pests and diseases of rice of selected areas. To record and collect detail information on insect pests and diseases a questionnaire and also information formats were developed for farmers and DAE/BRRRI personnel. In addition, to conduct a field survey to record the incidence and severity of insect pests and diseases of rice presently available in the field a data recording format was prepared and supplied to the Field Researchers. All formats and questionnaires are included in the Annexures VI to IX.

### **Appointment and Training of Field Researchers:**

Ten persons having Bachelor and Master Degree in agriculture were appointed as Field Researchers and they were trained on identification and management of insect pests and diseases of rice through power point presentation by the Senior Entomologist and Plant Pathologist engaged by the Center for Resources Development Studies Ltd. (CRDS). Handouts describing each insect pest and disease and coloured photographs were also supplied to the Field Researchers for correct identification of the insect pests and diseases that are likely to be available in the field during the survey.

### **Field Survey and Data Collection:**

Five survey teams having two members in each team made field survey and collected necessary information based on questionnaire and format from the farmers and concerned officials of 50 upazilas of 20 districts.

### **Secondary Data Collection:**

The secondary data on insect pests and diseases of rice were collected from BRRRI and Plant Protection Wing (PPW) of DAE. These data were checked with primary data and the final list of insect pests and diseases were prepared.



## Internet Searching:

The Internet searching was done on countries of export of seeds of hybrid rice and recorded insect pests and diseases of those countries. Finally by using primary and secondary data and Internet information, a list of quarantine pests and diseases were determined. Also the management of quarantine pests and diseases of rice was discussed.

## Interpretation of results:

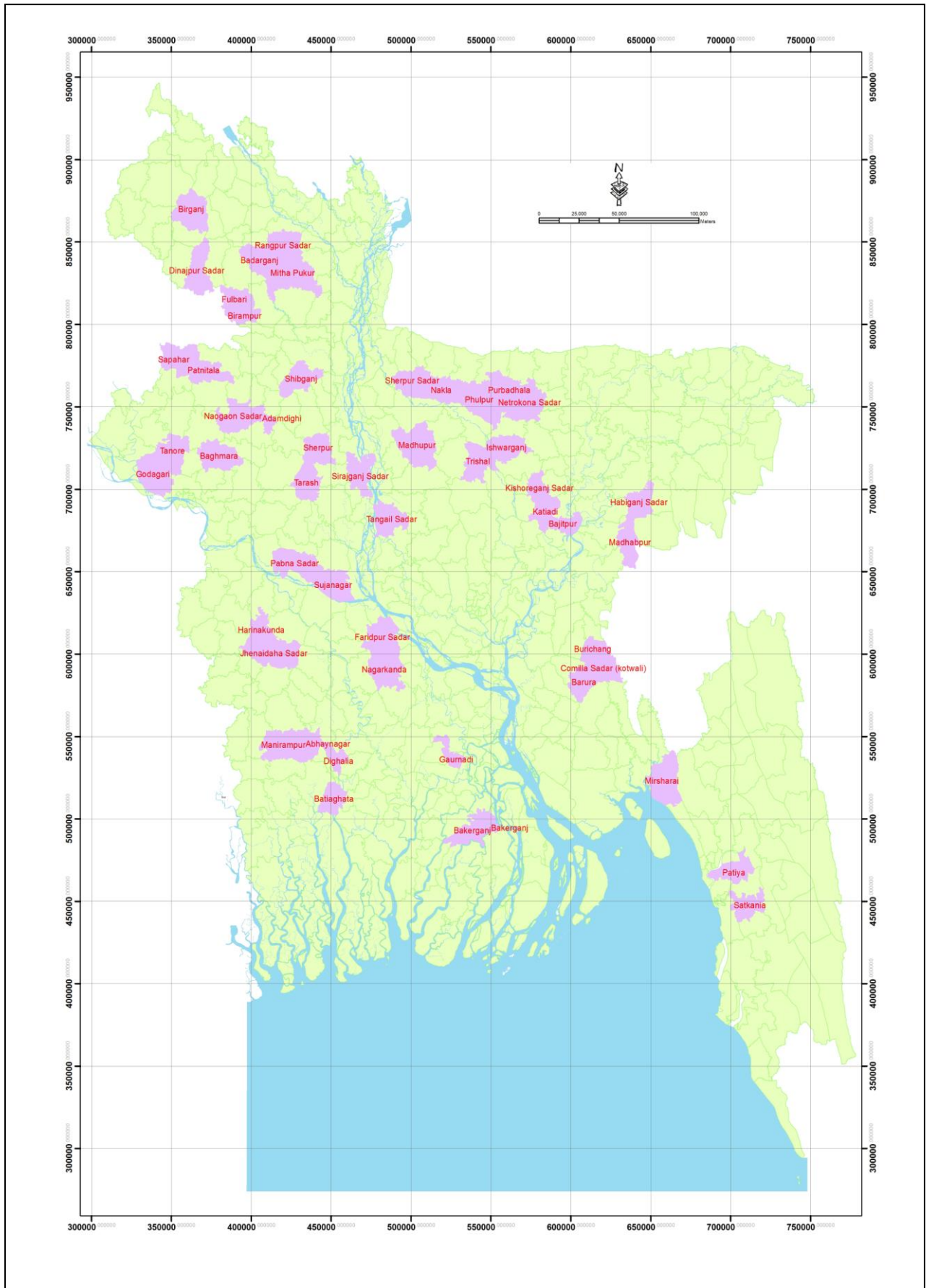
The collected data on insect pests and diseases of rice from different locations were analysed and interpreted with the aim to find out variations in respect of incidence and status of each pest of rice including variety as well as location and seasonal effect. The most vulnerable stage of plant growth for insect pests and disease attack was also determined based on both primary and secondary data.

A checklist was prepared based on locally available insect pests and diseases of rice in comparison with other countries of export importance.

**Table 1. A list of selected districts and upazilas included for survey**

SI No.	Districts	Upazilas
1.	Rangpur	Sadar, Mithapukur, Badargonj
2.	Dinajpur	Sadar, Fulbari, Birampur, Birgonj
3.	Bogra	Sherpur, Adamdighi, Sibgonj
4.	Naogaon	Sadar, Patnitala, Sapahar
5.	Rajshahi	Tanor, Godagari, Baghmara
6.	Pabna	Sadar, Sujanagar
7.	Sirajgonj	Sadar, Tarash
8.	Jessore	Monirampur, Bagarpara
9.	Khulna	Digholia, Batiaghata
10.	Jhenidah	Sadar, Harinakundu
11.	Barisal	Bakhergonj, Goarnadi
12.	Faridpur	Sadar, Nagorkanda
13.	Tangail	Sadar, Madhupur
14.	Sherpur	Sadar, Nokla
15.	Mymensingh	Trishal, Fulpur, Ishwargonj
16.	Kishorgonj	Sadar, Kotiadi, Bazitpur
17.	Netrokona	Sadar, Purbadhala
18.	Habigonj	Sadar, Madhavpur
19.	Comilla	Sadar, Burichong, Barura
20.	Chittagong	Mirersorai, Satkania, Puthia

**Figure 1: Map Showing selected 20 districts under the study**



### 3.0 STUDY REPORTS

The insect pests and diseases of rice were studied by using published reports of BRRI, DAE and other concerned organizations, scientific personnel and internet searching. A summary list of insect pests and diseases of rice were prepared and discussed herein.

#### 3.1 Insect pests of rice

Two hundred sixty six insect species have been identified so far as pest of rice in Bangladesh. Of these 42 species are considered as important insect pests (Alam et al. 1964, Alam 1977, Catling 1980, Alam et al. 1981, Barrion 1984, Kamal et al. 1993, Islam et al.2003). These pests can cause severe damage to rice crop at different crop growth stages and extent of damage varies depending on the crop season and surrounding environment. As changes have occurred in the insect pest complex of rice, several species once considered minor pest, have become major pests. A list of important insect pests of rice in Bangladesh is given in Table 2 below:

**Table 2. Insect pests of rice recorded in Bangladesh.**

Sl. No	Common Name	Scientific Name (Order:Family)	Status
1.	Yellow stem borer	<i>Scirpophaga incertulas</i> (Walker) (Lepidoptera: Pyralidae)	Major
2.	White rice stem borer	<i>S. innotata</i> (Walker) (Lepidoptera: Pyralidae)	Minor
3.	Dark headed borer	<i>Chilo polychrysus</i> (Meyrich) (Lepidoptera: Pyralidae)	Major
4.	Striped borer	<i>Chilo suppressalis</i> (Walker) (Lepidoptera: Pyralidae)	Minor
5.	Dark headed borer	<i>C. auricilia</i> (Dudgeon) (Lepidoptera: Pyralidae)	Minor
6.	Pink borer	<i>Sesamia inferens</i> (Walker) (Lepidoptera: Noctuidae)	Major
7.	Brown plant hopper	<i>Nilaparvata lugens</i> (Stal) (Homoptera: Delphacidae)	Major
8.	Small brown Plant hopper	<i>Laodelphax striatellus</i> (Homoptera: Delphacidae)	Minor
9.	White backed Plant hopper	<i>Sogatella furcifera</i> (Horvath) (Homoptera: Delphacidae)	Major
10.	White leafhopper	<i>Cofana spectra</i> (Distant) (Homoptera: Cicadellidae)	Minor
11.	Green leaf hopper	<i>Nephotettix virescens</i> (Distant) (Homoptera: Cicadellidae)	Major
12.	Green leaf hopper	<i>N. nigropictus</i> (Stal) (Homoptera: Cicadellidae)	Major
13.	Zigzag leaf hopper	<i>Recilia dorsalis</i> (Motschulsky) (Homoptera: Cicadellidae)	Minor
14.	Rice gall midge	<i>Orseolia oryzae</i> (Wood-Mason) (Diptera: Cecidomyidae)	Major
15.	Rice leaf folder	<i>Cnaphalocrocis medinalis</i> (Guenee) (Lepidoptera: Pyralidae)	Major

Sl. No	Common Name	Scientific Name (Order:Family)	Status
16.	Rice leaf folder	<i>Marasmia patnalis</i> (Lepidoptera: Pyralidae)	Major
17.	Rice leaf folder	<i>Marasmia exigua</i> (Lepidoptera: Pyralidae)	Minor
18.	Rice leaf folder	<i>L. oratorius</i> (Fabricius) (Hemiptera: Alydidae)	Major
19.	Rice bug	<i>Leptocorisa acuta</i> (Thunberg) (Hemiptera: Alydidae)	Major
20.	Stink bug	<i>Nezara viridula</i> (Linnaeus) (Hemiptera: Pentatomidae)	Minor
21.	Stink bug	<i>Eysarcoris ventralis</i> (Distant) (Hemiptera: Pentatomidae)	Major
22.	Rice hispa	<i>Dicladispa armigera</i> (Olivier) (Coleoptera: Hispididae)	Major
23.	Rice leaf beetle	<i>Leptispa pygmoea</i> (Baly) (Coleoptera :Chrysomelidae)	Minor
24.	Rice Thrips	<i>Frankliniella intonsa</i> (Tryborn) (Thysanoptera: Thripidae)	Major
25.	Rice Thrips	<i>Haplothrips soror</i> (Schimitz) (Thysanoptera: Thripidae)	Major
26.	Rice Thrips	<i>Haplothrips ganglbaueri</i> (Schimitz) (Thysanoptera: Thripidae)	Minor
27.	Rice case worm	<i>Nymphula depunctalis</i> (Genie) (Lepidoptera: Pyralidae)	Major
28.	Rice case worm	<i>N. fluctuosalis</i> (Zeller) (Lepidoptera: Pyralidae)	Major
29.	Rice mealy bug	<i>Brevennia rehi</i> (Lindinger) (Hemiptera: Pseudococcidae)	Major
30.	Whorl maggot	<i>Hydrellia philippina</i> (Ferino ) Diptera: Ephydriidae	Minor
31.	Ear-cutting caterpillar	<i>Mythimna separata</i> (Walker) (Lepidoptera: Noctuidae)	Major
32.	Rice swarming caterpillar	<i>Spodoptera mauritia</i> (Genie) (Lepidoptera: Noctuidae)	Major
33.	Army worm	<i>S. exigua</i> (Hubna) Lepidoptera: Noctuidae	Minor
34.	Army worm	<i>S. litura</i> (Fabricius) (Lepidoptera: Noctuidae)	Minor
35.	Ant	<i>Solenopsis germinate</i> (Fabricius) (Hymenoptera: Formicidae)	Minor
36.	Mole Cricket	<i>Grylotalpa orientalis</i> (Burmeister) (Orthoptera: Grylotalpidae)	Minor
37.	White grub	<i>Heteronychus Sp.</i> (Coleoptera: Scarabaedae)	Minor
38.	Grass hopper	<i>Oxya velox</i> (Fabricius) / <i>O. hyla hyla</i> Serville), (Orthoptera: Acrididae)	Minor
39.	Field Cricket	<i>Conocephalus longipennis</i> (de Haan) (Orthoptera: Tettigoniidae)	Minor

Sl. No	Common Name	Scientific Name (Order:Family)	Status
40.	Rice Aphid	<i>Rhopalosiphum padi</i> (Homoptera:Aphididae)	Minor
41.	Orange headed leaf hopper	<i>Thaia ghaurii</i> (Dworakowska) (Hemiptera: Cicadellidae)	Minor
42.	Leaf hopper	<i>Nisia nervosa</i> (Motsch.) (Hemiptera: Meenoplidae)	Minor

In Aus season the major insect pests of rice are Stem borer, Gall midge, Rice leaf folder, Grass hopper, Case worm, Whorl maggot, Rice hispa, White backed plant hopper and Green leaf hopper; while in T. Aman season, Brown plan hopper, White backed plant hopper, Rice hispa, Rice bug, Mealy bug, Whorl maggot, Grass hopper, Gall midge, Case worm, Leaf folders, Ear-cutting caterpillar and Swarming caterpillars are the major insect pests. In Boro season, Yellow stem borer, Brown plant hopper, White backed plant hopper, Green leaf hopper, Rice Thrips, Pink borer, Orange headed leaf hopper, Rice leaf folder, Rice hispa, Rice bug, Ear-cutting caterpillar and Swarming caterpillar are the major insect pests.

### 3.1.1 Management of major insect pests of rice

#### Management of Stem borers

1. Light trapping for moths and destruction of those thereafter
2. Hand picking of eggs from leaves and destruction.
3. Sweep net collection and destruction of adults.
4. Perching for predatory birds like drongo.
5. Destruction and burning of stubble after harvest after ploughing.
6. For yellow stem borer use of variety BR-1
7. Use and encouragement of biological control agent's parasites, predators and pathogens.
8. Use recommended insecticides.

#### Management of rice hispa

1. Sweeping and destruction of adults.
2. Leaf clipping and destroying grubs
3. Use and encouragement of biological control agents.
4. Collection of eggs and grubs and leaving those for parasites emergence.
5. Use of recommended insecticides and monitoring

#### Management of Rice gall midge

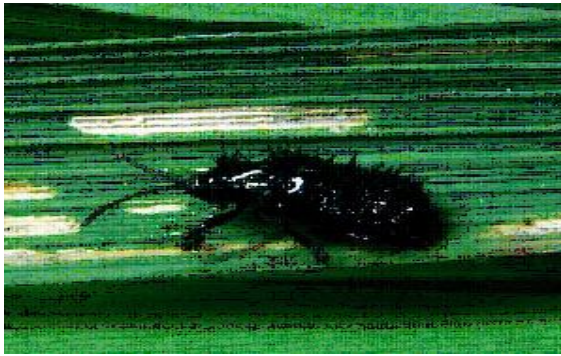
1. Regular surveillance just after transplanting.
2. Collection and destruction of adults through light trapping.
3. Use of recommended insecticides.

#### Management of Rice leaf folder

1. Perching
2. Light trapping for moth control.
3. Larval parasitism 40%
4. Use of recommended insecticides.



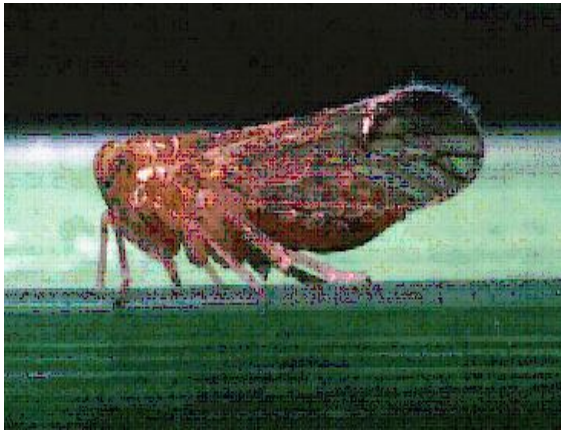
Figure-2: Photographs of Some Major Insect Pests of Rice



Rice hispa



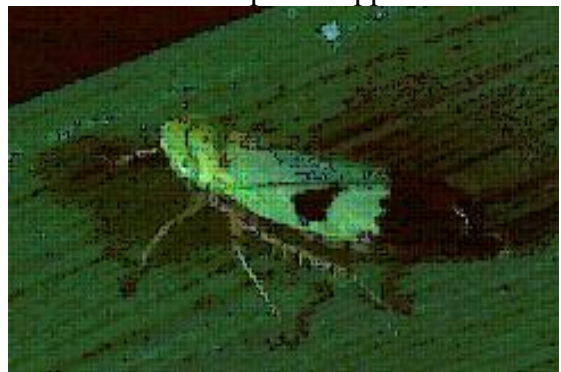
White backed plant hopper



Brown plant hopper



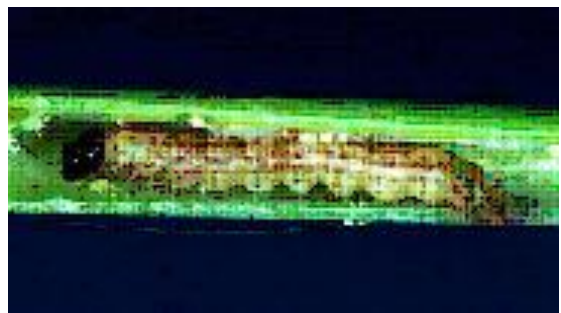
Rice leaf folder



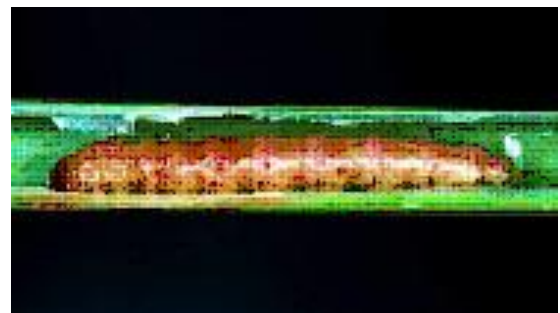
Green leaf hopper



Larvae of Yellow stem borer



Larvae of dark headed borer



Larvae of pink borer

### **Management of Rice case worm**

1. Light trapping
2. Perching
3. Collection of cases from water and destruction.
4. Draining out of standing water from the field.
5. Use of recommended insecticides.

### **Management of Rice swarming caterpillar**

1. Light trapping
2. Perching
3. Ploughing the land and after harvest burning and destruction of stubbles
4. Use of recommended insecticides when necessary.

### **Management of Brown plant hopper**

1. Use of light trap for collection and killing of adults
2. Draining out of standing water from the field
3. Planting early maturing variety with wider spacing
4. Use of resistant variety-
  - i. BR26, BRR I dhan27- Moderately Resistant
  - ii. BRR I dhan31, BRR I dhan35-resistant
5. Use of recommended insecticides in a safe manner.

### **Management of White backed plant hopper**

Same as brown plant hopper-Variety BR-14 and BR-23 are moderately resistant  
BR6, BR26, BRR I dhan27 and BRR I dhan33 are resistant.

### **Management of Green leaf hopper**

1. Use of light trapping
2. Sweep netting
3. Perching
4. Use of resistant / moderately resistant varieties
5. Use of recommended insecticides when needed.

### **Management of Rice thrips**

1. Use of nitrogenous fertilizer so that folder leaves can open and adults fall down and damage can recover.
2. Use of recommended insecticides when required.

### **Management of Mealy bug**

1. Destruction of infested plant or plant parts.
2. Use of recommended insecticides only in infested places

### **Management of Rice bug**

1. Light trapping
2. Use of insecticides in afternoon

### **Management of Rice ear-cutting caterpillar**

1. Perching
2. Hand picking of mature larvae
3. Destruction and burning of stubbles.
4. Ploughing and irrigation of field to destroy larvae and pupae
5. Use of recommended insecticides.

### 3.2 Diseases of rice

In Bangladesh 32 diseases have so far been reported to occur on rice. Among these, 22 diseases caused by fungal group of pathogens, three by bacteria, two by virus/mycoplasma like organisms and five by nematodes. At present, out of 32 diseases the major diseases include Sheath blight (ShB), Blast (Bl), Stem rot (SR), Bakanae (Bk), Brown spot (BS), Sheath rot (ShR), Leaf scald (LSc), Bacterial leaf blight (BLB), Tungro (Tg) and Ufra (Uf). Name of the diseases with their causal agents and status are shown in Table 3.

**Table 3. Diseases of rice recorded in Bangladesh and the causal organisms**

Sl.No	Disease	Causal organisms	Status
<b>Fungal diseases</b>			
1.	Sheath blight	<i>Rhizoctonia solani</i>	Major
2	Blast	<i>Pyricularia grisea</i>	Major
3	Stem rot	<i>Sclerotium oryzae</i>	Major
4	Bakanae	<i>Fusarium moniliforme</i>	Major
5	Brown spot	<i>Bipolaris oryzae</i>	Major
6	Sheath rot	<i>Sarocladium oryzae</i>	Major
7	Leaf scald	<i>Microdochium oryzae</i>	Major
8	Narrow brown spot	<i>Cercospora janseana</i>	Minor
9	Minute leaf spot	<i>Nigrospora oryzae</i>	Minor
10	Leaf smut	<i>Entyloma oryzae</i>	Minor
11	Curvularia leaf spot	<i>Curvularia lunata</i>	Minor
12	Stack burn	<i>Trichoconis padwickii</i>	Minor
13	Sheath Spot	<i>Rhizoctonia oryzae</i>	Minor
14	Aggregate sheath spot	<i>Rhizoctonia oryzae sativa</i>	Minor
15	Crown Sheath Rot	<i>Ophiobolus sp</i>	Minor
16	Sheath Blotch	<i>Pyrenochaeta oryzae</i>	Minor
17	Seedling blight	<i>Sclerotium rolfsii</i>	Minor
18	Damping-off	<i>Achlya proliferata</i>	Minor
19	Kernel bunt	<i>Tilletia barclayana</i>	Minor
20	False smut	<i>Ustilagoidea virens</i>	Minor
21	Grain Red Blotch	<i>Epicoccum purpurescens</i>	Minor
22	Grain discolouration	Different fungi and bacteria	Minor
<b>Bacterial diseases</b>			
23	Bacterial leaf blight	<i>Xanthomonas oryzae pv oryzae</i>	Major
24	Bacterial leaf streak	<i>Xanthomonas oryzae pv oryzicola</i>	Minor
25	Foot rot	<i>Erwinia caryophylli pv caryophylli</i>	Minor
<b>Virus diseases/MLOs</b>			
26	Tungro	Rice tungro virus	Major



27	Yellow dwarf	Mycoplasma	Minor
<b>Nematode diseases</b>			
28	Ufra	<i>Ditylenchus angustus</i>	Major
29	White tip	<i>Aphelenchoides besseyi</i>	Minor
30	Root knot	<i>Meloidogyne graminicola</i>	Minor
31	Root rot	<i>Hirschmaniella oryzae</i>	Minor
32	Stunt	<i>Tylenchorhynchus sp.</i>	Minor

There is seasonal variation on the occurrence and severity of different diseases. Sheath blight disease caused by *Rhizoctonia solani*, one of the most widely distributed diseases throughout the country is most predominant in T. Aman and Aus season, in Boro season this disease has least importance. Blast is most predominant in T. Aman and Boro season. In T. Aman season neck blast is most predominant on the other hand all types of blast is predominant in Boro season. The weather factors in Aus and T. Aman is conducive for Tungro disease. This disease is rarely observed in Boro season. Bacterial leaf blight disease is equally prevalent in all the three rice seasons in Bangladesh. Two seedling diseases viz., seedling blight and damping-off is the problem in Boro seedbed only.

### 3.2.1 Management of Major Rice Diseases:

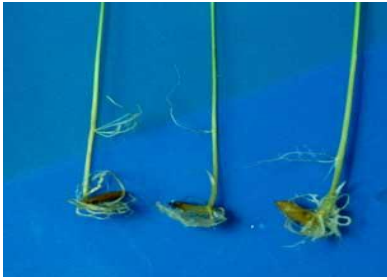
#### Sheath blight

- Planting in wide spacing (20-cm × 20-cm or 15-cm × 25-cm)
- Burning residues in infected fields once in a year after harvesting of T. Aman
- Using balanced dose of fertilizer
- In T. Aman, planting after mid August in endemic areas
- Use tolerant varieties like BR10, BR23, BRRI Dhan32, BRRI Dhan34, BRRI Dhan 38
- Top dressing of 40 Kg MP/ha in two equal splits at disease initiation
- Integration of recommended dose of fertilizers, planting in wide spacing and application of additional murate of potash fertilizer at the rate of 40kg/ha at disease initiation and application of fungicide once
- Spraying Folicur EW 250 or Contaf 5SC @ 500 ml/ha or Aconazole, Evaeilt, Anvil 5SC, or Tilt 250EC @ 1 l/ha or Aimcozim, Forastin, Agben, Cindazim, Evazim, Genuine, or Valcan @ 1kg/ha or Homai or Topsin M @ 2.25 Kg/ha etc. at disease appearance and fifteen days later.

#### Bacterial blight

- Cultivation of resistant or tolerant varieties
- Use of balanced fertilizers
- Split application of urea
- After disease appearance dry the land for 7-10 days
- Avoid urea top dressing upto a week after storm with rain
- After harvesting of T. Aman, burn the residues and stubbles in the field
- Use resistant or moderately resistant varieties (BR2, BR4, BR12, BR14, BR16, BR19, BR21, BR22, BR26, BRRI dhan27, BRRI dhan28, BRRI dhan31, BRRI dhan32, BRRI dhan33, BRRI dhan37, BRRI dhan38, BRRI dhan39, BRRI dhan27, BRRI dhan41, BRRI dhan46)

### Figure-3: Photographs of Some Major Diseases of Rice



Bakanae (aerial root)



Bakanae infected field



Bacterial leaf blight



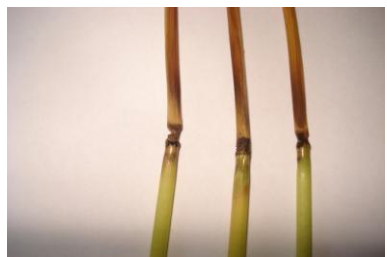
Bacterial leaf streak



BLS close view



Leaf blast



Node blast



Panicle blast



Sheath blight



Tungro



Leaf scald



Sheath rot

### **Blast**

- Use resistant/moderately resistant varieties (BR2, BR3, BR5, BR14, BR15, BR16, BR25, BR26, BRR1 dhan28, BRR1 dhan32, BRR1 dhan33)
- Collect seeds from disease free field
- Apply balanced fertilizers
- Apply 40kg potash fertilizer/ha as top dressing at disease initiation
- Keep standing water in the field
- Spray Trooper or Zeal @ 400gm/ha or Hinosan or Ediphen @ 800 ml/ha or Homai @ 2.25 Kg/ha

### **Tungro**

- Grow resistant or moderately resistant varieties (BR2, 5, 8, 10, 14, 16, 20, 22, 24, BRR1 dhan 27,32, 35, 36)
- Destruction of disease sources
- Plough down the straw and stubles after harvesting of infected crop
- Killing insect vector by using light trap
- Control and kill the green leaf hopper in the seedbed and field by sweeping with hand net
- Control insect by using knock down type of insecticides.

### **Bakanae**

- Use healthy seeds
- Use less nitrogen
- Raise seedlings in wet seedbed
- Good sanitation and alternate wetting and drying of field
- Seed treatment with any of the Carbendazim group of fungicide @ 3 g/ Kg seed

### **Ufra**

- Burning residues in infected fields once in a year
- Cleaning of self sown rice, ratoons and weeds under grass family from the field
- Do not grow seedling in the field where the disease occur earlier or near the infected field
- At early stage of the disease use insecticide under carbofuran group at 1 kg a.i./ha

### **Sheath rot**

- Use healthy seeds
- Apply balanced fertilizers
- Burn plant debris after harvest
- Spray Homai @ 2 Kg/ha or Tilt @ 1 l/ha at panicle initiation to booting stage

### **Stem rot**

- Planting in wide spacing (20-cm × 20-cm or 15-cm × 25-cm)
- Burning residues in infected fields once in a year
- Using balanced dose of fertilizer
- In T. Aman, planting after mid August in endemic areas
- Use tolerant varieties like BR10, BR23, BRR1 dhan32, BRR1 dhan34, BRR1 dhan 38
- Top dressing of 40 Kg MoP/ha in two equal splits at disease initiation
- Integration of recommended dose of fertilizers, planting in wide spacing and application of additional murate of potash fertilizer at the rate of 40kg/ha at disease initiation and application of fungicide once
- Spraying Homai or Topsin M @ 2.25 Kg/ha at disease appearance and fifteen days later.

### 3.3 Insect pests of rice in storage

There are eight species of insect pests causing economic damage to rice in storage condition. These insects include rice meal moth, rice weevil, red grain beetle, confused flour beetle, saw toothed beetle, angoumois grain moth, Khapra beetle and lesser grain borer. A list of insect pests of rice in storage is given in Table 4.

**Table 4. Insect pests of rice in storage**

Sl. No.	Common name	Scientific Name (Order:Family)	Status
1.	Rice meal moth	<i>Corcyra cephalonica</i> (Stainton) (Lepidoptera: Gelechidae)	Minor
2.	Rice weevil	<i>Sitophilus oryzae</i> (L.) (Coleoptera: Curculionidae)	Major
3.	Confused flour beetle	<i>Tribolium confusum</i> Duval (Coleoptera: Tenebrionidae)	Major
4.	Saw toothed beetle	<i>Oryzaephilus surinamensis</i> (L) (Coleoptera: Solvanidae)	Minor
5.	Rice moth	<i>Sitotroga cerealella</i> Zeller (Lepidoptera: Gelechidae)	Minor
6.	Khapra beetle	<i>Trogoderma granarium</i> (E) (Coleoptera: Dermestidae)	Minor
7.	Red grain beetle	<i>Tribolium castaneum</i> (Coleoptera: Tenebrionidae)	Minor
8.	Lesser grain borer	<i>Rhizopertha dominica</i> (F) (Coleoptera: Bostrychidae)	Minor

#### 3.3.1 Management of storage insect pests

##### Rice weevil -*Sitophilus oryzae* (L)

- Sanitation: Cleaning of bins, elevators, before new grain is put in storage to eliminate insect eggs, pupae and adults that grow, eat in the stored grain.
- Use of insect traps, half dried products viz. leaves of neem, nishinda. Physical methods
- Drying of grains, temperature management in storage. Carbon-di-oxide to fumigate
- Use of biological control agents.
- Use of Pheromone traps (sex scent lures)

##### Lesser grain borer- *Rhizopertha dominica*

Sanitation, Physical method

Sun drying of grains

Allow biological control agents

Use of pheromone traps

Bacterial Pesticides, *Bacillus thuringiensis* (B.t) for larvae of moth (Lepidoptera)

##### Rice moth - *Corcyra cephalonica* (Stainton)

Same as Lesser grain borer

##### Flour beetle- *Tribolium confusum*

Same as *Sitophilus oryzae*

**Saw toothed beetle - *Oryzaephilus surinamensis***

- Sanitation
- Physical methods
- Use of botanical product- neem, nishinda
- Use carbon di-oxide to fumigate

**Khapra beetle- *Trogoderma granarium***

Same as *Oryzaephilus*

**Angoumois grain moth- *Sitotroga cerealella* (Z)**

Same as *Rhizopertha dominica*

### 3.4 Diseases of rice in storage

In Bangladesh a major portion of rice seed is from farmers' source. Farmers actually never produce seed but keep a portion of their crop as seed. Farmers store their seed in different types of containers. Most of these containers are not suitable for the safe storage of the seed. At farmers' level rice seed is generally stored for around six months, even in this short duration stored seeds are badly damaged by stored grain moulds due to sub-optimal storage condition. Rice seeds, due to its hygroscopic nature absorb moisture from the atmosphere and create favourable condition for damage by stored grain pests (Thomson, 1979). Contaminated seeds can often results in poor germination and poor seedling vigour, yielding unhealthy crop (Mew 1994). Different kinds of storage moulds associated with stored seeds include different species of *Aspergillus*, *Penicillium*, *Rhizopus* and *Chaetomium*. Among these *Aspergillus* spp. are the most predominant especially *Aspergillus flavus* and *A. niger* (Table 5). Among the season Boro seeds are most vulnerable to damage by storage moulds.

**Table 5. Storage moulds of rice and their status**

Storage mould	Status
<i>Aspergillus flavus</i>	Major
<i>Aspergillus niger</i>	Major
<i>Aspergillus candidus</i>	Minor
<i>Aspergillus ochraceous</i>	Minor
<i>Aspergillus rubber</i>	Minor
<i>Aspergillus nidulans</i>	Minor
<i>Penicillium spp.</i>	Major
<i>Rhizopus stolonifer</i>	Minor
<i>Chaetomium spp.</i>	Minor

### 3.4.1 Management of storage moulds of rice

Moisture content of the seed and storage temperature are the deciding factors for the infection of stored seed by storage moulds. Even a good quality seed may also be spoiled if the storage conditions are not optimum for seed. Under sub-tropical countries like Bangladesh temperature and percentage of air Relative Humidity (RH%) remains high in most of the period in a year. Among the rice growing seasons in Bangladesh Rainfed Lowland Rice (T. Aman) and Irrigated Rice (Boro) are the two main seasons. The period of T. Aman season is from July to December and that for Boro from November to May. Normally the rain ceases in November and again starts in April. Therefore, during and after harvesting of T Aman crop the season is dry and beginning of the storage period is dry but in later part of the storage the weather becomes humid and temperature also rises. Opposite is the situation for Boro, which is generally harvested in May, which is the rainy period. Temperature and RH starts going down about four weeks before seed sowing. Out of six months storage period in both the seasons a major part of the storage passes through hot and humid environmental condition especially for Boro seed. Although seed is dried properly and stored at lower moisture content this does not remain static throughout the storage period. The moisture content of rice seed increases with the increase in atmospheric RH (Thomson 1979), if the storage container is not airtight. High temperature along with high seed moisture is conducive for development of stored grain insects and moulds- two main factors for seed deterioration in the storage. It has been reported that for the growth and development of storage moulds at least 70% RH is necessary however, for stored grain insect pest 30-50% RH is enough. Insects directly damage seed by eating out the kernel and mould attack resulted with a dull appearance of the seed and reduces seed viability (Mian and Fakir 1989, Sauer et al. 1992, Rahman and Mia 1998). The following precautions may be followed to protect the seed while in the storage:

- The moisture content of the seeds at storing should be less than 12%.
- It is advisable to store the seeds in air-tight container.
- Store under well-ventilated place and the container should be placed on a raised platform.
- Intermittent drying of the seed helps preventing infection by storage fungi.
- Take precaution against insect infestation because insect helps multiplication of storage moulds.

### 3.5 Insect pests of hybrid rice in Bangladesh

Seven species of insects have been recorded as pests of hybrid rice in Bangladesh. These are brown plant hopper, yellow stem borer, striped stem borer, green leaf hopper, rice leaf folder, rice mealy bug and gall midge. A list of insect pests of hybrid rice in Bangladesh is presented in table-6.

**Table 6. List of insect pests of hybrid rice in Bangladesh**

Sl. No.	Insect pests	Scientific name
1.	Brown plant hopper	<i>Nilaparvata lugens</i>
2.	Stem borers –Yellow stem borer	<i>Scirpophaga incertulus</i>
3.	Striped stem borer	<i>C. suppressalis</i>
4.	Green leaf hopper	<i>Nephotettis virescens</i>
5.	Rice leaf folder	<i>Cnaphalocrocis medinalis</i>
6.	Rice mealy bug	<i>Brevennia rehi</i>
7.	Gall midge	<i>Orseola oryzae</i>



### 3.5.1 Management of insect pests of hybrid rice

Sl. No	Insect pests	Management options
01	Brown Plant hopper	<ul style="list-style-type: none"> <li>• Use of light trap for collection and killing</li> <li>• Draining of standing water from the field</li> <li>• Planting early maturing variety with wider spacing</li> <li>• Use of resistant variety- BR26, BRRI dhan27- Moderately Resistant BRRI dhan31, BRRI dhan35-resistant Use of recommended insecticides in a safe manner.</li> </ul>
02	Stem borers	<ul style="list-style-type: none"> <li>• Light trapping for moths and destruction of those thereafter.</li> <li>• Hand picking of eggs from leaves and destruction.</li> <li>• Sweep net collection and destruction of adults.</li> <li>• Perching for predatory birds like drongo.</li> <li>• Destruction and burning of stubble after harvest after ploughing.</li> <li>• For yellow stem borer use of Variety BR1</li> <li>• Use recommended insecticides</li> <li>• Use and encouragement of biological control agents, parasites, predators and pathogens.</li> </ul>
03	Green leaf hopper	<ul style="list-style-type: none"> <li>• Use of light trapping</li> <li>• Sweep netting</li> <li>• Perching</li> <li>• Use of resistant variety- BR15, BR26, BRRI dhan36 moderately resistant. BR6 resistant.</li> <li>• Use of recommended insecticides when needed.</li> </ul>
04	Rice leaf folder	<ul style="list-style-type: none"> <li>• Perching</li> <li>• Light trapping for moth control.</li> <li>• Larval parasitism 40%</li> <li>• Use of recommended insecticides.</li> </ul>
05	Rice gall midge	<ul style="list-style-type: none"> <li>• Regular surveillance just after transplanting.</li> <li>• Collection and destruction of adults through light trapping.</li> <li>• Use of recommended insecticides.</li> </ul>
06	Mealy bug	<ul style="list-style-type: none"> <li>• Destruction of infested plant or plant parts.</li> <li>• Use of recommended insecticides only in infested places</li> </ul>

### 3.6 Seed-borne diseases of hybrid rice

Limited works on the seed-borne diseases of hybrid rice has been conducted. So far, seven diseases were found to occur on hybrid varieties (Table 7). these three are the most devastating diseases in Bangladesh and elsewhere, these are bacterial leaf blight, blast and bakanae. Other diseases include Bacterial leaf streak, Brown spot, Narrow brown leaf spot and minute leaf spot. In current boro season severe occurrence of blast disease has been observed on a hybrid rice wherever this has been grown.

**Table 7. Seed borne diseases of hybrid rice**

Sl. No.	Disease	Causal organism	Status
01	Bacterial leaf blight	<i>Xanthomonas oryzae</i> pv <i>oryzae</i>	Major
02	Blast	<i>Pyricularia grisea</i>	Major
03	Bakanae	<i>Fusarium moniliforme</i>	Major
04	Bacterial leaf streak	<i>Xanthomonas oryzae</i> pv <i>oryzicola</i>	Major
05	Minute leaf spot	<i>Nigrospora oryzae</i>	Minor
06	Brown spot	<i>Bipolaris oryzae</i>	Minor
07	Narrow brown spot	<i>Cercospora janseana</i>	Minor

### 3.6.1 Management of seed-borne diseases of hybrid rice

**Use of healthy seed:** The primary inoculum of the seed borne pathogen could be avoided by using healthy seed. To ascertain if the seed lot is healthy, proper seed health testing should be followed. In Bangladesh testing seed for health has not yet been introduced for seed certification. So it is difficult to avoid seed borne pathogen. Until there is no such regulation, the alternative way is to collect seed from disease free field.

**Field inspection:** A minimum of two inspections is needed during the growing period of the seed crop- once at early growing stage and once after flowering. These visits help taking decision if roguing or initiation of spray programme is needed. More precautions to be taken for growing early generation seed, where the tolerance level of seed infection should be low preferably zero. In such case application of effective chemicals at the early stage of the disease is recommended.

**Other methods include:** Proper selection of geographic areas; Crop rotation; Time of planting, Mode of planting, Selection of varieties, rational application of balanced fertilizers, use of organic matter and roughing of off-type and infected plants/panicles. Care should also be taken while harvesting and threshing, proper drying and seed cleaning, prevent introduction from abroad.

**Seed Treatment:** Seed treatment with hot water is a safeguard against all seed borne pathogens. However, chemical seed treatment should be target oriented. Because, a single chemical is not enough to eradicate all the seed bore pathogens. Like Fungicides under Carbendazim group is effective against *Fusarium moniliforme*, the causal agent of Bakanae disease of rice, but is totally ineffective against *Bipolaris oryzae*, the causal agent of Brown spot disease.

### 3.7 Field Survey

The information on insect pests and diseases of rice were collected from the field and various sources as mentioned under materials and methods. The collected information are summarized below:



### 3.7.1 Area under rice in 20 selected districts

Area under rice in three cropping seasons under hybrid and other rice varieties in 20 selected districts of Bangladesh are shown in Table 8. In Aus season total area under hybrid in the selected districts was 23,944 ha and the highest area was in Rajshahi district (13,128 ha). In this season hybrids are not yet cultivated in nine districts. During T. Aman season hybrids were grown only in five districts and the total area was 5121ha in contrast to 2258563ha under other varieties. In Boro season, on the other hand hybrids were found to grow in all the selected districts with the highest in Rangpur district (41,000ha) and the lowest area was in Faridpur (638ha). The total rice area in the selected districts was 5116233.5ha out of which 393044.5ha was under hybrid varieties i.e. 7.68% of the total rice area.

**Table 8. Season wise rice area under hybrid and inbred in 20 selected districts**

Sl. No.	District	Area (ha)					
		Aus		T. Aman		Boro	
		Hybrid	Others	Hybrid	Others	Hybrid	Others
1	Rangpur	750	12000	1880	158640	41000	93920
2	Dinajpur	0	10113	2184	232576	39530	136840
3	Bogra	300	25918	0	177780	32391	159729
4	Naogaon	1635	69,810	0	2,69,345	22157	2,27,359
5	Rajshahi	13,128	65,250	730	1,30,210	11,920	1,23,798
6	Pabna	0	40,800	0	78,639	2156.50	85,170
7	Serajgonj	0	5427	0	69,945	15,235	1,29,120
8	Jessore	1530	45750	0	138445	19350	137850
9	Khulna	35	6715	0	80005	15070	33735
10	Jhenaidah	205	24825	0	92200	3010	86980
11	Barisal	20	35888	28	119412	10108	53494
12	Faridpur	0	11290	0	49125	638	38262
13	Tangail	0	1065	7	107805	10564	156228
14	Sherpur	0	7490	0	91110	20090	67822
15	Mymensingh	170	56560	292	274298	20260	243640
16	Kishoregonj	0	22965	0	76705	28735	145920
17	Netrokona	0	1773	0	139210	16220	161750
18	Hobigonj	0	33695	0	67860	29535	83195
19	Comilla	4561	59612	0	115198	19920	145420
20	Chittagong	1610	44525	0	189610	6090	53200
	<b>Total</b>	<b>23944</b>	<b>581471</b>	<b>5121</b>	<b>2258563</b>	<b>363979.5</b>	<b>1883155</b>
	<b>Total hybrid</b>					<b>393044.5</b>	
	<b>Grand Total</b>						<b>5116233.5</b>

### 3.7.2 Rice varieties grown in 20 selected districts

Information from 20 selected districts both from DAE officials and the farmers revealed that different types of varieties are grown in different seasons. A list of varieties grown in 20 selected districts is shown in Table 9. In Aus season total number of varieties (HYV and local)

was 83, of which 31 were HYVs. In T. Aman season, the total number of varieties grown was 122 of which 39 was HYVs. The corresponding figures in Boro were 82 and 41, respectively. Total number of hybrids grown in this district across the seasons was 87.

**Table 9. List of hybrid and inbred varieties grown in 20 selected districts**

Sl. No.	Aus	T.Aman	Boro	Hybrid
01	BR1	BINA Sail	BINA-7	ACI
02	BR2	BINA4	BINA-8	ACI Super
03	BR3	BINA7	BINA-9	ACI-1
04	BR5	BINA9	BR1	ACI-2
05	BR6	BR1	BR2	ACI-5
06	BR8	BR2	BR3	Aftab
07	BR9	BR10	BR6	Aftab LP-108
08	BR11	BR11	BR9	Aftab LP-50
09	BR12	BR14	BR10	Aftab LP-70
10	BR14	BR16	BR11	Aftab-105
11	BR15	BR3	BR12	AgAmani
12	BR16	BR22	BR14	Agroni
13	BR20	BR23	BR15	Agroni-7
14	BR21	BR24	BR16	Aloron
15	BR24	BR25	BR17	Aloron-5
16	BR25	BR26	BR18	Atter
17	BR26	BR7	BR19	BADC Hybrid
18	BRR1 dhan27	BRR1 dhan28	BR20	BADC-1
19	BRR1 dhan28	BRR1 dhan29	BR24	Bej
20	BRR1 dhan29	BRR1 dhan30	BR25	Bijli
21	BRR1 dhan30	BRR1 dhan31	BR26	BRR1 hybrid-2
22	BRR1 dhan33	BRR1 dhan32	BRR1 dhan28	BRR1 hybrid
23	BRR1 dhan42	BRR1 dhan33	BRR1 dhan29	BRR1 hybrid-3
24	BRR1 dhan43	BRR1 dhan34	BRR1 dhan30	Chamak
25	BRR1 dhan45	BRR1 dhan38	BRR1 dhan33	Dhani
26	BRR1 dhan47	BRR1 dhan39	BRR1 dhan34	Jagoron
27	BRR1 dhan48	BRR1 dhan40	BRR1 dhan36	Folon
28	BINA7	BRR1 dhan41	BRR1 dhan37	GH-9
30	Paijam	BRR1 dhan44	BRR1 dhan39	Gold Tiya
31	Purbachi	BRR1 dhan45	BRR1 dhan45	Harvest
32	Aerial	BRR1 dhan46	BRR1 dhan46	Hira
33	Agali	BRR1 dhan49	BRR1 dhan47	Hira-1
34	Ausasaile	BRR1 dhan50	BRR1 dhan50	Hira-10
35	Bhaturi	BRR1 dhan51	IR-4094	Hira-2
36	Binasail	BRR1 dhan52	IR-50	Hira-3
37	Binni	Nayapajam	IR-64	Hira-4
48	Binnitola	Pajam	IRATOM	Hira-5
39	Bitlob	Purbachi	IRATOM-24	Hira-6
40	Boali	Agunsail	Pajam	Hira-95
41	Boalia	Aloi	Purbachi	Jagarani

Sl. No.	Aus	T.Aman	Boro	Hybrid
42	Bogi	Atnesile	Anna Porna	Jagaron
43	Chapail	Badiuzzaman	Batra Pari	Jamuna
44	Chikon dhan	Baismuri	Benombor	Japon
45	Dalka	Balam	Chandani	Jhalak
46	Dharial	Bashmoti	China	Khrisna
47	Dighi	Basiraj	CI	Kisan
48	Fijan	Basmoti	Dholi	Lal Teer
49	GS-1	Begun Bichi	Gochi	Lili
50	Habigonj	Beroi	Golari	LP-120
51	Haijak	BINA sail	Goldhan	LP-50
52	Hajal Dighi	Binasail	Golirri	LP-70
53	Hashikalmi	Binni	GS-1	Mayna
54	Indian50	Binni balam	Gutiiri	Mina
55	Jirasail	Biroi	IT	Modhumati
56	Jotapari	Boro hafju	Jagali	Modhumoti-2
57	Kajallota,	Borohagi	Jagli	Modhumoti-5
58	Kalamanik	Chapanoli	Jagli kali	Moyna
59	Kalobokri	Checonmaloti	Jamaibabu	Partex
60	Kalomanik	Chini Atab	Jira Sail	Raichar
61	Kasia binni	Choyon	Kajal lata	Raichar-101
62	Kataktara	Dhola digha	Kali	Raijar
63	Khorajamira	Dhudchar	Kali boro	Rajkumar
64	Miniket	Ecorcaul	Khat-10	Rajonar
65	Moishlem	Fulgangi	Khya boro	Ruposhi bangla
66	Nayanmoni	Gandhi Sail	Kunile	Ruposi
67	Pakri	Ganga	Lakhai	Rupsa
68	Pari	Golapi	Lakhi	Sambal
69	Parija	Golari	Lal dhan	Sampad
71	Pousa	Haloi	Lapha	Sarothi
72	Ratna	Hari	Laphaia	Sathi
73	Safa	Hijoldigha	Miniket	SB-9
74	Saika	Horaboti	Narikelbadi	Sera
75	Saitta	Hori	Parija	Shakti
76	Shoni	Jamaiaduri	Parijat	SL-78
77	Signal	Jira balam	Potolpyri	SL-8
78	Sonali	Jira sail	Rata	SL8H
79	Swarna Moyouri	Jirabadam	Ratna	Sonar Bangla
80	Teorba	Jotabaija	Sadaboro	Sonar Bangla-1
81	Vaturi	Kajolsail	Shaita	Sonar Bangla-6
82	Vosa	Kalijera	Tepe Boro	Super Hybrid
83	Zecra	Karba Balam		Super rice
84		Kartikshail		Surma
85		Kasia binni		Tej
86		Kasiaben		Tej (ACI)

Sl. No.	Aus	T.Aman	Boro	Hybrid
87		Khatobadha		Tia
88		Khil		
89		Khilloi		
90		Kinol		
91		Kumri		
92		Lalbela		
93		Lalmoti		
94		Lati sail		
95		Lohateng		
96		Malati		
97		Manum		
98		Masuri		
99		Moghi Chikon		
100		Muni		
101		Nakpechi		
102		Nepali Swarna		
103		Nigersail		
104		Paijara		
105		Pajam		
106		Parijat		
107		Patjag		
108		Rajasail		
109		Rajkumari		
110		Ratna		
112		Ronjit-Sorna		
113		Satchikon		
114		Satkaiynna chikon		
115		Shaita		
116		Shil komol		
117		Shona-5		
118		Shorna-5		
119		Sumon		
120		Swarna		
121		Tulsimala		
122		Vojon		

### 3.7.3 Major insect pests of rice in 20 selected district

The recorded major insect pests of rice in 20 selected districts are shown in Table 10 below:

**Table 10. List of major insect pests reported from 20 selected districts**

Sl. No.	District	Name of Insect pests
01	Rangpur	SB, BPH, LF, ECC, RB, GH, GM
02	Dinajpur	SB, RB, LF, BPH, CW, GLH, MB
03	Bogra	SB, RB, LF, BPH, GLH, MB

04	Naogaon	WBPH, SB, LF, BPH, GM, RB, MB, Thrips, CW, ECC, GLH
05	Rajshahi	SB, RB, LF, GM, BPH, ECC, GH, GLH, CW
06	Pabna	SB, LF, BPH, ECC, RB, GLH, CW, GM, RT
07	Serajgonj	SB, LF, BPH, ECC, RB, GLH, WBPH, CW, GM, MB
08	Jessore	SB, RB, GLH
09	Khulna	SB, RB, GLH, LF
10	Jhenaidah	SB, RB, GLH, BPH
11	Barisal	SB, RB, LF, RH, GLH
12	Faridpur	SB, RB, LF, RH, GLH
13	Tangail	RH, SB, RB, GM, WBPH, CW, GLH, BPH, LF
14	Sherpur	SB, LF, CW, RSC, ECC, RB, RH, BPH, GM,
15	Mymensingh	SB, LF, RB, BPH, GM, RH, ECC, CW
16	Kishoregonj	SB, RB, LF, RH, GLH, ECC, CW, Thrips
17	Netrokona	SB, LF, RB, GM, BPH, ECC, GLH, CW, RH
18	Hobigonj	SB, LF, BPH, GLH,
19	Comilla	SB, CW, LF, BPH, RB, GLH, GM
20	Chittagong	SB, CW, BPH, RB, GM, LF, RH

Stem borer (SB), Brown plant hopper (BPH), Leaf folder (LF), Ear cutting caterpillar (ECC), Rice bug (RB), Grass hopper (GH), Gall midge (GM), Case worm (CW), Green leaf hopper (GLH), Mealy bug (MB), White backed plant hopper (WBPH), Rice thrips (RT), Rice hispa (RH) and Rice swarming caterpillar (RSC) were the major insect pests of rice recorded in the selected 20 districts of Bangladesh. Number of insect pests was variable in the districts under study. Less number of insect pests was recorded in Jessore, Khulna, Jhenaidah, Barisal and Faridpur districts as compared to other 15 districts.

### 3.7.4 Major diseases of rice in 20 selected districts

From the 20 selected districts a total of 12 diseases were reported to occur. These include Bacterial leaf blight (BLB), Bacterial leaf streak (BLS), Bakanae (Bk), Blast (Bl), False smut (Fsmt), Foot rot (Fr), Leaf scald (LSc), Root rot (Rt), Sheath rot (ShR), Stem rot (SR), Tungro (Tg) and Ufra (Uf). Minimum number of diseases (three) was recorded In Jessore and Jhenaidah district. Diseases reported from Jessore were Bl, BLB and ShB and from Jhenaidah were Bl, BLB and BLS. Number of diseases reported from Naogaon district was 10 and this was the highest number in individual district, which was followed by Rajshahi district (Table 11). From the table it is evident that Blast disease is major in all the 20 districts and ShB in 17 districts.

**Table 11. List of major diseases reported from 20 selected districts**

Sl. No.	District	Name of Diseases
01	Rangpur	BLB, BLS, ShB, BS, Bl
02	Dinajpur	Bl, ShB, BLB, Fsmt, ShR, BS

03	Bogra	Bl, BLB, ShB, SR
04	Naogaon	Bl, BS, LSc, BLS, BLB, ShB, ShR, Kresek, Bk, SR
05	Rajshahi	Bl, BS, BLS, BLB, ShB, ShR, Kresek, Bk, SR
06	Pabna	BLB, ShB, BS, Bl, ShR, BLS
07	Serajgonj	ShB, BLB, BS, Bl, ShR, BLS, Ufra,
08	Jessore	Bl, BLB, ShB
09	Khulna	BS, SR, ShR, ShB, LSc, Bl
10	Jhenaidah	Bl, BLB, BLS
11	Barisal	Bl, Uf, BLB, BS
12	Faridpur	BLB, Bl, Uf, Tg, BLS
13	Tangail	BLB, BLS, Bl, BS, ShR, LSc, ShB
14	Sherpur	ShB, BFR, Bl, BS, BLB, RR, ShR, BLS
15	Mymensingh	Bk, ShB, ShR, Bl, BLB, BS, Uf
16	Kishoregonj	Bk, Bl, ShB, ShR, BLB
17	Netrokona	Bl, BS, ShB, Uf, BLB
18	Hobigonj	Bl, ShB, ShR, Bk
19	Comilla	Bl, BLB, ShR, ShB, Bk
20	Chittagong	BLB, Bl, ShB, ShR

Bk=Bakanae; Bl=Blast; BLB=Bacterial leaf blight; BLS=Bacterial leaf streak; BS=Brown spot; BFR=Bacterial foot rot; Fsmt=False smut; LSc=Leaf scald; RR=Root rot; ShB=Sheath blight; ShR=Sheath rot; SR=Stem rot; Tg=Tungro; Uf=Ufra

### 3.7.5 Farmer's information on rice insect pests and diseases

Through direct interview with 10 farmers from each of 50 upazilas under 20 selected districts of Bangladesh information on the occurrence of insect pests and diseases in their field and the management practices they followed were documented in Table 12. Farmers in Sadar, Mithapukur and Badorgonj upazilas under Rangpur identified eight insect pests and five diseases in their field. Among the insect pests SB and BPH and among the diseases ShB were common in all the three upazilas. Number of diseases reported from Badorgonj was the highest (4). Farmers reported that they are using mostly insecticides for controlling insect pests in their field. In addition to chemical control, farmers in Badorgonj also practice perching for insect control. Similarly for controlling diseases farmers depend on chemical pesticides.

Under Dinajpur district farmers from four upazilas viz., Sadar, Fulbari, Birampur and Birgonj reported to observe SB, RB, LF, BPH, CW, SHGH, GLH and MB in their field and for controlling these they mainly use pesticides but some farmers also practice IPM. Number of insect pests reported from Birgonj upazila was the lowest (3). Stem borer and LF were common in all the four upazilas. Diseases reported by the farmers in the four upazilas include Bl, ShB, False smut (Fsmt), BS, BLB, ShR and BLS. Incidence of Bl was reported from all the four upazilas, ShB was common in Sadar, Birampur and Birgonj, ShR in Fulbari and Birgonj and BLB at Fulbari and Birampur respectively. All the farmers reported to use fungicides for controlling the diseases. At Fulbari farmers apply MoP as top dressing for controlling BLB.

Farmers from Sherpur, Adamdighi and Shibgonj upazilas under Bogra district experience the occurrence of SB, BPH, LF, SHGH, GLH, RB and GM in their fields and for controlling these pests they generally apply insecticides and rarely practice IPM. Among the insect pests

infestation with SB, BPH and LF was common at all the three upazilas. Rice bug was reported from Adamdighi and Shibpur. Among the diseases observed by the farmers in their field include ShB, Bl, ShR, BS, BLB and BLS. Sheath blight and ShR were common in all the three upazilas and BLB and BLS were reported by the farmers from Adamdighi upazila only. For controlling these diseases farmers depend on chemical pesticides.

In Naogaon sadar the insects reported by the farmers include SB, RLF, GM, BPH, WBPH, GH, RB, MB, LHGH and RT; in Patnitola SB, RLF, BPH, LHGH, GH, CW, RB, MB, ECC, GLH and in Shapahar BPH, GLH, SB, GH, RLF, GM, RB, GLH, ECC and CW, the management options followed by the farmers include chemical/ cultural/ mechanical management. Diseases in Sadar were LSc, Bl, BS, BLB, BLS, ShB, ShR; Patnitola ShB, BS, Bl, BLB, BLS, Bakanae and Sapahar were Bl, ShB, ShR, BS, BLB, BLS, Bakanae, SR and control measures include Chemical /cultural /management.

In Tanor, Godagari and Baghmara upazilas of Rajshahi farmers reported insect pests were SB, BPH, ECC, GLH, RB, RLF, CW; SB, RB, RLF, GM, BPH, ECC, GH and SB, BPH, ECC, GLH, RLF, GH, RB, CW, respectively and the corresponding diseases were ShB, BLB, ShR, Bl, BS, BLS; Bl, BS, BLB, BLS, ShB and Bl, BS, BLB, ShB, SR, BLS, ShR, respectively. It is evident from the table that five insect pests namely SB, BPH, RB, ECC and RLF are common in all the three upazilas. Case worm was absent in Godagari and GM in Tanor. Among the diseases ShB, BLB, BLS and Bl were common in all the three upazilas, BS was reported from Tanor and Godagari, ShR from tanor and Baghmara and SR only from Baghmara. For insect pest management, farmers in these Upazilas practice Chemical/ cultural/ mechanical management and for disease control Chemical and cultural management (Table 11).

In Pabna sadar the insect pests and diseases across the seasons reported to occur by the farmers were SB, SHGH, LHGP, RLF, BPH, GLH, ECC, RB and ShB, BLB, BS, Bl, ShR, BLS, respectively. The occurrence of insect pests in Sujanagar were SB, SHGH, GM, CW, LHGP, RLF, BPH, GLH, ECC, RB, GH, WBPH, RT and diseases were ShB, Bl, BS, BLB, ShR and BLS. Control measures both insects and diseases were the same as Rajshahi district.

In Serajgonj sadar the insect pests and diseases across the seasons reported to occur by the farmers were SB, SHGH, GM, CW, LHGP, RLF, BPH, GLH, ECC, RB, MB and ShB, Bl, BS, BLB, ShR and BLS. The corresponding insect pests and diseases in Tarash were SB, SHGH, GM, CW, LHGP, RLF, BPH, GLH, ECC, RB, WBPH, RH and ShB, Bl, BS, BLB, Ufra, ShR and BLS. Control measures were similar to Rajshahi.

In Jessore information were collected from farmers of Bagharpara and Monirampur Upazila. Insect pests reported from Bagharpara were SB, RB, GLH and only Bl disease was reported. Insect pests reported from Monirampur were SB, RB, SHGH, GLH and diseases were BS, ShB, Bl, BLB, Ufra. Control measures for insect pests include chemical and in some cases IPM, disease control was mainly by chemicals.

According to the farmers of Digholia, Khulna insect pests of this location were SB, RB, GLH, LF and diseases were Bl, BS, ShB, ShR, LSc. Reported insect pests in Baitaghata were SB and LF and diseases were Bl and nematode. Control measures for both insect pests and diseases are similar to Jessore.

In Jhenaidah sadar insect pests reported were SB, RB, GLH, BPH and diseases were Bk, BLB and Bl. Insect pests reported from Harinakundho were SB, RB and GLH and diseases were BLS and Bl. Control measures for both insect pests and diseases are similar to Jessore.

Farmers of Bakergonj reported that the major insect pests were SB, LF, RB, RH, SHGH, GLH and diseases were Tg, BLB, Bl, Uf. Reported insect pests and diseases in Gaournadi were SB and RB and Bl and BLB, respectively. Control measures for both insect pests and diseases practice by the farmers of both the Upazilas are similar to Jessore.

Reported insect pests in Faridpur sadar Upazila were SB, RB, RH, SHGH and diseases were Tg, BLB, Bl, Uf, BLS. In Nagorkanda reported insect pests were SB, RB, LF, SHGH, GLH and diseases were Uf, BLB, Bl, BLS. Control measures for both insect pests and diseases are similar to Jessore.

From Tangail sadar three insect pests namely, the farmers have reported SB, RH and BPH and three diseases namely, Bl, BS and ShR. In Modhupur reported insect pests and diseases were SB and RH and BLB, Bl, ShR, ShB, Bk, respectively. Control measures are mainly chemical and cultural.

Four insect pests (SB, GLH, LF, GM) and four diseases (BLB, Blast, ShR, ShB) were reported from Sherpur sadar and from Nokla insect pests were SB, GLH, BPH, LF and diseases were same as sadar. Control measures are similar to Tangail.

Reported insect pests in Trisal, Fulpur and Ishwargonj under Mymensingh district were SB, RH, CW, LF and SB, RH, GM, LF and SB, RH, LF, BPH, respectively. Corresponding diseases were BS, Bl, ShB, BLB and Bl, ShB and Bl, ShB, BS, Uf respectively. Control measures are similar to Tangail.

From Netrokona sadar three insect pests namely, the farmers have reported SB, LF and BPH and three diseases namely, ShB, BLB and BS. In Purbodhola, reported insect pests and diseases were SB and BPH and Bl and ShB, respectively. Control measures are mainly chemical and cultural.

In Kishoregonj, information was collected from three Upazilas. Reported insect pests from sadar were SB, RH, RB, LF, GLH and diseases were Bl, FR, ShB, BS, BLB and Bk. Insect pests at Kotiadi were SB, ECC, RH, RB, GLH and those from Bazitpur were SB, RT, RB, GLH, ECC, CW, GM. Diseases from Kotiadi were Bl, FR, ShB, BS, BLB, Bk and from Bazitpur Bl, Tg, Bk, BLB, Uf. Control measures are mainly chemical and cultural.

From Hobigonj sadar reported insect pests were SB, LF, BPH, GLH and diseases were ShB, ShR, Bl, Bk, BS. The major insect pests in Madhobpur were SB, LF, BPH, GLH and major diseases were ShR, ShB, Bk, Bl. Control measures are chemical, IPM and cultural.

The major insect pests reported by the farmers in Adarsha sadar of Comilla were SB, CW, LF, BPH, RB and the diseases were ShB, ShR, Bk, Bl, BLB. At Burichang SB, BPH, CW, LF, GLH were the major insect pests and major diseases were ShR, ShB, Bk, Bl, BS. Major insect



pests and diseases reported from Barura were SB, CW, RB, LF, GM and Bl, BLS, ShB, Tg, ShR, Bk, FR, BLB, BS, respectively. Control measures of insect pests include IPM and use of pesticides and for diseases Chemical and cultural management.

In Chittagong district, information on the occurrence of insect pests and diseases were collected from the farmers belonging to Potia, Satkania and Mirsorai upazilas. According to the farmers report major insect pests and diseases at Potia were SB, CW, RB and BS, ShR, Bl, SR, Bk, respectively while insect pests namely SB, CW, GM, LF, RB, BPH and diseases namely Bl, ShR, Uf, Bk, BLB were major at Satkania. At Mirsorai, reported insect pests were SB, LF, BPH, “Leda poka”, RH and diseases were BLB, ShR, FR and Bl. Control measures for insect pests and diseases were the same as Comilla (Table 12).

**Table 12. Farmers’ information on insect pests and diseases and their control**

District	Upazila	Season	Insect pests	Control	Diseases	Control
Rangpur	Sadar	All	Stem borer BPH Leaf folder ECC	Granular Admire/ Mipcin Granular None	Sheath blight	Tilt/ Knowin
	Mithapukur	All	Stem borer BPH ECC Rice bug Grass hopper	Moter Admire Dursban Malathion Chloropyriphos	Sheath blight Sheath rot Blast	Contaf/ Tilt/ Score Nativo
	Bodorgonj	All	Stem borer Gallmidge Short-horned grass hopper Leaf folder BPH	Granular/ Lebaycid Furadan Perching Malathion Mipcin	Blast Brown spot Sheath blight BLB	Tilt Potash spray Folicur/
Dinajpur	Sadar	All	Stem borer Rice bug Leaf folder BPH Case worm	Perching/ Diazinon Sumithion Diazinon Phyter Perching	Blast Sheath blight False smut	Nativo Folicur Bavistin
	Fulbari	All	Stem borer Leaf folder Short horned grass hopper Rice bug GLH	Cypermethrin/ perching Cypermethrin/ perching Perching/ light trap/ Granular Light trap Sweeping net/ Light trap	Neck blast Brown spot BLB Sheath rot BLS	Proud/ Cupravit Urea application Mop top dressing Folicur/ Score
	Birampur	All	BPH Stem borer Leaf folder Rice bug Mealy bug	Sofcin Furadan/ Azodin Ostad Cupfaadi Diazinon	BLB Sheath blight Neck blast	Campion Tilt/ Score Trooper

District	Upazila	Season	Insect pests	Control	Diseases	Control
	Birgonj	All	BPH Stem borer Leaf folder	Combi2/ Admire Karate/ Virtaco Sofcin	Blast Sheath blight Neck blast Sheath rot	Nativo/ Tilt Score/ Folicur
<b>Bogra</b>	Sherpur	All	Stem borer BPH Leaf folder SHGH GLH	Fosil/Biomed Bicarp Hosalfan Fosil/Biomed Fosil/Hosalfan	Sheath blight Blast Sheath rot Brown spot	Tilt Combi 2
	Adamdighi	All	Rice bug SHGH Stem borer Leaf folder Gall midge Leaf cutter GLH BPH	Light trap Lebaycid IPM/ Granular Lebaycid Lebaycid Granular Lebaycid Sofcin	BLS BLB Sheath blight Sheath rot	Score/ folicur/ Contaf / Tilt
	Shibgonj	All	Stem borer BPH Leaf folder Rice bug	GranularMalathion/ Morter/ Sofcin/ Mipcin/ Spike/ Karate/ Ison/ Virtaco/ Furadan/ perching Marshal/ Sumithion	Neck blast Sheath blight Sheath rot	Hinosan/ Trooper Score/ Folicur
<b>Naogaon</b>	Sadar	All	SB, RLF, GM, BPH, WBPH, GH, RB, MB, LHGH, RT	Chemical/ cultural/ mechanical management	LSc, BI, BS BLB, BLS ShB, ShR	Chemical/ cultural management
	Patnitola	All	SB, RLF, BPH LHGH, GH, CW, RB, MB ECC, GLH WLH	Chemical/ cultural/ mechanical management	ShB, BS BI, BLB, BLS Bakanae	Chemical/ cultural management
	Sapahar	All	BPH, GLH SB, GH, RLF GM, RB, GLH ECC, CW	Chemical/ cultural/ mechanical management	BI, ShB, ShR BS, BLB, BLS Bk, SR	Chemical/ cultural management
<b>Rajshahi</b>	Tanor	All	SB, BPH, ECC GLH, RB, RLF, CW	Chemical/ cultural/ mechanical management	ShB, BLB ShR, BI, BS BLS	Chemical/ cultural management
	Godagari	All	SB, RB, RLF GM, BPH, ECC, GH	Chemical/ cultural/ mechanical management	BI, BS, BLB BLS, ShB	Chemical/ cultural management
	Baghmara	All	SB, BPH, ECC, GLH, RLF, GH RB, CW	Chemical/ cultural/ mechanical management	BI, BS, BLB ShB, SR, BLS, ShR	Chemical/ cultural management

District	Upazila	Season	Insect pests	Control	Diseases	Control
Pabna	Sadar	All	SB, SHGH, LHGP, RLF BPH, GLH ECC, RB	Chemical/ cultural/ mechanical management	ShB, BLB BS, Bl, ShR, BLS	Chemical/ cultural management
	Sujanagar	All	SB, SHGH GM, CW, LHGP, RLF, BPH, GLH ECC, RB, RT GH, WBPH	Chemical/ cultural/ mechanical management	ShB, Blast BS, BLB ShR, BLS	Chemical/ cultural management
Serajgonj	Sadar	All	SB, SHGH, GM, CW, LHGP, RB, RLF, BPH GLH, ECC MB	Chemical/ cultural/ mechanical management	ShB, Blast BS, BLB, ShR BLS	Chemical/ cultural management
	Tarash	All	SB, SHGH GM, CW LHGH, RLF BPH, GLH ECC, RB, WBPH, RH	Chemical/ cultural/ mechanical management	ShB, Bl, BS, BLB, Ufra, ShR BLS	Chemical/ cultural management
Jessore	Bagharpara	All	SB, RB, GLH	Parching/ Furadan Diagonal	Bl	
	Monirampur	All	SB, RB, SHGH, GLH	Perching/Vitaco Rejent /Furadan minsufier	BS, ShB, Bl, BLB, Ufra	Folicur Tilt
Khulna	Digholia	All	SB, RB, GLH, LF	Perching/ Light trap, Hand net Chloropyriphos Bistaran, Firetrap	Bl, BS, ShB, ShR, LSc	Bavistin Potash Theivit Tilt Boron
	Batiaghata	All	SB, LF	Perching/ Light trap Hand net Nitro	Bl, Nematode	Folicur Tilt/ Furadan
Jhenidah	Sadar	All	SB, RB, GLH, BPH	Furadan Morter Newfuran Karate/ Carbofuran Diazinon/ Perching	Bk, BLB, Bl	Folicur Tilt
	Harina Kundo	All	SB, RB, GLH	Perching Diazinon Karate Carbofuran	BLS, Bl	Tilt Foliquare Nativo
Barisal	Bakergonj	All	SB, LF, RB, RH, SHGH, GLH	Perching, light trap, Furadan, Malathion Basudin , Sumithion	Tg, BLB, Bl, Uf	Malathion Tilt, Carbofuran

District	Upazila	Season	Insect pests	Control	Diseases	Control
	Goarnadi	All	SB, RB	Perching, light trap, Furadan	Bl, BLB	Tilt, cultural
Faridpur	Sadar	All	SB, RB, RH, SHGH	Perching, Light trap, Furadan Chloropyriphos Dursban Basudin	Tg, BLB, Bl, Uf, BLS	Malathion, MOP Tilt Carbofuran
	Nagorkanda	All	SB, RB, LF, SHGH, GLH	Light trap, Perching, Furadan Basudin, Karate, Cup	Uf, BLB, Bl, BLS	Tilt, carbofuran Folicur
Tangail	Sadra	All	SB, RH, BPH	Cultural/chemical	Bl, BS, ShR	Cultural/pesticide
	Modhupur	All	SB, RH	Cultural/ chemical	BLB, Bl, ShR, ShB, Bk	Cultural/pesticide
Sherpur	Sadar	All	SB, GLH, LF, GM	Cultural/ chemical	BLB, Bl, ShR, ShB	Cultural/pesticide
	Nokla	All	SB, GLH, BPH, LF	Cultural/ chemical	BLB, Bl, ShR, ShB	Cultural/pesticide
Mymensingh	Trisal	All	SB, RH, CW, LF	Cultural/ chemical	BS, Bl, ShB, BLB	Cultural/pesticide
	Fulpur		SB, RH, GM, LF	Cultural/ chemical	Bl, ShB	Cultural/pesticide
	Ishwargonj	All	SB, RH, LF, BPH	Cultural/ chemical	Bl, ShB, BS, Uf	Cultural/pesticide
Netrokona	Sadar	All	SB, LF, BPH	Cultural/ chemical	ShB, BLB, BS	Cultural/pesticide
	Purbadhola		SB, BPH	Cultural/ chemical	ShB, Bl	Cultural/pesticide
Kishoregonj	Sadar	All	SB, RH, RB, LF, GLH,	Perching; Light trap	Bl, ShR, ShB, Bk, BLB	Cultural/pesticide
	Kotiadi	All	SB, ECC, RH, RB, GLH, LF, WM,	Chemical/ cultural/ mechanical management	Bl, FR, ShB, BS, BLB, Bk	Cultural/pesticide
	Bazitpur	All	SB, RT, RB, GLH, ECC, CW, GM	Chemical/ cultural/ mechanical	Bl, Tg, Bk, BLB, Uf	Cultural/pesticide
Hobigonj	Sadar	All	SB, LF, BPH, GLH	IPM; Perching, Insecticide	ShB, ShR, Bl, Bk, BS	Chemical/cultural
	Madhobpur	All	SB, LF, BPH, GLH	IPM; Perching, Insecticide	ShR, ShB, Bk, Bl	Cultural/pesticide
Comilla	Adarsha Sadar	All	SB, CW, LF, BPH, RB	IPM; Insecticide	ShB, ShR, Bk, Bl, BLB	Use fungicide, Water management, use MoP
	Burichong	All	SB, BPH, CW, LF, GLH	IPM; Insecticide	ShR, ShB, Bk, Bl, BS	Do- and roguing

District	Upazila	Season	Insect pests	Control	Diseases	Control
	Barura	All	SB, CW, RB, LF, GM	IPM; Insecticide	Bl, BLS, ShB, Tg, ShR, Bk, FR, BLB, BS	Do- and roguing
Chittagong	Potia	All	SB, CW, RB	Perching; IPM; Insecticide	BS, ShR, Bl, SR, Bk	Do- and roguing
	Satkania	All	SB, CW, GM, LF, RB, BPH	IPM; Insecticide	Bl, ShR, Uf, Bk, BLB	Do- and roguing
	Mirsorai	All	SB, LF, BPH, "Leda poka", RH	Perching; IPM; Insecticide	BLB, ShR, FR, Bl	Do-

### 3.7.6 DAE/BRRI officials' information on rice insect pests

Information collected from DAE/BRRI personnel on insect pests of rice from different districts were collected and district wise information is given below:

**Table 13. Season wise insect pests of rice in Rangpur district**

Crop season	Insect pests	Control measures
<b>Inbred</b>		
Aus	Stem borer	Application of insecticides- Marshal/ Diazinon/ Regent/ Sumithion/ Phyter/ Cypermethrin group/ Cartaf; Perching/ Light trap/ IPM
	Leaf folder	Application of insecticides- Sumithion/ Tido; IPM, Perching
	Rice bug	Application of insecticides- Morter; Light trap
T. Aman	Stem borer	Application of insecticides- Marshal/ Diazinon/ Sumithion/ Cypermethrin group/ Cartaf; IPM, Perching
	BPH	Application of insecticides- Relly/ Admire/ Gain/ Mipsin/ Sopsin/ Emidachlorofit group/ Ektara; bend the plants on both side to help sun to reach
	Rice bug	Application of insecticides- Chloropyriphos
	GLH	Application of insecticides- Chloropyriphos
	Leaf folder	Application of insecticides- Chloropyriphos/ Sumithion/ Tido/; Perching
Boro	Stem borer	Application of insecticides- Diazinon/ Marshal/ Cypermethrin group; IPM/ Perching/ Light trap
	Leaf folder	Application of insecticides- Diazinon/ Tido/ Sumithion; IPM/ Perching/Light trap
<b>Hybrid</b>		
Aus	Stem borer	Application of insecticides- Marshal/ Diazinon/ Cypermethrin group/ Cartaf; IPM/ Perching/ Light trap
T. Aman	Stem borer	Application of insecticides- Marshal/ Diazinon/ Tido Cypermethrin group// Sumithion; IPM/ Perching/ Light trap
	BPH	Application of insecticides- Relly/ Admire/ Ektara

Crop season	Insect pests	Control measures
	Leaf folder	Application of insecticides- Sumithion/ Tido, Perching
	Gall midge	Application of insecticides
Boro	Stem borer	Application of insecticides- Marshal/ Diazinon/ Cypermethrin group, Cartaf; IPM/ Perching/ Light trap/
	BPH	Application of insecticides- Ektara
	Leaf folder	Application of insecticides- Tido/ Sumithion

Three insect pests named stem borer, leaf folder and rice bug were recorded in the Aus season and five insect pests viz, stem borer, brown plant hopper, rice bug, green leaf hopper and leaf folder in the T.Aman season and two insect pests stem borer and leaf folder in the Boro season.

In case of hybrid rice, only stem borer was found in the Aus season and four insect pests viz, stem borer, brown plant hopper, leaf folder and gall midge in the T.Aman season and three insect pests namely, stem borer, brown plant hopper and leaf folder in the Boro season. A list of season wise insect pests of rice in Rangpur district is presented in Table 13.

**Table 14. Season wise insect pests of rice in Dinajpur district**

Crop season	Insect pests	Control measures
<b>Inbred</b>		
Aus	Stem borer	Application of insecticides- Granular/ Raison/ Cartaf; Light trap/ Perching/ IPM/
	GLH	Diazinon
	Leaf folder	Application of insecticides -Karate; Perching
T. Aman	BPH	Application of insecticides- Ektara/ Admire/ Mipsin/ Sofsin
	Stem borer	Application of insecticides- Raison/ Granular/ Cartaf/; Perching, Split dose of N-fertilizer
	Leaf folder	Application of insecticides- Cartaf
	Gall midge	Line sowing; Application of USG; Perching
	Case worm	Application of insecticides- Liquid, systemic
Boro	Stem borer	Application of insecticides- Raison/ Granular/ Basudin/ Cartaf/ Basusin; Perching. Line sowing, Application of USG
	Leaf folder	Application of insecticides- Carate/ Stonoch
	Case worm	Application of insecticides- Sumithion/ Ektara
	Short horned grass-hopper	Perching. Line sowing, Application of USG
<b>Hybrid</b>		
Aus	No crop	
T. Aman	Stem borer	Application of insecticides- Raison/ Granular/ Cartaf/; Light trap
Boro	Stem borer	Application of insecticides- Granular/ Raison/ Virtaco/ Cartaf/; Light trap/ Perching/ Line sowing
	Leaf folder	Application of insecticides- Granular
	Short horned grass hopper	Perching, Application of USG, Line sowing

Three insect pests viz. stem borer, green leaf hopper and leaf folder were recorded in the Aus season while brown plant hopper, stem borer, leaf folder, gall midge and case worm in the T.Aman and stem borer, leaf folder, case worm and short horned grass hopper in the Boro season.

No hybrid rice was grown in the Aus season. Stem borer was found in the T.Aman season and three insects like stem borer, leaf folder and short horned grass hopper were recorded in the Boro season. A list of season wise insect pests of rice in Dinajpur district is shown in Table 14.

**Table 15. Season wise insect pests of rice in Bogra district**

Crop season	Insect pests	Control measures
<b>Inbred</b>		
Aus	Stem borer	Application of insecticides- Granular/ Diazinon/ Carbofuran group /Spike/ Virtaco/ Carate/ Tufguard/ Curator/ IPM/ICM
	Rice bug	Diazinon/ Desis
	Case worm	Application of insecticides- Sopsin/ Mipsin/Aktara/IPM/ICM
	GLH	Application of insecticides- Carbofuran group /follow IPM/ICM
	SHGH	Application of insecticides- Carbofuran group /follow IPM/ICM
	BPH	Application of insecticides -Carbofuran group
	Leaf folder	Application of insecticides -Carbofuran group /Morter/ Sumithion
T.Aman	BPH	Application of insecticides- Emitachloropit/ Sopsin/ Mipsin/ Diazinon/ Carbofuran group/ Chloropyriphos group
	Stem borer	Application of insecticides –Granular/ Sumithion /Admire/ Carate/ follow IPM/ICM
	Leaf folder	Application of insecticides -Chloropyriphos group / Marshal/ Regent
Boro	Stem borer	Application of insecticides –Granular/ Carbofuran group /Spike/ Admire/ Karate/ Marshal/ follow IPM/ICM /Perching
	Leaf folder	Application of insecticides - Chloropyriphos group /Cartaf/ GranularEmitachloropit
	BPH	Application of insecticides- Emitachloropit/ Chloropyriphos group
	Rice bug	Application of insecticides- Sumithion/ Marshal/ Desis
<b>Hybrid</b>		
Aus	Stem borer	Application of insecticides -Carbofuran group
T. Aman	Stem borer	Application of insecticides- Carbofuran group
	Leaf folder	Application of insecticides- Carbofuran group
	BPH	Application of insecticides- Mipsin/ Sofsin/ Ektara/ Carbofuran group
Boro	Stem borer	Application of insecticides – Granular/ Carbofuran group /Karate/ Marshal/ follow IPM/ICM
	BPH	Application of insecticides- Emitachloropit/ Carbofuran group
	Leaf folder	Application of insecticides- Granular

Seven insect pests, namely stem borer, rice bug, case worm, green leaf hopper, short horded grass hopper, brown plant hopper and leaf folder were available in the Aus season and three insect pests viz, brown plant hopper, stem borer and leaf folder were found in the T.Aman

season and four insects like stem borer, brown plant hopper, rice bug and leaf folder were recorded in the Boro season.

In case of hybrid only stem borer was found in the Aus season while stem borer, leaf folder and BPH were found both in T. Aman and Boro seasons. A list of season wise insect pests of rice in Bogra district is given in Table-15.

**Table 16. Season wise insect pests of rice in Naogaon district**

Crop season	Insect pests	Control measures
<b>Inbred</b>		
Aus	SB, R LF, RB, ECC, RCW, BPH	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Agronomic management</li> <li>• Insecticides use</li> </ul>
T. Aman	SB, RLF, GLH, RGM, BPH, ECC	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Agronomic management</li> <li>• Insecticides use</li> </ul>
Boro	SB, GLH, WLH , GM, GH, RLF, WM, BPH, CW	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Agronomic management</li> <li>• Insecticides use</li> </ul>
<b>Hybrid</b>		
Aus	BPH, SB, RLF, RB	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Agronomic management</li> <li>• Insecticides use</li> </ul>
T.Aman	No crop	
Boro	SB, RLF, GLH, RB, RCW, ECC, BPH	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Insecticides use</li> </ul>

Six insect pests namely, rice stem borer, rice leaf folder, rice case worm, brown planthopper, ear-cutting caterpillar and rice bug were found in Aus season, six insect pests, rice stem borer, rice leaf folder, gall midge, brown planthopper, green leaf hopper and ear-cutting caterpillar were recorded in T.Aman season and nine insect pests, stem borer, green leaf hopper, white leaf hopper, gall midge, grass hopper, rice leaf folder, whorl maggot, brown planthopper, and case worm were observed in Boro season, Four insects namely stem borer, rice leaf folder, brown planthopper and rice bug were recorded on hybrid Aus rice. There is no practice of growing hybrid rice in T.Aman season. Seven insect pests namely, stem borer, rice bug, rice



leaf folder, green leaf hopper, brown planthopper, ear-cutting caterpillar and rice case worm were recorded in hybrid Boro season.

**Table 17. Season wise insect pests of rice in Rajshahi district**

<b>Crop season</b>	<b>Insect pests</b>	<b>Control measures</b>
<b>Inbred</b>		
Aus	SB, GH, GLH, RLF, CW, LHGH, PB, WLH, BPH, ECC, RB	<ul style="list-style-type: none"> <li>● Perching</li> <li>● Light trapping</li> <li>● IPM</li> <li>● Use of insecticides</li> <li>● Use of cultural method</li> </ul>
T. Aman	SB, RLF, GM, BPH, GLH, RCW, RB, RMB, WLH, PB, RFC, ECC	<ul style="list-style-type: none"> <li>● Perching</li> <li>● Light trapping</li> <li>● IPM</li> <li>● Use of insecticides</li> <li>● Use of cultural method</li> </ul>
Boro	SB, GM, GLH, WLH, YSB, PB, RCW, RB, GH, RLF, BPH, ECC	<ul style="list-style-type: none"> <li>● Perching</li> <li>● Light trapping</li> <li>● IPM</li> <li>● Use of insecticides</li> <li>● Use of cultural method</li> </ul>
<b>Hybrid</b>		
Aus	BPH, SB, RLF, RB, ECC	<ul style="list-style-type: none"> <li>● Perching</li> <li>● Light trapping</li> <li>● IPM</li> <li>● Use of insecticides</li> <li>● Use of cultural method</li> </ul>
T.Aman	CW, SB, RLF, GH, BPH, MB, RB, GM	<ul style="list-style-type: none"> <li>● Perching</li> <li>● Light trapping</li> <li>● IPM</li> <li>● Use of insecticides</li> <li>● Use of cultural method</li> </ul>
Boro	SB, RLF, GLH, RB, RCW, ECC, BPH, GH, GM, RT	<ul style="list-style-type: none"> <li>● Perching</li> <li>● Light trapping</li> <li>● IPM</li> <li>● Use of insecticides</li> <li>● Use of cultural method</li> </ul>

Eleven insect pests viz. Stem borer, grass hopper, green leaf hopper, rice leaf folder, case worm, long horned grass hopper, pink borer, white leaf hopper, brown plant hopper, ear-cutting caterpillar and rice bug have been recorded in Aus season, twelve, like SB, RLF, GM, BPH, GLH, RCW, RB, RMB, WLH, PB, RFC, ECC in the T.Aman season and twelve insect pests, viz. SB, GM, GLH, WLH, YSB, PB, RCW, RB, GH, RLF, BPH, ECC in the Boro season.

In case of hybrid rice, brown plant hopper, stem borer, rice leaf folder, rice bug and ear-cutting caterpillar were found in Aus season while case worm, stem borer, rice leaf folder, grasshopper, brown plant hopper, mealy bug, rice bug and gall midge in the T.Aman season and stem borer, rice leaf folder, green leaf hopper, rice bug, case worm, ear-cutting caterpillar, brown planthopper, grasshopper, gall midge, and rice thrips in the Boro season. A list of season wise insect pests of rice in Rajshahi district is presented in Table 17.

**Table 18. Season wise insect pests of rice in Pabna district**

Crop season	Insect pests	Control measures
<b>Inbred</b>		
Aus	SB, RLF, RB, GH, GLH, CW, PB, ECC, SHGH	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Burning of Tyre</li> <li>• Insecticides use</li> </ul>
T. Aman	GLH, SHGH, RLF, YSB, RB, BPH, GM, Thrips, CW	ICM method Same as above
Boro	GLH, WLH, YSB, PB, CW, RB, GM, ECC, SHGH	ICM method Same as above
<b>Hybrid</b>		
Aus	No crop	
T.Aman	No crop	
Boro	SB, RLF, RB, WBPH, SHGH, GLH, GH	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trapping</li> <li>• Burning of Tyre</li> <li>• Insecticides use</li> </ul>

In Aus season, nine insect pests viz. stem borer, rice leaf folder, rice bug, grass hopper, green leaf hopper, case worm, pink borer, ear-cutting caterpillar and short horned grasshopper were reported, nine insect pests like green leaf hopper, short horned grass hopper, rice leaf folder, yellow stem borer, rice bug, brown plant hopper, gall midge, thrips and case worm in the T.Aman season and green leaf hopper, white leaf hopper, yellow stem borer, pink borer, case worm, rice bug, gall midge, ear-cutting caterpillar, short horned grass hopper in the Boro season.

Hybrid rice is not grown in Aus and Aman season but it is grown in Boro season. Seven insect pests viz, stem borer, rice leaf folder, rice bug, white backed plant hopper, short horned grasshopper, green leaf hopper and grasshopper were found in Boro season. A list of season wise insect pests of rice and their control measures in Pabna district is given in Table 18.

**Table 19. Season wise insect pests of rice in Serajgonj district**

Crop season	Insect pests	Control measures
<b>Inbred</b>		
Aus	SB, R LF, RB, GH, GLH, CW	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trap</li> <li>• Insecticides use</li> </ul>
T. Aman	GLH, BPH, RLF, RGM, RB, RT, ECC, YSB, CW	<ul style="list-style-type: none"> <li>• IPM measures</li> <li>• Perching</li> <li>• Light trappi</li> <li>• Insecticides use</li> </ul>
Boro	GLH, WLH, YSB, PB, CW, RB, BPH, GM, WM, WBPH, SC	<ul style="list-style-type: none"> <li>• Perching</li> <li>• Light trapping</li> <li>• Use of cultural practices.</li> <li>• Use of insecticides</li> </ul>
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Hybrid Boro	SB, RLF, GM, RB, CW, ECC, BPH, SHGH, GH, MB, WBPH, SC, GLH	<ul style="list-style-type: none"> <li>• Sweeping</li> <li>• Light trapping</li> <li>• Perching</li> <li>• Use of insecticides</li> </ul>

Six insect pests, stem borer, rice leaf folder, rice bug, grass hopper, green leaf hopper and case worm were the dominant pests recorded in Aus season; and nine insect pests viz. green leaf hopper, brown planthopper, rice leaf folder, rice gall midge, rice bug, rice thrips, ear-cutting caterpillar, yellow stem borer and case worm occurred in the T.Aman season of Serajgonj district. Eleven insect pests were recorded to be dominant in Boro season. These were green leaf hopper, white leaf hopper, yellow stem borer, pink borer, case worm, rice bug, brown plant hopper, gall midge, whorl maggot, white backed planthopper and swarming caterpillar.

There is no practice of growing hybrid rice in Aus and T.Aman season. Thirteen insect pests like stem borer, rice leaf folder, gall midge, rice bug, case worm, ear-cutting caterpillar, brown planthopper, short horned grass hopper, grass hopper, mealy bug, white backed plant hopper, swarming caterpillar and green leaf hopper were dominant. List of insect pests in different season on HYVs and hybrids along with their control measures is shown in Table-19.

**Table 20. Season wise insect pests of rice in Jessore district**

Season	Insect pests	Control
Aus	Rice thrips	Chemical /Cultural management/ Mechanical control
	Brown plant hopper	Chemical /cultural /mechanical control
	Whorl maggot	Chemical /cultural /mechanical control
	Stem borer	Chemical /cultural /mechanical control
	Leaf folder	Chemical /cultural /mechanical control

	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf roller	Chemical /cultural /mechanical control
	BPH	Chemical /cultural /mechanical control
	Swarming caterpillar	Chemical /cultural /mechanical control
	SHGH	Chemical /cultural /mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /cultural /mechanical control
	Leaf folder	Chemical /cultural /mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Brown plant hopper	Chemical /cultural /mechanical control
	Stem borer	Chemical /cultural /mechanical control
	Rice thrips	Chemical /cultural /mechanical control
	Rice bug	Chemical /cultural /mechanical control
	Green leaf hopper	Chemical /cultural /mechanical control
	SHGH	Chemical /cultural /mechanical control
T. Aman	Stem borer	Chemical /cultural /mechanical control
	Swarming caterpillar	Chemical /cultural /mechanical control
	Mealy bug	Chemical /cultural /mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Mole cricket	Chemical /cultural /mechanical control
	LHGH	Chemical /cultural /mechanical control

Eight insect pests, namely, thrips, brown plant hopper, whorl maggot, stem borer, leaf folder, short horned grass hopper, rice bug, green leaf hopper were recorded in the Aus season, seven insect pests named stem borer, leaf roller, brown plant hopper, swarming caterpillar, short horned grass hopper, rice bug and green leaf hopper occurred in the T.Aman season and five insect pests viz stem borer, green leaf hopper, leaf folder, rice bug and short horned grass hopper were found in the Boro season.

In case of hybrid rice, brown plant hopper, stem borer, thrips, rice bug, green leaf hopper and short horned grass hopper were available in the Aus season and stem borer, swarming caterpillar and mealy bug were found in the T.Aman season and six insect pests viz, stem borer, leaf folder, short horned grass hopper, rice bug, mole cricket and long horned grass hopper occurred in the Boro season.

A list of season wise insect pests of rice in Jessore district is given in Table-20.

**Table 21. Season wise insect pests of rice in Khulna district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /cultural /mechanical control
	Case worm	Chemical /cultural /mechanical control
	SHGH	Chemical /cultural /mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /cultural /mechanical control
	Case worm	Chemical /cultural /mechanical control
	Leaf folder	Chemical /cultural /mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /cultural /mechanical control
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control

Stem borer, leaf folder, short horned grass hopper, rice bug and green leaf hopper were found in the Aus season and six insect pests viz. stem borer, leaf folder, case worm, short horned grass hopper, rice bug and green leaf hopper were available in the T.Aman season and seven insect pests named stem borer, green leaf hopper, case worm, leaf folder, rice bug, short horned grass hopper and green leaf hopper occurred in the Boro season.

There was no practice of growing hybrid rice in Aus and T.Aman season in the Khulna district. Six insect pests viz, stem borer, leaf folder, short horned grass hopper, rice bug, green leaf hopper and brown plant hopper were recorded in the Boro season. A list of season wise insect pests of rice in Khulna district is shown in Table-.21.

**Table 22. Season wise insect pests of rice in Jhenaidah district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	MB	Chemical /cultural /mechanical control

	Leaf roller	Chemical /cultural /mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	MB	Chemical /cultural /mechanical control
	Leaf folder	Chemical /cultural /mechanical control
	Case worm	Chemical /cultural /mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control

Six insect pests viz, stem borer, short honed grass hopper, rice bug, mealy bug, leaf folder and green leaf hopper occurred in the Aus season, seven insect pests named stem borer mealy bug, leaf folder, case worm, ear-cutting caterpillar, rice bug and green leaf hopper were found in the T.Aman season and four insects viz, stem borer, leaf folder, rice bug and short horned grasshopper were available in the Boro season.

In case of hybrid rice, stem borer was the only pest found in the Aus season. Hybrid rice was not grown in the T.Aman season. In the Boro season, five insect pests viz, stem borer, leaf folder, short horned grass hopper, rice bug and green leaf hopper were recorded.

A list of season wise insect pests of rice in Jhenaidah district is present in Table-22.

**Table 23. Season wise insect pests of rice in Barisal district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
	Whorl maggot	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	LHC	Chemical /Cultural management/ Mechanical control
	Whorl maggot	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control

Season	Insect pests	Control
	Rice bug	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	LHC	Chemical /Cultural management/ Mechanical control
	Whorl maggot	Chemical /Cultural management/ Mechanical control
	Case worm	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	LHC	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	LHC	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control

Stem borer, leaf folder, rice bug, green leaf hopper, and whorl maggot were the insect pests recorded in the Aus season, five insect pests, namely, stem borer, leaf folder, short horned grass hopper, long horned cricket and whorl maggot were found in the T.Aman season and eight insect pests viz, stem borer, rice bug, short horned grass hopper, long horned cricket, whorl maggot, case worm, leaf folder and green leaf hopper were available in the Boro season.

In case of hybrid rice, five insect pests in the Aus, two in the T.Aman and five in the Boro season were recorded. These were, stem borer, rice bug, leaf folder, short horned grass hopper and long horned cricket in the Aus season, stem borer and leaf folder in the T.Aman season and stem borer, leaf folder, short horned grass hopper, long horned cricket and rice bug in the Boro season.

A list of season wise insect pests of rice in Barisal district is furnished in Table-23.

**Table 24. Season wise insect pests of rice in Faridpur district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	LHC	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control



	RB	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control

Five insect pests namely, stem borer, short horned grass hopper, rice bug, long horned cricket and green leaf hopper were found in the Aus season, seven insect pests viz, stem borer, leaf folder, short horned grass hopper, ear-cutting caterpillar, rice bug, green leaf hopper and brown plant hopper occurred in the T.Aman season and six insect pests named stem borer, leaf folder, brown plant hopper, rice bug, short horned grass hopper, and green leaf hopper were recorded in the Boro season.

No hybrid rice was grown in the Aus and T.Aman season in Faridpur district. In the Boro season six insect pests viz, stem borer, leaf folder, short horned grass hopper, brown plant hopper, rice bug and green leaf hopper were recorded.

A list of season wise insect pests of rice in Faridpur district has been presented in Table-24

**Table 25. Season wise insect pests of rice in Tangail district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	LHGH	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Gall midge	Chemical /Cultural management/ Mechanical control
	WBPH	Chemical /Cultural management/ Mechanical control
	Case worm	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Hairy caterpillar	Chemical /Cultural management/ Mechanical control
	Green leaf hopper	Chemical /Cultural management/ Mechanical control
	WBPH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control



	Leaf folder	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	WBPH	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	No crop	
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Hairy caterpillar	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	WBPH	Chemical /Cultural management/ Mechanical control

Nine insect pests, namely, rice stem borer, long horned grass hopper, short horned grass hopper, rice leaf folder, rice bug, gall midge, white backed plant hopper, case worm and green leaf hopper were found in Aus season, five insect, viz stem borer, rice bug, hairy caterpillar, green leaf hopper and white backed plant hopper were recorded in T.Aman season and seven insect pests viz, rice stem borer, rice leaf roller, brown plant hopper, case worm, green leaf hopper, rice bug, white backed plant hopper were observed in Boro season.

There is no practice of growing hybrid rice in Aus season in the surveyed upazilas. Three insect pests namely, stem borer, rice bug and hairy caterpillar were available in T. Aman season and seven insect pests viz, stem borer, leaf folder, BPH, case worm, green leaf hopper, rice bug and white backed plant hopper were recorded in Boro season.

Season wise insect pests of rice in Tangail district are shown in Table- 25.

**Table 26. Season wise insect pests of rice in Sherpur district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Case worm	Chemical /Cultural management/ Mechanical control
	Swarming caterpillar	Chemical /Cultural management/ Mechanical control
	Ear-cutting caterpillar	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	Case worm	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Ear-cutting caterpillar	Chemical /Cultural management/ Mechanical control
	Brown plant hopper	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control

	BPH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control

Six insects, namely, stem borer, rice bug, leaf folder, case worm, swarming caterpillar and ear-cutting caterpillar occurred in Aus season, five insect pests like stem borer, case worm, leaf folder, ear-cutting caterpillar and BPH were found in T. Aman season and stem borer, leaf folder, case worm, BPH and green leaf hopper were in the Boro season. Hybrid rice was not grown in Aus and T. Aman season and in Boro season stem borer, case worm, BPH and leaf folder appeared as the main pests. Season wise insect pests of rice in Sherpur district is presented in Table 26.

**Table 27. Season wise insect pests of rice in Mymensingh district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	RSC	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	GM	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	SHGH	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	RH	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
T. Aman	CW	Chemical /Cultural management/ Mechanical control
	SB	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control

Season	Insect pests	Control
	BPH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control

Seven insect pests, stem borer, leaf folder, rice bug, brown plant hopper, rice swarming caterpillar, short horned grass hopper and gall midge were the dominant pests recorded in Aus season; stem borer, leaf folder, rice bug, short horned grass hopper, brown plant hopper, rice ear-cutting caterpillar and case worm were found in T. Aman season and stem borer, leaf folder, BPH and rice bug were observed in the Boro season.

Hybrid varieties were grown in all the seasons in Mymensingh district. Stem borer, leaf folder, and rice bug appeared in Aus season while case worm, stem borer, leaf folder, rice bug and BPH were available in the T.Aman season and stem borer, rice bug, BPH and leaf folder were observed in the Boro season. Season wise list of insect pests of rice in Mymensingh district is shown in Table 27.

**Table 28. Season wise insect pests of rice in Kishoregonj district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	Rice hispa	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	WM	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	Rice bug	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	WM	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	GM	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control

Season	Insect pests	Control
	CW	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
T. Aman	SB	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control

Eight insect pests named stem borer, leaf folder, case worm, rice bug, ear-cutting caterpillar, rice hispa, green leaf hopper and thrips were observed in the Aus season and seven insect pests viz, stem borer, leaf folder, case worm, rice bug, ear-cutting caterpillar, green leaf hopper and whorl maggot were found in the T.Aman season and eight named stem borer, leaf folder, rice bug, case worm, whorl maggot, thrips, green leaf hopper and gall midge occurred in the Boro season.

Hybrid rice was grown in all the three seasons. Stem borer, leaf folder, case worm and rice bug were found in the Aus season and stem borer and rice bug were available in the T.Aman season and five insect pests named stem borer, case worm, leaf folder, rice bug, and thrips were recorded in the Boro season. A list of season wise insect pests of rice in Kishoregonj district is presented in Table 28.

**Table 29. Season wise insect pests of rice in Netrokona district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	GM	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control

Season	Insect pests	Control
	Rice hispa	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control

Three insect pests like stem borer, leaf folder and BPH were found in Aus season, insect pests namely, stem borer, leaf folder, rice bug, gall midge, BPH, rice ear-cutting caterpillar and case worm were recorded in the T.Aman season and five insect pests viz, stem borer, green leaf hopper, case worm, leaf folder and BPH occurred in the Boro season in Netrokona district. Hybrid rice was grown only in Boro season where six insect pests viz, stem borer, green leaf hopper, case worm, rice hispa, BPH and leaf folder were recorded. Season wise insect pests of rice in Netrokona district are presented in Table- 29.

**Table 30. Season wise insect pests of rice in Hobigonj district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	RH	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control

Six insect pests viz., Stem borer, leaf folder, thrips, case worm, rice bug, and rice hispa occurred in the Aus season and eight insect pests named stem borer, leaf folder, thrips, case worm, rice bug, brown plant hopper, green leaf hopper and ear-cutting caterpillar were found in the T. Aman season and five insect pests viz., stem borer, leaf folder, green leaf hopper, rice bug and brown plant hopper were recorded in the Boro season.

Hybrid rice was not grown in T. Aman season. Stem borer was the only insect available in the Aus season and in Boro season stem borer and leaf folder were recorded. A list of season wise insect pests of rice in Hobigonj district is given in Table-30

**Table 31. Season wise insect pests of rice in Comilla district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RH	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	GM	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	RH	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	Leaf folder	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
T. Aman	No crop	
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	GLH	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control

Six insect pests viz. stem borer, leaf folder, thrips, rice bug, case worm and brown plant hopper were recorded in the Aus crop and nine insect pests named stem borer, leaf folder, rice hispa, rice bug, gall midge, brown plant hopper, ear-cutting caterpillar, case worm and green leaf hopper were found in T.Aman season and eight insect pests named stem borer, rice hispa, rice bug, ear-cutting caterpillar, case worm, leaf folder, green leaf hopper and brown plant hopper occurred in the Boro season.

In case of hybrid rice, stem borer, leaf folder, green leaf hopper, rice bug and brown plant hopper were recorded in Aus season. No hybrid rice was grown in T. Aman season. In Boro seasons the insect pests recorded were stem borer, leaf folder, green leaf hopper, rice bug, case

worm and brown plant hopper. A list of season wise insect pests of rice in Comilla district is shown in Table- 31.

**Table 32. Season wise insect pests of rice in Chittagong district**

Season	Insect pests	Control
<b>Inbred</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	GM	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	RH	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	GM	Chemical /Cultural management/ Mechanical control
	GH	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	ECC	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control
	GH	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	BPH	Chemical /Cultural management/ Mechanical control
	RT	Chemical /Cultural management/ Mechanical control
<b>Hybrid</b>		
Aus	Stem borer	Chemical /Cultural management/ Mechanical control
T. Aman	Stem borer	Chemical /Cultural management/ Mechanical control
Boro	Stem borer	Chemical /Cultural management/ Mechanical control
	RB	Chemical /Cultural management/ Mechanical control
	CW	Chemical /Cultural management/ Mechanical control
	Thrips	Chemical /Cultural management/ Mechanical control
	LF	Chemical /Cultural management/ Mechanical control

Six insect pests namely, stem borer, rice bug, leaf folder, brown plant hopper, case worm and gall midge were found in the Aus season and ten insect pests named stem borer, leaf folder, rice hispa, rice bug, gall midge, grass hopper, thrips, brown plant hopper, ear-cutting caterpillar and case worm occurred in the T.Aman season and seven insect pests viz. stem borer, leaf folder, grass hopper, case worm, rice bug, brown plant hopper and thrips were recorded in the Boro season.

Stem borer was the only insect pest available in the hybrid rice in Aus and T.Aman season and five insect pests viz. stem borer, rice bug, case worm, thrips and leaf folder were recorded in the Boro season. A list of season wise occurrence of insect pests is presented in Table 32.



### 3.7.7 DAE/BRRI officials' information on diseases

Information collected from DAE/BRRI personal on diseases of rice from different districts were collected and district wise information is given below:

DAE/BRRI officials have reported a total of five major diseases of rice from Rangpur districts. These include Sheath blight (ShB), Blast (Bl), Brown spot (BS), Bacterial leaf blight (BLB), Stem rot (SR) and one minor disease, Bacterial leaf streak (BLS). On inbred varieties BLB and ShB were reported to occur in all the three seasons i.e. Aus, T. Aman and Boro; Bl disease occurred in Aus and Boro seasons and BS in Aus and T. Aman seasons, respectively. In hybrid rice varieties BLS was reported to occur in T. Aman and Boro seasons, and Bl and ShB in all the three seasons. In this district BLS was not reported on inbred varieties.

For controlling the diseases farmers mainly depend on chemicals. In some cases cultural practices like water management and use of balanced fertilizer is also practiced (Table 33).

**Table 33. Season wise diseases of rice in Rangpur district**

Season	Diseases	Control Measures
Aus	Sheath blight	Application of fungicide – Carbendazim group/ Virtoco/ Proud/ Tilt/ Potash spray
	Brown spot	Balanced fertilizer use
	Blast	Application of fungicide- Trooper/ Nativo/ Proud/ Tilt
	Bacterial leaf blight	Application of fungicide- Potash spray
T. Aman	Bacterial leaf blight	Application of fungicide- Tilt/ Sulpher; Potash spray/ Balanced fertilizer use/ water management
	Sheath blight	Application of fungicide- Folicur/ Score/ Tilt/ Proud; Hexaconazole/ Tebuconazole/ Propiconazol/ Carbendazim group; Potash spray
	Brown spot	Balanced fertilizer use/ Water management
	Stem rot	Application of fungicide- Tilt/;
Boro	Bacterial leaf blight	Application of fungicide- Tilt/ Proud/; Potash spray
	Blast	Application of fungicide- Trooper/ Nativo/ Proud.
	Sheath blight	Application of fungicides- Folicur/ Tilt/ Score/ Proud/; Carbendazim group
<b>Hybrid</b>		
Aus	Bacterial leaf blight	Application of fungicide- Potash spray
	Blast	Application of fungicides- Trooper/ Nativo/
	Sheath blight	Application of fungicide- Tilt/ Proud/ ;
T. Aman	Sheath blight	Application of fungicide- Folicur/ Tilt/ Score/ Proud/; Potash spray
	Brown spot	Balanced fertilizer use/ Water management
	Bacterial leaf streak	Application of fungicide- Folicur/; Potash spray/ Balanced fertilizer application
	Blast	Application of fungicides- Trooper/
Boro	Bacterial leaf streak	Application of fungicide- Folicur/ Tilt/ Cupravit/; Potash spray/ Balanced fertilizer application



Season	Diseases	Control Measures
	Sheath blight	Application of fungicide- Folicur/ Contaf/ Tilt/ Carbendazim group
	Blast	Application of fungicides- Trooper/ Nativo/

### Season wise occurrence of diseases in Dinajpur district

DAE/BRI official has reported a total of five major diseases of rice from Dinajpur districts. These include Sheath blight (ShB), Blast (Bl), Brown spot (BS), sheath rot (ShR) and Bacterial leaf blight (BLB). The only minor disease reported was False smut (Fsmt) in T. Aman season on inbred varieties. On inbred varieties Bl and ShB were reported to occur in all the three seasons i.e. Aus, T. Aman and Boro; BLB occurred in T. Aman and Boro seasons and BS in Boro seasons and ShR in T. Aman season only.

On hybrid varieties Bl was reported to occur in Aus and Boro seasons, ShB in T. Aman and Boro, Sheath rot in T. Aman and BLB and BS in Boro season, respectively.

For controlling the diseases farmers mainly depend on chemicals. In some cases cultural practices like water management and use of balanced fertilizer is also practiced (Table 34).

**Table 34. Season wise diseases of rice in Dinajpur district**

Season	Diseases	Control measures
Aus	Blast	Application of fungicide- Nativa/ Trooper/ Combi-2/ Tilt/ Folicur/ Hexaconazole group/ Combi-2
	Sheath blight	Application of fungicide- Score/ Tilt/ Folicur/ Ediphen
T. Aman	Sheath blight	Application of fungicide-Score/ Tilt/ Carbendazim group/ Folicur/ Score/ Bavistin/ Irrigation/ Potash fertilizer application
	False smut	Application of fungicide- Bavistin/ Tilt
	Sheath rot	Application of fungicide- Folicur/ Carbendazim group/ Trooper/ Kasumin; Remove water/ Roguing/
	Bacterial leaf blight	Application of fungicide-Copper compound (Champion/ Cupravit); Water management (Drying the field)
	Blast	Application of fungicide- Proud/ Cupravit
Boro	Blast	Application of fungicide- Nativo/ Tilt/ Folicur/ Trooper/ Kasumin/ Proud/ Cupravit; Potash spray/
	Sheath blight	Application of fungicide- Score/ Tilt/ Folicur/ Proud/ Cupravit
	Bacterial leaf blight	Application of fungicide- Champion
	Brown spot	Application of fungicide- Water management/
		Application of fungicide
<b>Hybrid</b>		
Aus	Blast	Application of fungicide- Tilt/
T. Aman	Sheath blight	Application of fungicide- Folicur/ Carbendazim group/ Score/ Tilt/ Bavistin/
	Sheath rot	Application of fungicide- Folicur/ Carbendazim group/

Season	Diseases	Control measures
Boro	Blast	Application of fungicide- Nativo/ Tilt/ Trooper/ Proud/ Cupravit
	Sheath blight	Application of fungicide- Score/ Folicur/ Proud/ Cupravit
	Bacterial leaf blight	Application of fungicide- Cupravit/
	Brown spot	Urea application

### Season wise occurrence of diseases in Bogra district

On inbred rice varieties during Aus season six diseases namely, Blast (Bl), Sheath blight (ShB), Sheath rot (ShR), Bacterial leaf blight (BLB), Brown spot (BS) and Stem rot (SR) were reported to occur in Bogra district and diseases in T. Aman season were Bl, BLB, ShB and (Fsmt) and those in Boro season were Bl, BS, ShB, ShR and BLB. On hybrid rice varieties diseases reported in Aus and T. Aman was only Bl but in Boro season occurrence of Bl, BLB, ShR and ShB was reported.

Control measures are similar in both hybrid and inbreds, which include application of fungicides only (Table 35).

**Table 35. Season wise diseases of rice in Bogra district**

Crop season	Diseases	Control measures
Aus	Blast	Application of Ridomil MZ/ Dithane M-45/ Propiconazol group/ Nativo
	Sheath blight	Application of Combi-2, 30/ Hinosan/ Score/ Tilt/ Contaf/ Folicur/
	Sheath rot	Application of Propiconazol group/ Hinosan/ Score/ Tilt/ Contaf/ Folicur
	Bacterial leaf blight	Application of Carbendazim group/ Trooper
	Brown spot	Application of Carbendazim group/
	Stem rot	Application of Hinosan/ Score/ Tilt
T.Aman	Blast	Application of Tropper/ Score/ Tilt/ Ridomil MZ/ Dithane M-45
	False smut	Application of fungicide- Carbendazim group/
	BLB	Application of fungicide- Trooper/ Tilt/ Score
	Sheath blight	Application of fungicide- Tropper/ Score/ Tilt
Boro	Blast	Application of fungicide- Trooper/ Ridomil MZ/ Dithane M-45/ Combi-2, 30/ Tilt/ Score
	Brown spot	Application of fungicide- Tilt 250 EC/
	Sheath blight	Application of fungicide- Combi-2, 30/ Tropper/ Score/ Tilt/ Contaf/ Folicur
	Sheath rot	Application of fungicide- Combi-2, 30/ Contaf/ Folicur/ Tilt
	Bacterial leaf blight	Application of fungicide- Tropper/ Score/ Tilt/ Nativo/ Cupravit/
<b>Hybrid</b>		
Aus	Blast	Application of fungicide- Hinosan/ Score/ Ridomil MZ/ Dithane M-45
T. Aman	Blast	Application of fungicide- Hinosan/ Score/ Bavistin

Crop season	Diseases	Control measures
Boro	Blast	Application of fungicide- Hinosan/
	Bacterial leaf blight	Application of fungicides- Cupravit
	Sheath rot	Application of fungicide- Contaf/ Folicur/ Tilt
	Sheath blight	Application of fungicide- Contaf/ Folicur/ Tilt

### Season wise occurrence of diseases in Naogaon district

On inbred rice varieties during Aus season five major diseases namely, Bl, ShB, Bakanae (Bk), BLB, BS and BLS a minor disease were reported to occur in this district. Kresek phase of bacterial blight also reported from this district. Seven diseases reported to occur in T. Aman season were Bl, BLB, ShB, ShR, BS, BLS and Root rot (RR). Diseases in Boro season were Bl, BS, ShB, ShR, BLB, BLS and Foot rot (FR). No hybrid was grown in the selected Upazilas of this district during T. Aman. In Aus season Bl and BLB was reported to occur on hybrid varieties and in Boro season the diseases were Bl, BLB, BS, BLS, RR and ShB. Control measures were similar in both types of varieties, which include chemical and cultural management (Table 36).

**Table 36. Season wise diseases of rice in Naogaon district**

Crop season	Diseases	Control measures
Aus	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Bakanae	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Kresek	Chemical and cultural management
	Brown spot	Chemical and cultural management
T.Aman	Blast	Chemical and cultural management
	BLB	Chemical and cultural management
	BLS	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Root rot	Chemical and cultural management
Boro	Blast	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Foot rot	Chemical and cultural management
<b>Hybrid</b>		
Aus	Blast	Chemical and cultural management
	BLB	Chemical and cultural management
T. Aman	No crop	
Boro	Blast	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management

Crop season	Diseases	Control measures
	Root rot	Chemical and cultural management
	Sheath blight	Chemical and cultural management

### Season wise occurrence of diseases in Rajshahi district

On inbred rice varieties during Aus season seven diseases namely, Bl, BLB, ShB, ShR, BS, BLS and Tungro (Tg) were reported to occur in this district. Eight diseases occurred in T. Aman season were Bl, ShB, BLB, BS, SR, BLS, ShR, and Tg. these diseases five were fungal, two bacterial and one virus disease. Diseases in Boro season were Bl, BS, ShB, SR, BLB and BLS. Diseases on hybrid varieties in Aus season were Bl, ShB, SR, BLS, BS, Tg and BLB. In T. Aman season BS, SR, ShB, BLS, BLB, ShR and Bl and in Boro season the diseases were Bl, BS, BLB, ShB, SR and BLS. Control measures were similar in both types of varieties, which include chemical and cultural management (Table 37).

**Table 37. Season wise diseases of rice in Rajshahi district**

Crop season	Diseases	Control measures
Aus	Blast	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Tungro	Chemical and cultural management
T.Aman	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	BLB	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Stem rot	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Tungro	Chemical and cultural management
Boro	Blast	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Stem rot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
<b>Hybrid</b>		
Aus	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Stem rot	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Tungro	Chemical and cultural management
	BLB	Chemical and cultural management
T. Aman	Brown spot	Chemical and cultural management
	Stem rot	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management

Crop season	Diseases	Control measures
	Bacterial leaf blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Blast	Chemical and cultural management
Boro	Blast	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Stem rot	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management

### Season wise occurrence of diseases in Pabna district

Five major diseases namely, Bl, BLB, ShB, ShR and BS were reported to occur in this district during Aus season on inbred rice varieties. In T. Aman season reported diseases were Bl, ShB, BLB, BLS and ShR. These disease three were fungal and two bacterial diseases. Diseases in Boro season were Bl, BS, ShB and BLB.

During Aus and T. Aman seasons no hybrid variety was grown in this district. Diseases in Boro season were BS, BLB, ShB and BLS. Control measures were similar in both types of varieties, which include chemical and cultural management (Table 38).

**Table 38. Season wise diseases of rice in Pabna district**

Crop season	Diseases	Control measures
<b>Inbred</b>		
Aus	Blast	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Brown spot	Chemical and cultural management
T.Aman	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Sheath rot	Chemical and cultural management
Boro	Blast	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Brown spot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Sheath blight	
	Bacterial leaf streak	Chemical and cultural management

### Season wise occurrence of diseases in Serajgonj district

Five diseases namely, Bl, ShB, BS, BLB and BLS were reported to occur in this district during Aus season on inbred rice varieties. In T. Aman season six reported diseases were Bl, ShB, BLB, Uf, BLS and ShR. Diseases in Boro season were Bl, ShB, ShR, BLB and BLS.

No hybrid variety was grown in this district during Aus and T. Aman seasons. Diseases in Boro season were Bl, ShB, ShR, BLB, BLS, FR and LSc. Control measures were similar in both types of varieties which include chemical and cultural management (Table 39).

**Table 39. Season wise diseases of rice in Serajgonj district**

Crop season	Diseases	Control measures
Aus	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Brown spot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
T.Aman	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Ufra	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Sheath rot	Chemical and cultural management
Boro	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Blast	Chemical and cultural management
	Sheath blight	Chemical and cultural management
	Sheath rot	Chemical and cultural management
	Bacterial leaf blight	Chemical and cultural management
	Bacterial leaf streak	Chemical and cultural management
	Foot rot	Chemical and cultural management
	Leaf scald	Chemical and cultural management

### Season wise occurrence of diseases in Jessore district

On inbred rice varieties six diseases namely, Bl, ShB, ShR, BLB, Tg and BS were reported to occur in this district during Aus season. In T. Aman season six reported diseases were Bl, BLB, ShB, ShR and BS. Diseases in Boro season were Bl, BS, ShB and BLB. Common diseases over seasons were Bl, ShB, BS and BLB.

Diseases of hybrid rice during Aus season were BS, ShB and BLB, in T.Aman season Bl, BLB, ShB, ShR and in Boro were Bl, BLB, ShR, ShB, BLS and BS, respectively (Table 40).

Control measures include chemical and cultural methods (Table 40).

**Table 40. Season wise diseases of rice in Jessore district**

Crop season	Diseases	Control measures
Aus	Blast	Balanced fertilizer use/ Application of fungicide- Nativo
	Sheath blight	Balanced fertilizer use Application of fungicide- Contaf/ Folicur
	Sheath rot	Application of fungicide- Contaf
	Bacterial leaf blight	Balanced fertilizer use /Application of MoP
	Tungro	Malathion
	Brown spot	Use fungicide- Mancozeb /Balanced fertilizer
T.Aman	Blast	Balanced fertilizer use /Application of fungicide-
	BLB	Balanced fertilizer use /Application of fungicide- / MoP
	Sheath blight	Balanced fertilizer use /Application of fungicide- / Dithane M-45/ Contaf/ Hexaconazole
	Sheath rot	Application of fungicide
	Brown spot	Application of fungicide
Boro	Blast	Application of fungicide- Trooper/ Tilt/ Score
	Brown spot	Application of fungicide- Carbendazim
	Sheath blight	Balanced fertilizer use /Application of fungicide- /Dithane M-45
	Bacterial leaf blight	Balanced fertilizer use /Application of MoP
<b>Hybrid</b>		
Aus	Brown spot	Application of fungicide /Balanced fertilizer
	Sheath blight	Application of fungicide /Balanced fertilizer
	Bacterial leaf blight	MoP
T. Aman	Blast	Balanced fertilizer use /Application of fungicide- Dithane M-45,
	Bacterial leaf blight	Balanced fertilizer use
	Sheath blight	Balanced fertilizer use / Dithane M-45/ Hexaconazole
	Sheath rot	Application of fungicide /Balanced fertilizer
Boro	Blast	Application of fungicide-
	Bacterial leaf blight	Cupravit/ MoP
	Sheath rot	Application of fungicide- Contaf/ Folicur/ Tilt
	Sheath blight	Application of fungicide- Contaf/ Folicur/ Tilt
	Bacterial leaf streak	MoP
	Borwn spot	Carbendazim

**Season wise occurrence of diseases in Khulna district**

During Aus season, only two diseases namely, Bl and BS were reported to occur in this district on inbred rice varieties. In T. Aman season five reported diseases were Bl, BLB, ShB, ShR and BS. Diseases in Boro season were Bl, BS, Uf, BLB and BLS. Common diseases over seasons were Bl and BS.

In this district hybrid varieties are grown only in Boro season and reported diseases were Bl, BLB, Uf, LSc, BLS and BS (Table 41).

Control measures include applicatioin of different chemicals and cultural measures (Table 41).



**Table 41. Season wise diseases of rice in Khulna district**

Crop season	Diseases	Control measures
Aus	Blast	Balanced fertilizer use/ Application of fungicide- /Knowin /Score
	Brown spot	Application of fungicide- /Balanced fertilizer
T.Aman	Blast	Balanced fertilizer use /Application of fungicide- Score/ Tilt/ Bavistin /Knowin /Score
	BLB	Balanced fertilizer use / Cultural management
	Sheath blight	Balanced fertilizer use /Application of fungicide- Score/ Tilt / Bavistin/ /water management / Indofil /Amcozim
	Sheath rot	/ Score/ Tilt / Bavistin / Indofil /Amcozim
	Brown spot	Balanced fertilizer use
Boro	Blast	Application of fungicide- Tilt/ Knowin /Score
	Brown spot	Application of fungicide- Balanced fertilizer
	Ufra	Furadon/ Curetor/ granular insecticide
	Bacterial leaf blight	Balanced fertilizer use /Application of fungicide- Cupravit/ Thiovit /water management
	Bacterial leaf streak	/water management
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	
Boro	Blast	Application of fungicide- Knowin /Score /Tilt /Folicur
	Bacterial leaf blight	Application of fungicide- Knowin /Score /MoP /water management / Cupravit /Kasumin
	Ufra	Application of nematicide
	Leaf scald	Application of fungicide /Cultural management-
	Bacterial leaf streak	MoP / Cultural management
	Borwn spot	Carbendazim /water management / Cupravit /Kasumin

**Season wise occurrence of diseases in Jhenaidah district**

During Aus season, five diseases namely, Bl, BLB, BLS, SR and BS were reported to occur in this district on inbred rice varieties. In T. Aman season five reported diseases were Bl, BLB, ShB and SR. Diseases in Boro season were Bl, ShB, SR and BLB. Common diseases over seasons were Bl, BLB and SR.

In this district hybrid varieties are grown in Aus and Boro season and the reported diseases in Aus season were BLB, BLS and BS and in Boro season Bl, BLB, SR and BLS (Table 42).

Control measures include applicatioin of different chemicals and cultural measures (Table 42).



**Table 42. Season wise diseases of rice in Jhenaidah district**

Crop season	Diseases	Control measures
Aus	Blast	Balanced fertilizer / Application of fungicide-
	Bacterial leaf blight	Balanced fertilizer / Application of fungicide-
	Bacterial leaf streak	Application of fungicide /Cultural management
	Stem rot	Application of fungicide /Cultural management
	Brown spot	Application of fungicide- /Cultural management
T.Aman	Blast	Balanced fertilizer /Application of fungicide
	Bacterial leaf blight	Balanced fertilizer use / Cultural management
	Sheath blight	Balanced fertilizer/fungicide / Cultural
	Stem rot	Application of fungicide- /Cultural management
Boro	Blast	Application of fungicide- Tilt/ Knowin /Score
	Sheath blight	Application of fungicide- /Cultural management
	Stem rot	Application of fungicide- /Cultural management
	Bacterial leaf blight	Balanced fertilizer use /Cultural management
<b>Hybrid</b>		
Aus	Bacterial leaf blight	Application of fungicide- /Cultural management
	Bacterial leaf streak	Application of fungicide- /Cultural management
	Brown spot	Application of fungicide- /Cultural management
T. Aman	No crop	
Boro	Blast	Application of Knowin /Score /Tilt /Folicur
	Bacterial leaf blight	Application of fungicide- /Cultural management
	Stem rot	Application of fungicide- /Cultural management
	Bacterial leaf streak	MoP / Cultural management

**Season wise occurrence of diseases in Barisal district**

During Aus season, six diseases namely, Bl, BS, ShB, BLB, BLS and SR were reported to occur in this district on inbred rice varieties. In T. Aman season eight diseases reported to occur were Bl, BLB, Uf, ShB, ShR, Fsm, Tg and BLS. Diseases in Boro season were Bl, BS, Uf, SR, BLB, ShB and Tg. Common diseases over seasons were Bl, BLB and ShB.

In this district hybrid varieties are grown in Aus and Boro season and the reported diseases in Aus season were BLB, BLS, BS and ShB and in Boro season Bl, BLB, Uf, ShB, BLS and Tg (Table 43).

Control measures include application of different chemicals and cultural measures (Table 43).

**Table 43. Season wise diseases of rice in Barisal district**

Crop season	Diseases	Control measures
Aus	Blast	Balanced fertilizer use/ Application of fungicide-
	Brown spot	Application of fungicide- /Balanced fertilizer
	Sheath blight	Application of fungicide- Tilt
	Bacterial leaf blight	
	Bacterial leaf streak	
	Stem rot	Application of fungicide- Tilt
T.Aman	Blast	Balanced fertilizer use /Application of fungicide-

Crop season	Diseases	Control measures
	Bacterial leaf blight	Balanced fertilizer / Cultural /Cupravit
	Ufra	Malathion /Furadon
	Sheath blight	Application of fungicide/ cultural management
	Sheath rot	Application of fungicide-
	False smut	Application of fungicide- Folicur
	Tungro	Application of insecticide
	Bacterial leaf streak	Balanced fertilizer use /Cupravit
Boro	Blast	Application of fungicide / cultural mgt.
	Brown spot	Application of fungicide- Balanced fertilizer
	Ufra	Furadon/ Curetor/ granular insecticide
	Stem rot	Application of fungicide-
	Bacterial leaf blight	Balanced fertilizer use /Application of fungicide- Tilt/ /Hinosan /water management
	Sheath blight	Application of fungicide-
	Tungro	Application of insecticide
Hybrid		
Aus	Bacterial leaf blight	Application of fungicide- Tilt/ /Hinosan
	Bacterial leaf streak	Application of fungicide- Tilt/ /Hinosan
	Brown spot	Application of fungicide-
	Sheath blight	Application of fungicide-
T. Aman	No crop	
Boro	Blast	Application of fungicide- Score /Tilt /Nativo
	Bacterial leaf blight	Application of fungicide- Tilt/ /Hinosan
	Ufra	Application of nematicide
	Sheath blight	Application of fungicide /Cultural management-
	Bacterial leaf streak	MoP / Cultural management
	Tungro	Application of pesticide

### Season wise occurrence of diseases in Faridpur district

During Aus season, five diseases namely, BLB, Tg, Uf, BS and ShB were reported to occur in this district on inbred rice varieties. In T. Aman season five diseases reported to occur were BS, BLB, ShB, Uf and Bl. Diseases in Boro season were Bl, ShB, BS, BLB and BLS. Common diseases over seasons were BLB, ShB and BS.

In this district hybrid varieties are grown in Aus and T.Aman season and the reported diseases in both the seasons were BS and ShB (Table 44).

Control measures include application of different chemicals and cultural measures (Table 44).

**Table 44. Season wise diseases of rice in Faridpur district**

Crop season	Diseases	Control measures
Aus	Bacterial leaf blight	Application of Cupravit /Agrovit
	Tungro	Application of insecticide /Malathion
	Ufra	Application of pesticides /Cultural management
	Brown spot	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
T.Aman	Brown spot	Balanced fertilizer /fungicide- Score/ Tilt
	Bacterial leaf blight	Balanced fertilizer use / Cultural management

Crop season	Diseases	Control measures
	Sheath blight	Balanced fertilizer/fungicide / Cultural
	Ufra	Application of Carbofuran
	Blast	Application of fungicide- Tilt /Folicur
Boro	Blast	Application of fungicide- Tilt/ Knowin /Score
	Sheath blight	Application of fungicide- /Cultural management
	Brown spot	Balanced fertilizer use /Application of fungicide / Cultural management
	Bacterial leaf streak	Application of fungicide- /Cultural management
	Bacterial leaf blight	Balanced fertilizer use /Cultural management
<b>Hybrid</b>		
Aus	Brown spot	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
T. Aman	Brown spot	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
Boro	No crop	

### Season wise occurrence of diseases in Tangail district

During Aus season, seven diseases namely, BLB, BLS, Bl, BS, ShR, LSc and ShB were reported to occur in this district on inbred rice varieties. In T. Aman season seven diseases reported to occur were BLB, BLS, Bl, ShB, BS, ShR and LSc. Diseases in Boro season were Bl, ShB, BS, ShR, BLB and Bk. Common diseases over seasons were BLB, Bl, ShB and BS.

In this district hybrid varieties are grown in T.Aman and Boro seasons and the reported diseases in T. Aman season were BLB, Bl, BS, ShR and BLS and in Boro were BS, BLB, Bl and ShR (Table 45).

Control measures include application of different chemicals and cultural measures (Table 45).

**Table 45. Season wise diseases of rice in Tangail district**

Crop season	Diseases	Control measures
Aus	Bacterial leaf blight	Application of Cupravit /Agrovit
	BLS	Application of fungicide- /Cultural management
	Blast	Application of fungicide- /Cultural management
	Brown spot	Application of fungicide- /Cultural management
	ShR	Application of fungicide- /Cultural management
	Leaf scald	Application of pesticides /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
T.Aman	Bacterial leaf blight	Application of fungicide- /Cultural management
	Bacterial leaf streak	Application of fungicide- /Cultural management
	Blast	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
	Brown spot	Application of fungicide- /Cultural management
	Sheath rot	Application of Carbofuran
	Leaf scald	Application of fungicide- Tilt /Folicur
Boro	Blast	Application of fungicide- Tilt/ Knowin /Score
	Sheath blight	Application of fungicide- /Cultural management
	Brown spot	Application of fungicide- /Cultural management

Crop season	Diseases	Control measures
	Sheath rot	Application of fungicide- /Cultural management
	Bacterial leaf blight	Application of fungicide- /Cultural management
	Bakanae	Application of fungicide- /Cultural management
<b>Hybrid</b>		
Aus	No crop	
T. Aman	BLB	Application of fungicide- /Cultural management
	Blast	Application of fungicide- /Cultural management
	Brown spot	Application of fungicide- /Cultural management
	Sheath rot	Application of fungicide- /Cultural management
	BLS	Application of fungicide- /Cultural management
Boro	Brown spot	Application of fungicide- /Cultural management
	BLB	Application of fungicide- /Cultural management
	Blast	Application of fungicide- /Cultural management
	Sheath rot	Application of fungicide- /Cultural management

### Season wise occurrence of diseases in Sherpur district

During Aus season, three diseases namely, BLB, Bl and ShB were reported to occur in this district on inbred rice varieties. In T. Aman season eight diseases reported to occur were BLB, BLS, Bl, ShB, FR, BS, RR and ShR. Diseases in Boro season were Bl, ShB, FR, ShR and BLB.

In this district hybrid varieties are grown only in Boro seasons and the reported diseases were BLB, Bl, ShB, FR and ShR (Table 46).

Control measures include application of different chemicals and cultural measures (Table 46).

**Table 46. Season wise diseases of rice in Sherpur district**

Crop season	Diseases	Control measures
Aus	Bacterial leaf blight	Application of Cupravit /Agrovit
	Blast	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
T.Aman	Bacterial leaf blight	Application of fungicide- /Cultural management
	Bacterial leaf streak	Application of fungicide- /Cultural management
	Blast	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
	Foot rot	
	Brown spot	Application of fungicide- /Cultural management
	Root rot	Application of Carbofuran
	Sheath rot	Application of fungicide- /Cultural management
Boro	Blast	Application of fungicide- Tilt/ Knowin /Score
	Sheath blight	Application of fungicide- /Cultural management
	Foot rot	Application of fungicide- /Cultural management
	Sheath rot	Application of fungicide- /Cultural management
	Bacterial leaf blight	Application of fungicide- /Cultural management
<b>Hybrid</b>		
Aus	No crop	
T. Aman	No crop	

Crop season	Diseases	Control measures
Boro	BLB	Cultural management
	Blast	Application of fungicide- /Cultural management
	Sheath blight	Application of fungicide- /Cultural management
	Foot rot	Application of fungicide- /Cultural management
	Sheath rot	Application of fungicide- /Cultural management

### Season wise occurrence of diseases in Mymensingh district

On inbred rice varieties, six diseases namely, BLB, Bk, Bl, BS, ShR and ShB were reported to occur during Aus season. In T. Aman season five diseases reported to occur were BLB, Bl, ShB, BS and ShR. Diseases in Boro season were Bl, ShB, Uf, BLB and Bk. Common diseases over seasons were BLB, Bl, and ShB.

In this district hybrid varieties are grown in all the three seasons. Diseases in Aus were ShB, BLB, BS, ShR and Bl, in T.Aman BLB, Bl, BS, ShR and ShB and in Boro season the reported diseases were BS, BLB, ShB, Bl, ShR, Uf and Bk (Table 47).

Control measures include application of different chemicals and cultural measures (Table 47).

**Table 47. Season wise diseases of rice in Mymensingh district**

Crop season	Diseases	Control measures
Aus	Bacterial leaf blight	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Blast	Cultural management /chemical application
	Brown spot	Cultural management /chemical application
	ShR	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
T.Aman	Bacterial leaf blight	Cultural management /chemical application
	Blast	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Brown spot	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
Boro	Blast	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Ufra	Cultural management /chemical application
	Bacterial leaf blight	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
<b>Hybrid</b>		
Aus	Sheath blight	Cultural management /chemical application
	BLB	Cultural management /chemical application
	Brown spot	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
	Blast	Cultural management /chemical application
T. Aman	BLB	Cultural management /chemical application
	Blast	Cultural management /chemical application
	Brown spot	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application

Crop season	Diseases	Control measures
Boro	Brown spot	Cultural management /chemical application
	BLB	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Blast	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
	Ufra	Cultural management /chemical application
	Bakanae	Cultural management /chemical application

### Season wise occurrence of diseases in Kishoregonj district

During Aus season, four diseases namely, Bl, SR, ShB and ShR were reported to occur in this district on inbred rice varieties. In T. Aman season eight diseases reported to occur were Bl, ShB, SR, ShR, BLB, Bk, BS and Tg. Diseases in Boro season were Bl, ShB, BLB, Bk, ShR and Uf. Common diseases over seasons were Bl, ShB and ShR.

In this district hybrid varieties are grown in all the three seasons and the reported diseases of hybrid rice in Aus season were BLB and ShR, in T. Aman Bl and ShB and in Boro were Bl, ShB, BLB and ShR (Table 48).

Control measures include application of different chemicals and cultural measures (Table 48).

**Table 48. Season wise diseases of rice in Kishoregonj district**

Season	Disease	Control measures
Aus	Blast	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Stem rot	Application of fungicide-, Balanced fertilization, Water management
	Sheath blight	Application of fungicide-, Balanced fertilization, Water management
	Sheath rot	Application of fungicide-, Balanced fertilization, Water management
T. Aman	Blast	Application of fungicide, Balanced fertilization, Keep standing water in the field
	Sheath blight	Application of fungicide, Balanced fertilization
	Stem rot	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Sheath rot	Application of fungicide-, Balanced fertilization, Water management
	Bacterial leaf blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Bakanae	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Brown spot	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Tungro	
Boro	Blast	Application of fungicide, Balanced fertilization, Keep standing water in the field

Season	Disease	Control measures
	Sheath blight	Application of fungicide, Balanced fertilization, Use MoP
	Bacterial leaf blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Bakanae	Application of fungicide-, Balanced fertilization, Water management
	Sheath rot	Application of fungicide-, Use MoP, Water management
	Ufra	
<b>Hybrid</b>		
Aus	Bacterial leaf blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Sheath rot	Application of fungicide-, Balanced fertilization, Water management, Use MoP
T. Aman	Blast	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Sheath blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
Boro	Blast	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Sheath blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Bacterial leaf blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Sheath rot	Application of fungicide-, Balanced fertilization, Water management, Use MoP

#### Season wise occurrence of diseases in Netrokona district

During Aus season, four diseases namely, Bl, ShB, BS and BLB were reported to occur in this district on inbred rice varieties. In T. Aman season five diseases reported to occur were Bl, BS, ShB, Uf and BLB. Diseases in Boro season were Bl, ShB, BLB, Bk and BS. Common diseases over seasons were Bl, ShB and BLB.

In this district hybrid varieties are grown in T. Aman and Boro seasons and the reported diseases in T. Aman were Bl, BS and Bk and in Boro were Bl, ShB and Bk (Table 49).

Control measures include applicatioin of different chemicals and cultural measures (Table 49).

**Table 49. Season wise diseases of rice in Netrokona district**

Season	Disease	Control measures
Aus	Blast	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Sheath blight	Application of fungicide-, Balanced fertilization, Water management
	Brown spot	Application of fungicide-, Balanced fertilization, Water management
	BLB	Application of fungicide-, Balanced fertilization, Water management



Season	Disease	Control measures
T. Aman	Blast	Application of fungicide, Balanced fertilization, Keep standing water in the field
	Brown spot	Application of fungicide, Balanced fertilization
	Sheath blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Ufra	Application of fungicide-, Balanced fertilization, Water management
	Bacterial leaf blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
Boro	Blast	Application of fungicide, Balanced fertilization, Keep standing water in the field
	Sheath blight	Application of fungicide, Balanced fertilization, Use MoP
	Bacterial leaf blight	Application of fungicide-, Balanced fertilization, Water management, Use MoP
	Bakanae	Application of fungicide, Balanced fertilization, Water management
	Brown spot	Application of fungicide, Use MoP, Water management
<b>Hybrid</b>		
Aus	No crop	
T. Aman	Blast	Application of fungicide, Balanced fertilization, Water management, Use MoP
	Brown spot	Application of fungicide, Balanced fertilization, Water management, Use MoP
	Bakanae	
Boro	Blast	Application of fungicide, Balanced fertilization, Water management, Use MoP
	Sheath blight	Application of fungicide, Balanced fertilization, Water management, Use MoP
	Bakanae	Application of fungicide-, Balanced fertilization, Water management, Use MoP

### Season wise occurrence of diseases in Hobigonj district

During Aus season, four diseases namely, ShB, ShR, BS and Bk were reported to occur in this district on inbred rice varieties. In T. Aman season three diseases reported to occur were ShB, ShR and BLB. Diseases in Boro season were Bk, Bl, BS and ShB.

In this district hybrid varieties are grown in Aus and Boro seasons and the reported diseases in Aus season were ShB and ShR and in Boro were Bl, BS, ShB and ShR (Table 50).

Control measures include applicatioin of different chemicals and cultural measures (Table 50).

**Table 50. Season wise diseases of rice in Hobigonj district**

Season	Disease	Control measures
Aus	Sheath blight	Application of fungicide- use balanced fertilizer, Water management



Season	Disease	Control measures
	Sheath rot	Application of fungicide- Use balanced fertilizer, Water management
	Brown spot	Application of fungicide- Water management
	Bakanae	Roguing
T. Aman	Sheath blight	Application of fungicide-, use balanced fertilizer, Water management
	Sheath rot	Application of fungicide-, use balanced fertilizer, Water management
	Bacterial leaf blight	
Boro	Bakanae	Application of fungicide-, Water management
	Blast	Application of fungicide-, Water management, Balanced fertilization
	Brown spot	Application of fungicide-, Water management
	Sheath blight	Application of fungicide, Balanced fertilization, Water management
<b>Hybrid</b>		
Aus	Sheath blight	Balanced fertilization,
	Sheath rot	Application of fungicide
T. Aman	-----	-----
Boro	Blast	Application of fungicide, use MoP
	Brown spot	Application of fungicide, use MoP
	Sheath blight	Application of fungicide, Balanced fertilization, Water management
	Sheath rot	Application of fungicide

### Season wise occurrence of diseases in Comilla district

Ten diseases namely, Bl, Bk, SR, ShB, Tg, BLB, Uf, ShR, BS and BLS were reported to occur during Aus season in Comilla on inbred rice varieties. In T. Aman season also ten diseases namely, Bl, Bk, SR, ShB, Tg, BLB, Uf, BLS, ShR and BS were reported. Diseases in Boro season were Bl, Bk, SR, ShB, Tg, Uf, BLB, BLS and ShR. All the nine major diseases except BS were common diseases in all the three growing seasons.

In this district hybrid varieties are grown in all the three seasons. In Aus season reported diseases were Bl, Bk, SR, ShB, Tg, ShR and BS. Reported diseases in T. Aman were Bl, Bk, SR, ShB, Tg, and ShR and in Boro were Bl, Bk, SR, ShB, Tg, BLB and BS (Table 51).

Control measures include application of different chemicals and cultural measures (Table 51).

**Table 51. Season wise diseases of rice in Comilla district**

Season	Disease	Control measures
Aus	Blast	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Stem rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Tungro	Cultural management /chemical application
	Bacterial leaf blight	Use MoP, Dry the field
	Ufra	Cultural management /chemical application

Season	Disease	Control measures
	Sheath rot	Cultural management /chemical application
	Brown spot	Application of fungicide-
	Bacterial leaf streak	Use balanced fertilizer
T. Aman	Blast	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Stem rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Tungro	Cultural management /chemical application
	Bacterial leaf blight	Use MoP, Dry the field
	Ufra	Cultural management /chemical application
	Bacterial leaf streak	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
	Brown spot	Cultural management /chemical application
Boro	Blast	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Stem rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Tungro	Cultural management /chemical application
	Ufra	Cultural management /chemical application
	Bacterial leaf blight	Use MoP, Dry the field
	Bacterial leaf streak	Use MoP, Dry the field
	Sheath rot	Application of fungicide-
<b>Hybrid</b>		
Aus	Blast	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Stem rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Tungro	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
	Brown spot	Cultural management /chemical application
T. Aman	Blast	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Stem rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Tungro	Cultural management /chemical application
	Sheath rot	Cultural management /chemical application
Boro	Blast	Cultural management /chemical application
	Bakanae	Cultural management /chemical application
	Stem rot	Cultural management /chemical application
	Sheath blight	Cultural management /chemical application
	Tungro	Cultural management /chemical application
	Bacterial leaf blight	Cultural management /chemical application
	Brown spot	Cultural management /chemical application

### Season wise occurrence of diseases in Chittagong district

On inbred rice varieties during Aus season, six diseases namely, BLB, ShB, ShR, Bk, Uf, and Bl were reported to occur in this district. Diseases reported in T. Aman season were Bl, BLB,

ShR, ShB and BS. Reported diseases in Boro season were Bl, Tg, Bk, BLB, ShB and ShR. Common diseases in all the three seasons were BLB, Bl, ShB and ShR.

In this district hybrid varieties are grown in all the three seasons. In Aus season reported diseases were Bl, BS, ShR and ShB, in T. Aman, BLB, and Bl and in Boro were Bl, Bk, Tg, BLB and ShR (Table 52).

Control measures include application of different chemicals and cultural measures (Table 52).

**Table 52. Season wise diseases of rice in Chittagong district**

Season	Diseases	Control measures
Aus	Bacterial blight	Application of fungicides, Clean culture, water management, Balanced fertilizer use, MoP
	Sheath blight	Application of fungicides- Tilt/ Contaf; Clean culture, Water management, use MoP
	Sheath rot	Application of fungicides- Tilt/ Contaf; Clean culture, use MoP, Use balanced fertilizer
	Bakanae	Use MoP, Use balanced fertilizer
	Ufra	Use balanced fertilizer, MoP
	Blast	Application of fungicides- Tilt/; use MoP
T. Aman	Blast	Application of fungicides, Clean culture, use MoP, Use balanced fertilizer, Water management
	Bacterial blight	Application of fungicides, Clean culture, use MoP, Use balanced fertilizer, Water management
	Sheath rot	Application of fungicides, Clean culture
	Sheath blight	Dry the field, Use balanced fertilizer
	Brown spot	Use balanced fertilizer
Boro	Blast	Application of fungicides, MoP, Water & fertilizer management
	Tungro	Use MoP, Dry the field
	Bakanae	
	Bacterial leaf blight	Use MoP, Use balanced fertilizer,
	Sheath blight	Chemical and cultural
	Sheath rot	Application of fungicides, Use balanced fertilizer, use MoP, Water management
<b>Hybrid</b>		
Aus	Blast	Application of fungicides, Use of Mop, Water management
	Brown spot	Application of fungicides, Use of Mop
	Sheath rot	Chemical and cultural
	Sheath blight	Use MoP
T. Aman	Bacterial leaf blight	Use balanced fertilizer, MoP
	Blast	Use balanced fertilizer, MoP
Boro	Blast	Application of fungicides, Use balanced fertilizer, Use MoP, Water management
	Bakanae	Application of fungicides
	Tungro	Roguing out infected plants
	Bacterial leaf blight	Use balanced fertilizer
	Sheath rot	Application of fungicides, Water management

### 3.7.8 Insect pests of Rice in Boro season

**Table 53. Insect pests of rice in Boro season in 20 selected districts**

SL.#	District	Upazila	Name of insect pests	Infestation (%) Occurrence :	Status
01	Rangpur	Sadar	Stem borer	Less than 1 %	Minor
		Mithapukur	Nil	-	
		Bodergonj	Leaf folder	Less than 1 %	Minor
02	Dinajpur	Sadar	Nil	-	
		Fulbari	Nil	-	
		Birampur	Stem borer	Less than 1 %	Minor
		Birgonj	Nil	-	
03	Bogra	Sherpur	Stem borer	Less than 1 %	Minor
		Adamdighi	Stem borer, short horned, grass hopper	Less than 1 %	Minor
		Sibgonj	Stem borer	Less than 1 %	Minor
04	Naogaon	Sadar	Green leaf hopper, stem borer, leaf folder	Less than 1 %	Minor
		Patnitola	Long-horned grass hopper, stem borer	Less than 1 %	Minor
05	Rajshahi	Godagari	Stem borer, ECC, LHGH	Less than %	Minor
		Baghmara	ECC, stem borer,	Less than 1 %	Minor
		Tanore	Stem borer, ECC	Less than 1 %	Minor
06	Pabna	Sadar	ECC, stem borer, LHGH	Less than 1 %	Minor
		Sujanagar		Less than 1 %	Minor
07	Serajgonj	Sadar	ECC, Stem borer, GLH, Rice bug	Less than 1 %	Minor
		Tarash	ECC, Stem borer, SHGH, LHGH, Gall midge, Rice bug, WBLH	Less than 1 %	Minor
08	Jessore	Monirampur	Stem borer, Rice bug, WBLH	Less than 1 %	Minor
		Bagarpara	Stem borer, Rice bug, GLH	Less than 1 %	Minor
09	Khulna	Dighalia	Stem borer, GLH, leaf folder, Nematode	Less than 1 %	Minor
		Batiaghata	Stem borer, Nematode	Less than 1 %	Minor
10	Jhenaidhah	Sadar	Stem borer, Rice bug, BPH	Less than %	Minor
		Harinakundu	Stem borer, GLH	Less than 1 %	Minor
11	Barisal	Bakergonj	Stem borer, SHGH, GLH, Leaf folder	Less than 1 %	Minor
		Gournadi			

SL.#	District	Upazila	Name of insect pests	Infestation (%) Occurrence :	Status
12	Faridpur	Sadar	Stem borer, SHGH, BPH	Less than 1 %	Minor
		Nagorkanda	Stem borer, GLH	Less than 1 %	Minor
13	Tangail	Sadar	BPH, Stem borer	0.75 0.95	Minor
		Madhupur	Stem borer, GLH	0.70 0.50	Minor
14	Sherpur	Sadar	Stem borer, GLH	0.60 0.45	Minor
		Nokla	Stem borer, leaf roller, GLH	0.55 0.45 0.65	Minor
15	Mymensingh	Ishwargonj	Stem borer, leaf folder, BPH	0.75 0.60 0.75	Minor
		Trisal	Stem borer, Leaf folder, Case worm	0.85 1.00 0.60	Minor
		Fulpur	Stem borer, Leaf folder	0.85 0.65	Minor
16	Kishoregonj	Sadar	Stem borer, Leaf folder	Less than 1 %	Minor
		Kotiadi	Stem borer, Gall midge	Less than 1 %	Minor
		Bajitpur	Stem borer, Thrips	Less than 1 %	Minor
17	Netrokona	Sadar	Stem borer BPH	0.85 0.75	Minor
		Purbodhala	Stem borer, Leaf folder, BPH	0.95 0.70 0.85	Minor
18	Hobigonj	Sadar	Stem borer, Leaf folder	Less than 1 %	Minor
		Madhabpur	Stem borer, leaf folder	Less than 1 %	Minor
19	Comilla	Sadar	Stem borer	Less than 1 %	Minor
		Burichong	Stem borer	Less than 1 %	Minor
		Barura	Stem borer	Less than 1 %	Minor
20	Chittagong	Patia	Stem borer	Less than 1%	Minor
		Satkania	Stem borer	Less than 1%	Minor
		Mirasharai	Stem borer	Less than 1%	Minor

Insect pests of rice recorded in Boro season from 20 districts under study include stem borer, leaf folder, short horned grass hopper, green leaf hopper, long horned grass hopper, ear-cutting caterpillar, rice bug, gall midge, white backed leaf hopper, brown plant hopper, case worm and rice thrips. The infestation level was very low in all the 20 selected districts in the Boro season. It ranged from 0.45 to 1.00 per cent. The numbers of insect pests recorded in different districts were variable. Highest number of insect pests was recorded from Tarash upazila under Sirajgonj district (Table-53) The reason for this low infestation might be due to early stage of

plant growth. Although most of the insect pests reported are considered, as major pests of rice but these pests did not get enough time to build up their population growth during the study period to acquire the major status.

### 3.7.9 Diseases of Rice in Boro season from 20 selected districts

Field survey of Boro crop revealed that there was no disease in Rangpur, Fulbaria, Birampur and Birgonj of Dinajpur and Sapahar of Naogaon district. In Dinajpur sadar, occurrence of only Blast was noted. In most of the other upazilas one to three diseases were observed. In the surveyed areas a total of nine diseases namely, Blast, Brown spot, ShB, BLB, BLS, ShR, Ufra, LSc and Bakanae were recorded. However, incidence of all the diseases was below 1% with low severity. the diseases Blast was found very common in almost all the upazilas. The probable reason is the stage of the crop, which was little bit early and the pathogen did not get ample time to spread.

**Table 54. Diseases of rice in Boro season in 20 selected districts**

District	Upazila	Diseases	Occurrence (%)	Severity (H/M/L)
Rangpur	Sadar	Nil	Nil	
	Mithapukur	Nil	Nil	
	Badorgonj	Nil	Nil	
Dinajpur	Sadar	Blast	<1	Low
	Fulbaria	Nil	Nil	
	Birampur	Nil	Nil	
	Birgonj	Nil	Nil	
Bogra	Sherpur	Brown spot	<1	Low
	Adamdighi	Bl, ShB	<1	Low
	Shibgonj	Blast	<1	Low
Naogaon	Sadar	BS, Bl, BLB	<1	Low
	Patnitola	BS, ShB, Bl	<1	Low
	Sapahar	Nil		
Rajshahi	Tanor	Bl, BLS	<1	Low
	Godagari	ShB, BS, BLS, BLB, Bl	<1	Low
	Baghmara	ShB, BLB, BLS, BS	<1	Low
Pabna	Sadar	Bl, BS	<1	Low
	Sujanagar	BLB	<1	Low
Serajgonj	Sadar	Bl, ShR	<1	Low
	Tarash	ShB, BLB	<1	Low
Jessore	Monirampur	ShB, BLB, Uf, Bl	<1	Low
	Bagarpara	BLB, Bl	<1	Low
Khulna	Digholia	BS, LSc, Bl	<1	Low
	Boitaghata	Blast	<1	Low
Jhenidah	Sadar	BLB, Bl	<1	Low
	Harinakunda	Blast	<1	Low
Barisal	Bakergonj	BLB, BLS, Bl, Uf	<1	Low
	Gournadi	Blast	<1	Low
Faridpur	Sadar	BLB, BLS, Bl, Uf	<1	Low
	Nogorkanda	BLB, Bl, Uf, BLS	<1	Low
Tangail	Sadar	BS	0.5	Low

District	Upazila	Diseases	Occurrence (%)	Severity (H/M/L)
		Blast	0.66	Low
		ShR	0.5	Low
	Modhupur	ShB	0.85	Low
		Blast	0.5	Low
		BLB	0.6	Low
Sherpur	Sadar	Blast	0.5	Low
		ShB	0.7	Low
	Nokla	ShB	0.7	Low
		Blast	0.5	Low
Mymensingh	Trisal	ShB	0.65	Low
		BLB	0.6	Low
	Fulpur	ShB	0.65	Low
		Blast	0.55	Low
	Ishwargonj	ShB	0.7	Low
		Blast	0.7	Low
Kishoregonj	Sadar	BLB, Blast	<1	Low
	Kotiadi	BLB, Bl, Bk	<1	Low
	Bazitpur	Blast, Bk	<1	Low
Netrokona	Sadar	ShB	0.85	Low
		Bakanae	0.55	Low
		BS	0.7	Low
	Purbadhola	ShB	0.85	Low
		Bl	0.75	Low
		BS	0.6	Low
		Bk	0.6	Low
Hobigonj	Sadar	Bl, BS	<1	Low
	Madhobpur	Blast, Bk	<1	Low
Comilla	Sadar	Blast	<1	Low
	Burichonj	Blast	<1	Low
	Barura	Blast	<1	Low
Chittagonj	Potia	ShB, Bl	<1	Low
	Satkania	Blast	<1	Low
	Mirshorai	Blast	<1	Low

### 3.7.10 Information on Farmer's profile

The farmers' information from 20 selected districts is shown in Table 55. In each district there were 2-4 upazilas and under each upazila, 10 rice farmers were interviewed on different aspects. The age of the interviewed farmers varied from 17-85 years, the majority having fifties. Education level included no formal education to higher secondary level. The farming experience had wide variation, having one year to 60 years. Many of the interviewed farmers are the members of different farmers clubs especially IPM, ICM, CIG with the exception of Sadar upazila of Rangpur, Pabna, Jessore, Jhenaidah and Faridpur districts, Nagarkanda, Modhupur and Putia upazilas where none were member of any club. A total number of 302 farmers had training on rice production; only the farmers of four upazilas namely Baghmara, Tanor, Sadar (Faridpur) and Potia had no training on rice production.

**Table 55. Farmers profile of 20 selected districts of Bangladesh**

Sl#	District	Upazila	Farmers' profile					
			No. of farmers	Age (Yr)	Education	Experience (Yr)	Membership in Farmers' club	Rice Training
01	Rangpur	Sadar	10	18-65	1-4	3-30	0	3
		Mithapukur	10	32-62	1-4	12-40	2-IPM	9
		Badargonj	10	35-65	1-3	5-40	1-IPM 1-ICM	4
02	Dinajpur	Sadar	10	16-40	1-4	2-35	3-IPM	7
		Fulbari	10	25-70	1-4	15-60	4-ICM	5
		Birampur	10	28-70	1-4	10-60	3-IPM	2
		Birgonj	10	27-55	1-5	2-30	2-IPM	2
03	Bogra	Sherpur	10	28-75	1-4	25-50	2-ICM 1-IPM 1-CIG	9
		Adamdighi	10	26-77	1-4	10-40	5-IPM 1-ICM	8
		Sibgonj	10	32-52	1-4	12-40	1-IPM 2-ICM 4-CIG	7
04	Naogaon	Sadar	10	28-62	1-4	3-45	2-IPM	3
		Patnitola	10	25-65	1-4	4-10	2-IPM	4
		Sapahar	10	21-45	1-4	5-32	4-ICM	4
05	Rajshahi	Godagari	10	32-52	1-3	10-40	1-Krisak club 2-ICM	5
		Baghmara	10	27-85	1-3	6-60	1-IPM	0
		Tanor	10	35-52	1-3	15-45	1-Sonali sangha	0
06	Pabna	Sadar	10	35-48	1-4	15-28		2
		Sujanagar	10	26-60	1-4	15-50	2-IPM 1-Krisak club	4
07	Serajgonj	Sadar	10	30-55	1-4	15-60	1-IPM 1-Krisak school	5
		Tarash	10	17-65	1-4	5-30	3-IPM	7
08	Jessore	Monirampur	10	25-72	1-4	15-55	0	1
		Bagharpara	10	23-42	Educated	01-30	2-CIG	2
09	Khulna	Batiaghata	10	22-55	Educated	05-40	9-IPM	8
		Digholia	10	20-55	Educated	03-28	2-IPM	5
10	Jhenidah	Sadar	10	25-66	1-3	10-60	0	6
		Hariakhandi	10	21-70	Educated	07-50	1-IPM	2
11	Barisal	Bakergonj	10	22-75	Educated	08-60	9-IPM	3
		Goarnadi	10	40-60	Educated	20-55	IPM-1	10
12	Faridpur	Sadar	10	27-80	Educated	02-60	0	0



Sl#	District	Upazila	Farmers' profile					
			No. of farmers	Age (Yr)	Education	Experience (Yr)	Membership in Farmers' club	Rice Training
		Nagorkanda	10	21-74	1-3	05-55	0	9
13	Tangail	Sadar	10	28-80	1-4	3-60	8-ICM	10
		Madhupur	10	30-68	1-3	5-40	5-Krishak Samobay Samity	7
14	Sherpur	Sadar	10	22-60	1-4	3-40	1-DAE	3
		Nokla	10	22-55	1-4	4-30	6-ICM	7
15	Mymensingh	Ishwargonj	10	22-60	2-3	10-40	9-IPM	10
		Trishal	10	35-60	1-3	10-40	2-CIG	9
		Fulpur	10	25-50	1-3	3-30	3-DAE	6
16	Kishoregonj	Sadar	10	30-65	2-4	12-40	3-IPM 5-ICM	10
		Kotiadi	10	35-55	2-4	12-30	2-IPM	10
		Bazitpur	10	30-50	2-3	8-20	10-IPM	10
17	Netrokona	Sadar	10	28-70	1-4	8-34	3-ICM	7
		Purbadhala	10	38-65	1-3	15-40	2-IPM	7
18	Hobigonj	Sadar	10	35-60	1-3	15-40	10-IPM	10
		Madhobpur	10	27-60	2-3	10-40	0	10
19	Comilla	Sadar	10	36-60	2-3	10-35	10-IPM	10
		Burichong	10	40-60	2-3	20-38	10-IPM	10
		Barura	10	25-65	2-3	10-40	10-IPM	10
20	Chittagong	Potia	10	38-80	1-3	18-50	0	0
		Satkania	10	36-48	1-3	15-20	10-IPM	10
		Merersorai	10	30-55	1-3	8-35	10-IPM	10

#### 4.0 QUARANTINE INSECT PESTS AND DISEASES OF RICE

The insect pests and diseases of rice occurring in different countries were described in details in the subsequent chapters.

#### 4.1 Rice insect pests with distribution to different countries

The list of insect pests of rice reported in different countries are presented in Table 56.

**Table 56. List of insect pests of rice and their distribution**

Sl.	Common Name	Scientific Name	Distribution	Status
1.	Rice stem borer, Yellow stem borer	<i>Scirpophaga incertulas</i> (Walker)	Asia, Australia	Major
2.	White rice stem borer	<i>S. innotata</i> (Walker)	East Asia, Australia	Major
3.	Dark headed borer	<i>Chilo polychrysus</i> (Meyrich)	Asia	Major
4	Dark headed borer	<i>C. auricilia</i> Dudgeon	Asia, Bangladesh India, China, Taiwan, Japan, Korea, Pakistan, Philippines, Srilanka, Thailand.	Major
5	Striped borer	<i>Chilo suppressalis</i> (Walker)	Europe, Middle East, Asia, Oceania	Major
6	Pink borer	<i>Sesamia inferens</i> (Walker)	Asia, Australia, Oceania.	Major
7	Brown plant hopper	<i>Nilaparvata lugens</i> (Stal)	South and South East Asia, China, Japan	Major
8	Small brown plant hopper	<i>Laodelphasx striatellus</i>	China, Japan, Republic of Korea, Palearctic regions	Minor
9.	White backed plant hopper	<i>Sogatella furcifera</i> (Horvath)	South and South East Asia, Northern Australia, China, Japan, Republic of Korea, South Pacific, Islands.	Major
10	White leafhopper	<i>Cofana spectra</i> (Distant)	South and South East Asia, Australia, Africa, China.	Major
11	Rice green leaf hopper	<i>Nephotettix virescens</i> (Distant)	China (including Taiwan), Japan, Republic of Korea, South and South East Asia.	Major
12.	Zigzag leaf hopper	<i>N. nigropictus</i>	South and South East	Major

Sl.	Common Name	Scientific Name	Distribution	Status
		(Motschulsky)	Asia, Taiwan, China and Japan.	
13.	Rice gall midge	<i>Orseolia oryzae</i> (Wood-Mason)	South and South East Asia, India, Cambodia, Southern China, Indonesia, Laos, Myanmar, Nepal, Pakistan, Srilanka, Thailand, and Vietnam	Major
14.	Rice leaf folder	<i>Cnaphalocrocis medinalis</i> (Guenee)	Humid tropical and Temperate Countries	Major
15	Rice leaf folder	<i>Marasmia patnalis</i>	Asia, Oceania, Australia and Africa,	Major
16	Rice leaf folder	<i>Marasmia exigua</i>	South and South East Asia.	Major
17.	Rice bug	<i>Leptocorisa acuta</i> (Thunberg)	Asia, Australia	Major
18.	Rice bug	<i>L. oratorius</i> (Fabricius)	Do	Major
19.	Stink bug	<i>Nezara viridula</i> Linnaeus	World wide, Southern Japan	Major
20	Rice hispa	<i>Dicladyspa armigera</i> (Oliver)	Asia, Africa	Major
21.	Rice leaf beetle	<i>Leptispa pygmoea</i> (Baly)	Bangladesh, India	Major
22.	Rice water weevil	<i>Lissorhoptrus oryzyphilus</i> (Kuschel)	China, India, Japan, Republic of Korea, Canada, Mexico, Cuba, Dominican republic	Major
23.	Rice Thrips	<i>Frankliniella intonsa</i> (Tryborn)	Taiwan, China, Japan, India, Philippines	Major
24.	Rice Thrips	<i>Haplothrips soror</i>	Taiwan, Northeastern, China, India, Indonesia, Japan, Republic of Korea, Philippines, USA, Northern USSR, Thailand, Africa, Europe.	Major
25.	Rice case worm	<i>Nymphula depunctalis</i> (Genie)	Australia, India, Bangladesh, Malaysia, Indonesia, Srilanka, Africa and South America.	Major
26.	Rice case worm	<i>N. fluctuosalis</i>	African countries, Japan,	Major

Sl.	Common Name	Scientific Name	Distribution	Status
		(Zeller)	China, India, Bangladesh, Australia, Philippines, Srilanka, Thailand.	
27.	Rice mealy bug	<i>Brevennis rehi</i> (Lindinger)	Bangladesh, India, and Thailand.	Major
28.	Whorl maggot	<i>Hydrellia philippina</i> (Ferino)	Philippines, Bangladesh, India.	Minor
29.	Ear-cutting caterpillar	<i>Mythimna separata</i> (Walker)	Throughout Asia, The Australian region, Europe, North America (Indigenous)	Major
30.	Rice swarming caterpillar	<i>Spodoptera mauritia</i> (Genie)	Widely distributed in Indian Sub continent Asia, Australia,	Major
31.	Cutworm	<i>S. exigua</i> (Hubna)	Africa, Asia.	Major
32.	Cutworm	<i>S. litura</i> (Fabricius)	Africa Asia- India, Subcontinent, Australia, China, Turkey.	Major
33.	Army worm	<i>Solenopsis germinate</i> (Fabricius)	Asia, Philippines, Bangladesh, India.	Major
34.	Mole Cricket	<i>Gryllotalpa africana</i> (Burmeister)	Most of the Asian countries, Australia, Egypt, Guinea, Zimbabwe, Dominican republic	Minor

Geographical distributions of 34 insect pests are shown in Table 56. Among these 31 insect pests are major. Rice stem borers, Plant hoppers, Leaf folders, Stink bug, Rice hispa, Rice thrips, Rice case worm, Ear cutting caterpillar, Rice swarming caterpillar, Cutworms and Mole cricket are more or less widely distributed in more than one continents. Others are distributed in few to more countries in Asia.

#### 4.2 Rice diseases with distribution to different countries

Most of the diseases of rice has worldwide distribution or at least distributed throughout the Asian countries. Diseases those have wide distribution are Bacterial leaf blight, Bacterial leaf streak, Bacterial brown stripe, Bacterial grain rot, Blast, Sheath blight, Sheath rot, Bakanae, Brown spot, Stem rot, Leaf scald, Narrow brown leaf spot, Sheath spot, Leaf smut, Minute leaf spot, Stack burn, Grain red blotch, False smut, Kernel bunt, Tungro. Diseases so far not found in Bangladesh are Bacterial stripe, Bacterial sheath rot, Sheath brown rot, Udbatta, Downy mildew, Dwarf, Stripe, Hoja blanka, Black streaked dwarf, orange leaf, Transitory yellowing, Grassy stunt, Ragged stunt, Mosaic, Gall dwarf, Bunchy stunt, Chlorotic streak, Wrinkle stunt and Witches broom (Table 57).

**Table 57. Distribution of rice diseases in different countries**

Sl.	Disease	Causal organism	Distribution	Status
<b>Bacterial Diseases</b>				
01	Bacterial blight	<i>Xanthomonas oryzae</i> pv <i>oryzae</i>	Bangladesh; India; Philippines; East, central, west and south China; Thailand; Japan; SriLanka; Taiwan; Korea; Vietnam; Australia; Latin America; South America; North America; Carribian region; Malagasy; West Africa; Mali; Nigeria; Senegal;	Major
02	Bacterial leaf streak	<i>Xanthomonas oryzae</i> pv <i>oryzicola</i>	Bangladesh, Philippines (Pordesimo 1958); South China (Fang <i>et al.</i> 1957); India, Thailand, Malaysia, Vietnam, Indonesia, Cambodia, west African countries	Major
03	Bacterial foot rot	<i>Erwinia chrysethemi</i> pv <i>chrysethemi</i>	Bangladesh, Japan, Indonesia	Minor
04	Bacterial stripe	<i>Pseudomonas syringae</i> pv <i>panici</i>	Japan, Taiwan, Philippines	Minor
05	Bacterial sheath rot	<i>Pseudomonas syringae</i> pv. <i>syringae</i>	Eastern & Northern proviencs of China, Philippines, Japan, Indonesia	Minor
06	Bacterial brown stripe	<i>Pseudomonas avenae</i>	World wide distribution	Minor
07	Sheath brown rot	<i>Pseudomonas fuscovaginae</i>	Latin America, Philippines, Surinam, Uruguay, Panama, Guatemala, ElSavador, Nicaragua	Minor
08	Bacterial grain rot	<i>Pseudomonas glumae</i>	Wide distributed	Major
<b>Fungal diseases</b>				
09	Blast	<i>Pyricularia grisea</i>	Bangladesh, All the 179 rice producing prefectures in China (Shen & Lin 1994), Thailand (Disthaporn 1994), India (Padmanabhan 1965), Philippines (Ou 1985), South Carolina, Iraq All Asian countries	Major
10	Sheath blight	<i>Rhizoctonia solani</i>	Bangladesh, Japan, Philippines, China, India,	Major

Sl.	Disease	Causal organism	Distribution	Status
			Thailand, Srilanka, Brazil, Surinam, Venezuela, Madagascar, USA. Throught the temperate and tropical regions (Hashioka & Makino 1969)	
11	Sheath rot	<i>Sarocladium oryzae</i>	Bangladesh, Taiwan, Japan, also present in south east Asia and the Indian sub-continent (Agnihotrudu 1973, Amin <i>et al.</i> 1974, Chin 1974, Nair 1976) and USA (Shahjahan <i>et al.</i> 1977)	Major
12	Bakanae	<i>Fusarium moniliforme</i>	Bangladesh, Japan, Taiwan, India, All rice growing areas (Ou 1985)	Major
13	Brown spot	<i>Bipolaris oryzae</i>	All rice growing countries (Ou 1985)	Major
14	Stem rot	<i>Sclerotium oryzae</i>	Bangladesh, Chian, India, Philippines, Japan, Italy, Sri lanka, Vietnam, USA, Burma, in most of the African and Latin American countries, all the countries in South east Asia.	Major
15	Leaf scald	<i>Microdochium oryzae</i>	Bangladesh, Eastern China, India, Thailand, Japan, Brunei, Indonesia, Latin America, West Africa, El-Salvador, Guatemala, Italy, Louisiana	Major
16	Narrow brown leaf spot	<i>Cercospora janseana</i>	Bangladesh, China, India, Philippines, Thailand, Burma, Indonesia, Malaysia, & other countries in Asia, USA, Latin America, Africa, Australia, Papua New Guinea	Minor
17	Aggregate sheath spot	<i>Rhizoctonia oryzae sativae</i>	Bangladesh, China, India, Australia, California, Louisiana, Arkansas, Texas, Japan, Vietnam, Taiwan	Minor
18	Sheath spot	<i>Rhizoctonia oryzae</i>	Bangladesh, Louisiana, Australia, Arkansas, Texas, Japan, Vietnam, Taiwan	Minor
19	Leaf smut	<i>Entyloma oryzae</i>	Bangladesh, world wide	Minor
20	Minute leaf spot	<i>Nigrospora oryzae</i>	Bangladesh, world wide	Minor

Sl.	Disease	Causal organism	Distribution	Status
21	Sheath blotch	<i>Pyrenochaeta oryzae</i>	Bangladesh, Vietnam, USA,	Minor
22	Stack burn	<i>Trichoconis padwickii</i>	Bangladesh, India, China, USA, Egypt, Nigeria, Madagascar, Surinam, world wide	Minor
23	Grain Red Blotch	<i>Epicoccum purpurescens</i>	Bangladesh, world wide	Minor
24	False smut	<i>Ustilagoidea virens</i>	Bangladesh, world wide	Minor
25	Kernel bunt	<i>Tilletia barclayana</i>	Bangladesh, India, China, Philippines, Thailand, Japan, Korea, Burma, Cambodia, Indonesia, Malaysia, Nepal, Pakistan, Taiwan, Vietnam, Australia, Fiji, Mexico, Guyana, Trinidad, Venezuela, Sierra Leone, USA	Minor
26	Damping-off	<i>Achlya proliferata</i>	Bangladesh, India, Japan, California	Minor
27	Seedling blight	<i>Sclerotium rolfsii</i>	Bangladesh, India, Philippines, Malaysia, USA	Minor
28	Udbatta	<i>Balansia oryzae-sativae</i>	India, South west China,	Major
29	Downey mildew	<i>Sclerophthora macrospora</i>	Pakistan, New Zealand India, North-east & East China, Japan, Italy, Australia, Korea, Taiwan, Arkansas, Eritrea, Ethiopia, South Africa, Bulgaria, Italy, Austria, Poland, Yugoslavia	Minor
<b>Virus diseases/MLOs</b>				
30	Tungro	Rice tungro virus	Bangladesh, Philippines, Malaysia, Indonesia, Thailand, India, (Ou 1985)	Major
31	Dwarf	<i>Rice dwarf virus</i>	Japan, Korea, China, Philippines, India	Major
32	Stripe	<i>Rice stripe virus</i>	Japan, Korea, China, Taiwan	Minor
33	Yellow dwarf	<i>Mycoplasma</i>	All Asian countries	Minor
34	Hoja Blanka	<i>Rice hoja blanca virus</i>	Mexico, Central America and region. In South America the disease is endemic to Colombia, Venezuela, Ecuador, Peru, Suriname, French Guiana and Guyana	Major
35	Black streaked dwarf	<i>Rice black streaked virus</i>	Japan, Korea, China, Vietman	Minor

Sl.	Disease	Causal organism	Distribution	Status
36	Orange leaf	<i>Rice orange leaf virus</i>	Thailand, India, Philippines, Indonesia, Malaysia, Srilanka, Nigeria	Minor
37	Transitory yellowing	<i>Rice transitory yellowing virus</i>	Taiwan, China, Thailand, Japan	Major
38	Grassy stunt	<i>Rice grassy stunt virus</i>	India, Philippines, Thailand, Malaysia, Indonesia,, Taiwan, Srilanka	Major
39	Ragged stunt	<i>Rice ragged stunt virus</i>	India, Philippines, Thailand, Indonesia	Minor
40	Mosaic	<i>Rice mosaic virus</i>	Philippines	Minor
41	Bunchy stunt	<i>Rice bunchy stunt virus</i>	China	Minor
42	Gall dwarf	<i>Rice gall dwarf virus</i>	Thailand	Minor
43	Chlorotic streak	<i>Rice chlorotic streak virus</i>	India	Minor
44	Ufra	<i>Ditylenchus angustus</i>	Bangladesh, India, Thailand, Cambodia, Philippines	
45	White tip	<i>Aphelenchoides besseyi</i>	World wide	
46	Root knot	<i>Meloidogyne graminicola</i>	Bangladesh, India, Nepal, Pakistan, Myanmar, Thailand, Cambodia, Laos, Philippines, Malaysia, Indonesia, South Africa, Colombia, Brazil, USA	
47	Rice root nematode	<i>Hirschmanniella oryzae</i>	Bangladesh, India, Nepal, China, Taiwan, Pakistan, Philippines, Thailand, Cambodia, Japan, Malaysia, South Africa, Guinea, Senegal, Liberia, Sierra Leone, South America, USA	

### 4.3 Hybrid rice seeds are imported from China, India and the Philippines for planting purpose.

Insect pests and diseases of rice of these three countries are shown in Table 58.

**Table 58. Insect pests and diseases of rice recorded in China, India and the Philippines**

Sl. No.	Country	Insect pests	Diseases
1	China	Yellow stem borer, Dark headed borer, Striped borer, Pink borer, Brown plant hopper, Small brown plant hopper, White backed plant	Bacterial leaf blight, Bacterial leaf streak, Bacterial brown stripe, Bacterial grain rot, Blast, Sheath blight, Bakanae, Brown spot, Stem rot, Leaf scald, Narrow



		hopper, White leafhopper, Rice green leaf hopper, Zigzag leaf hopper, Rice gall midge, Rice leaf folder, Rice bug, Stink bug, Rice hispa, Rice water weevil, Rice thrips, Rice case worm, Rice mealy bug, Whorl maggot, Ear-cutting caterpillar, Rice swarming caterpillar, Cutworm, Army worm, Mole Cricket	brown leaf spot, Aggregate sheath spot, Sheath brown spot, Sheath blotch, Leaf smut, Stack burn, Kernel bunt, False smut, Seedling blight, Udbatta, Downy mildew, Tungro, Dwarf, Stripe, Yellow dwarf, Grassy stunt, Transitory yellowing, Orange leaf, Black streaked dwarf, White tip, Rice root lesion,
2	India	Yellow stem borer, Dark headed borer, Striped borer, Pink borer, Brown plant hopper, Small brown plant hopper, White backed plant hopper, White leafhopper, Rice green leaf hopper, Zigzag leaf hopper, Rice gall midge, Rice leaf folder, Rice bug, Stink bug, Rice hispa, Rice leaf beetle, Rice water weevil, Rice Thrips, Rice case worm, Rice mealy bug, Whorl maggot, Ear-cutting caterpillar, Rice swarming caterpillar, Cutworm, Army worm, Mole Cricket	Bacterial leaf blight, Bacterial leaf streak, Bacterial brown stripe, Bacterial grain rot, Blast, Sheath blight, Bakanae, Brown spot, Stem rot, Leaf scald, Narrow brown leaf spot, Aggregate sheath spot, Sheath blotch, Sheath net blotch, Leaf smut, Stack burn, Kernel bunt, Minute leaf spot, False smut, Seedling blight, Grain red blotch, Damping-off, Udbatta, Downy mildew, Tungro, Dwarf, Yellow dwarf, Grassy stunt, Ragged stunt, Orange leaf, Chlorotic streak, Ufra, White tip, Root knot, Root rot, Rice root lesion, Stunt,
3	Philippines	Yellow stem borer, White rice stem borer, Striped borer, Dark headed borer, Pink borer, Brown plant hopper, Small brown plant hopper, White backed plant hopper, White leafhopper, Rice green leaf hopper, Zigzag leaf hopper, Rice gall midge, Rice leaf folder, Rice bug, Stink bug, Rice hispa, Rice Thrips, Rice case worm, Rice mealy bug, Whorl maggot, Ear-cutting caterpillar, Rice swarming caterpillar, Cutworm, Army worm, Mole Cricket	Bacterial leaf blight, Bacterial leaf streak, Bacterial brown stripe, Bacterial grain rot, Blast, Sheath blight, Bakanae, Brown spot, Stem rot, Leaf scald, Narrow brown leaf spot, Sheath blotch, Leaf smut, Stack burn, Kernel bunt, False smut, Seedling blight, Tungro, Dwarf, Yellow dwarf, Grassy stunt, Ragged stunt, Orange leaf, Mosaic, Ufra, White tip, Root knot, Root rot, Rice root lesion, stunt

#### 4.4 Quarantine insect pests of rice

The quarantine insect pests of rice were determined by using the list of insect pests available and/or absence in different countries especially in China, India and the Philippines. Finally the quarantine insect pests for Bangladesh were identified. The following Tables listed the quarantine insect pests of the Philippines, China, India and Bangladesh.

**Table 59. Quarantine insect pests of rice for Philippines**

Common Name	Scientific name	Family	Materials accompanied
Planthoppers Brown planthopper	<i>Nilaparvata lugens</i> (Stal)	Delphacidae	Whole plant
Leafhoppers	<i>Nephotettix virescens</i> <i>N. nigropictus</i> <i>N. malayanus</i> <i>Recilia dorsalis</i>	Cicadellidae	leaves
Stem borers Rice stripped borer Dark headed stem borer Gold fringed stem borer White stem borer Rice yellow stem borer Pink stem borer	<i>Chilo suppressalis</i> (Walker) <i>C. polychrysus</i> (Meyrick) <i>C. auricilius</i> (Dudgeon) <i>S. innotata</i> (Walker) <i>Scirpophaga incertulas</i> (Walker) <i>Sesamia inferens</i> (Walker)	Pyralidae Pyralidae Pyralidae Pyralidae Pyralidae Pyralidae	Stem
Defoliators – Armyworms and cutworms	<i>Spodoptera exempta</i> (Walker) <i>S. exigua</i> (Humber) <i>Mythimna separata</i> (Walker) <i>Spodoptera mauritia</i> (Boisduval) <i>S. litura</i> (Fabricius)	Noctuidae	Stem
Rice bugs	<i>Scotinophara coarctata</i> (Fabricius) <i>S. lurida</i> (Burmeister)	Pentatomidae	Stem (nodes are preferred feeding sites) Panicles

Among the rice insect pests, plant hopper, brown plant hopper, *Nilaparvata lugens* are affecting seed health, leaf hopper, green leaf hopper, *Nephotettix virescens*, *N. nigropictus*, *N. modulatus* and Zigzag leaf hopper, *Recilia dorsalis* are affecting rice leaf, of the rice stem borers, rice striped borer, *Chilo suppressalis*, dark headed borer, *C. polychrysus*, gold fringed stem borer, *C. auricilius*, yellow stem borer, *Scirpophaga incertulas*, *S. innotata* and pink borer, *Sesamia inferens* are affecting stem. The defoliators, rice ear-cutting caterpillar, *Mythimna separata*, rice swarming caterpillar, *Spodoptera mauritia*, army worms, *S. litura* and *S. exigua* are affecting rice leaf, stem and stem nodes and *M. separata* prefers rice ear. The bugs, like pentatomid bugs, *Scotinophara coarctata* and *S. lurida* are affecting rice stem, nodes and panicles (Table 59).

**Table 60. Quarantine insect pests of rice for China**

Common name/ Scientific name	Family	Materials accompanied
Rice water weevil <i>Lissorhoptrus oryzyphilus</i> Kuschel	Curculionidae	Free riding on human transport, seedlots/packing materials
Granary weevil <i>Sitophilus granarius</i>	Curculionidae	Seed

Rice water weevil (*Lissorhoptrus oryzyphilus*) may be introduced to a new region/country as free riding on human transport, seedlots/packing materials and granary weevil (*Sitophilus granarius*) may be accompanied by seeds (Table 60).

**Table 61. Quarantine insect pests of rice in India**

<i>Common name</i>	<i>Scientific name</i>	<i>Major hosts</i>	<i>Material accompanied</i>
American sugarcane borer	<i>Diatraea saccharalis</i> (F.)	Sugarcane, rice	Straw, hay
American rice stalk borer	<i>D. plejadellus</i> Zinck	Rice	Straw, hay
Neotropical corn borer	<i>Zeadiatraea lineolata</i> (Walk.)	Maize, rice, sorghum	Straw, hay
Yellow headed borer	<i>Diatraea centrella</i> (Mosch)	Sugarcane, maize, sorghum, rice	Straw, hay
Greater grain borer	<i>Prostephanus truncatus</i>	Wheat, rice	Seeds
Granary weevil	<i>Sitophilus granarius</i> (L)	Stored grain, rice in field	Seeds
Smaller strain grain weevil	<i>S. sasakii</i> (Takahashi)	Wheat, rice	Seeds
Maize weevil (large strain)	<i>S. zeamais</i> (Motschulsky)	Wheat, rice, maize	Seeds
Confused flour beetle	<i>Tribolium confusum</i> (J. du Val.)	Flour mills	Seeds

American rice stalk borer (*Diatraea plejadellus*), Yellow headed borer (*Diatraea centrella*) Greater grain borer (*Prostephanus truncatus*) granary weevil (*Sitophilus granarius*) Smaller strain grain weevil (*S. sasakii*) and confused flour beetle (*Tribolium confusum*) are the quarantine rice insect pests of India. These are accompanied by straw, hay and seeds from the imported countries (Table 61).

**Table 62. Quarantine insect pests of rice for Bangladesh**

<b>Sl.No</b>	<b>Common name</b>	<b>Scientific name</b>	<b>Materials accompanied</b>
1	Army worm	<i>Spodoptera littoralis</i>	Straw, hay and seeds
2	Whorl maggot	<i>Hydrellia sassakii</i>	Straw, hay and seeds
3	Rice water weevil	<i>Lissorhoptrus oryzophilus</i> (J.)	Free rice in human transport, seedlots/packing materials

Army worm (*Spodoptera littoralis*), whorl maggot (*Hydrellia sassakii*) and Rice water weevil (*Lissorhoptrus oryzophilus*) are the quarantine rice insect pests in Bangladesh. These are accompanied by hay, straw, plant parts and grain (Table 62).

#### 4.5 Quarantine Diseases of rice

Every country has listed some pathogen as quarantine pests to save their rice crop from unexpected damage. In some country the existing pathogen has also been listed as quarantine pest. The reason is that some pathogen has wide variability among their population and also there are different pathotypes in different countries. Therefore, entry of a new pathotype into the country may create addition hazard for rice production. For example Blast disease is present in the Philippines still this pathogen has been listed as a quarantine pest. Besides *Pyricularia oryzae*, the causal agent of blast disease, *Xanthomonas oryzae* pv. *oryzae*, *Xanthomonas oryzae* pv. *oryzicola* the causal agents of Bacterial leaf blight and Bacterial leaf streak and *Aphelenchoides besseyi*, the causal organism of white tip disease of rice. A list of quarantine pathogen of rice for Philippines are shown in Table 63.

**Table 63. Quarantine diseases of rice for Philippines**

Scientific Name	Affected Plant Parts
<i>Pyricularia oryzae</i> Cav.	Leaves, nodes, panicles, grains
<i>Xanthomonas oryzae</i> pv. <i>oryzae</i>	Leaves, panicles
<i>Xanthomonas oryzae</i> pv. <i>oryzaicola</i>	Leaves, panicles
<i>Aphelenchoides besseyi</i>	Leaves, panicles, grains

**Table 64. Quarantine diseases of rice for China**

Common name/Scientific name
<b>Nematode</b>
<i>Ditylenchus angustus</i>
<i>Xanthomonas oryzae</i> pv <i>oryzae</i>
<i>Xanthomonas oryzae</i> pv <i>oryzicola</i>
<i>Rhizoctonia solani</i> Kühn

The list of quarantine pathogens for China is shown in Table 64. Quarantine Pathogens for China include *Ditylenchus angustus*, *Xanthomonas oryzae* pv *oryzae*, *Xanthomonas oryzae* pv *oryzicola* and *Rhizoctonia solani* the causal agents of Ufra, BLB, BLS and Sheath blight disease respectively.

### Quarantine diseases of rice for Bangladesh

Considering the presence or absence of any disease in Bangladesh and also the pathotype variations 11 diseases are identified as quarantine pests for Bangladesh. The diseases are Udbatta, Downy mildew, Blast, Bacterial leaf blight, Bacterial leaf streak, Sheath brown rot, Dwarf, Stripe, Grassy stunt and Ragged stunt should be considered as prohibited pests. Detail list of diseases with the pathogen are shown in Table 66.

**Table 65. List of quarantine diseases of rice for Bangladesh**

Sl.	Disease	Pathogen	Pathway
1	Udbatta	<i>Balansia oryzae-sativae</i>	Seed for planting, plant parts
2	Downey mildew	<i>Sclerophthora macrospora</i>	Seed for planting, plant parts
3	Blast	<i>Pyricularia grisea</i>	Seed for planting, plant parts
4	Bacterial blight	<i>Xanthomonas oryzae</i> pv <i>oryzae</i>	Seed for planting, plant parts
5	Bacterial leaf streak	<i>Xanthomonas oryzae</i> pv <i>oryzicola</i>	Seed for planting, plant parts
6	Sheath brown rot	<i>Pseudomonas fuscovaginae</i>	Seed for planting, plant parts
7	Dwarf	<i>Rice dwarf virus</i>	Insect vector, egg mass
8	Stripe	<i>Rice stripe virus</i>	Insect vector, egg mass
9	Grassy stunt	<i>Rice grassy stunt virus</i>	Insect vector, egg mass
10	Ragged stunt	<i>Rice ragged stunt virus</i>	Insect vector, egg mass

## **5.0 PEST RISK ANALYSIS OF IMPORTED HYBRID RICE SEED**

Pest may be defined as any species, strain or biotype of plant or animal or any pathogenic agent injurious to plants or plant products. Pest Risk Analysis (PRA) is the process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it.

Pest Risk Analysis (PRA) consists of three stages namely initiating the process for analyzing risk, assessing pest risk and managing pest risk. Initiating the process involves identification of pests or pathways for which the PRA is needed. Pest risk assessment determines whether each pest identified as such, or associated with a pathway, is a quarantine pest characterized in terms of likelihood of entry, establishments, spread and economic importance. Pest risk management involves developing, evaluating, comparing and selecting options for reducing the risk.

### **5.1 Initiation of process for analyzing risk**

Generally there are two initiation points for a pest risk analysis as given below:

- a) The identification of a pathway, usually an imported commodity, that may allow the introduction and/or spread of quarantine pest,
- b) The identification of a pest that may qualify as a quarantine pest.

In our country plant materials may enter through air, land or sea. In the system plant quarantine activities were performed at all the three pathways. There are 3 airports, 2 sea ports and 12 land ports presently operating in Bangladesh. Qualified personnel like plant pathologists and entomologists were engaged at each port and necessary facilities for pests and diseases checking were available. Thus, quarantine pests and diseases are easily identified at the port of entry.

The lists of quarantine pests and diseases of rice were identified and shown in earlier chapter.

### **5.2 Pest risk assessment**

Once a pest is identified as quarantine pest, the next stage is to assess its risk. The criteria for identifying a quarantine pest are of prime importance. It may be remembered that quarantine pest should have potential economic importance to the area endangered, not yet present there, or present but not widely distributed and being officially controlled. Endangered area means an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss. It is further remembered that if the pest is present in the PRA area and has widely distributed, then the pest does not qualify as a quarantine pest. On the other hand if the pest is present in the PRA area and is not widely distributed and the pest is subject to official control in the PRA area, then the pest is qualified as quarantine pest. Further if the pest is absent in the PRA area, then it is considered as quarantine pest.

In the present study, considering the above points, the lists of quarantine pests of rice were prepared and presented in the report.

### 5.2.1 Pest Risk Assessments for insect

Pest Risk Assessment tool maximizes safety and reduces risk. In the past possibly a considerable number of exotic species have been imported as pests along with plants or plant materials. Some of them have settled and caused some problems; the damage of rice plants is sometimes severe and subsequently causes heavy loss of crop. Hybrid seeds are imported from abroad for planting purpose in Bangladesh. Therefore, pest risk analysis and assessment are important issues for hybrid varieties.

As an example Rice water weevil (*L. oryzaophilus*) is considered as one of the quarantine insect pests for Bangladesh. Pest risk assessment of this pest is elaborated below:

#### Elements of categorization

This insect pest is absent in the PRA area

This is considered as prohibited pest

The possibility of its appearance in Bangladesh is in Boro season

#### Host range

Other than rice, this insect pest has a large number (64) of alternate host of which most of them belong to Graminee Family which are available in Bangladesh

#### Suitability of Environment

Rice water weevil cause damage to the crop at or above 21<sup>0</sup>C. The temperature of Bangladesh is conducive for this pest.

#### Conclusion

This pest has been considered as quarantine pest and there is possibility of its introduction in Bangladesh through packing materials, seedlots and human transports as free rider. The environmental condition of Bangladesh is favourable for its establishment and spread. The alternate hosts of this pest are available in the country. Thus it may be concluded that introduction of this pests may cause economic damage to the crop

### 5.2.2 Pest risk assessment for diseases

#### Identification of the disease

From the disease survey reports of Bangladesh Rice Research Institute and discussion with DAE officials it was evident that Udbatta disease of rice caused by *Ephelis oryzae* is absent in Bangladesh. This disease has got the potentiality of causing significant damage to the crop. The environmental condition of Bangladesh is congenial for the development of this disease. Therefore, *Ephelis oryzae* the causal agent of udbatta disease of rice is identified as a quarantine pest for Bangladesh. This pathogen is seed borne and there is possibility of introduction of this pest into the territory of Bangladesh if proper care is not taken.

#### Identification of the pathway

This requires phytosanitary measures to prevent its entry into the territory of the country. This pathogen is internally seed-borne (Mohanty 1964) in rice. Internally borne pathogen could survive in the seed as long as the seed remains viable. Therefore, the probable pathway of entry is through seed from the country of origin where this disease is present.

### ***Identification of PRA area***

Bangladesh.

### ***Information***

Collected information from different sources eg. survey data from Bangladesh Rice Research Institute, other published documents (Talukdar 1974) and limited field survey during this process show that udbatta disease caused by *Ephelis oryzae* is absent in Bangladesh. Its present distribution is in China and India and 5-30% panicle infection has been reported from these countries. Temperature for germination of spore ranged 18-30°C, best at 26°C.

It has a quite big host range namely *Isachne elegans*, *Eragrostis tenuifolia*, *Arthraxon ciliaris* var. *coloratus*, *Saccolipsis indica*, *Cynodon dactylon*, *Pennisetum* spp., and rye (Ou, 1985).

### **Conclusion of initiation**

At the end of Stage 1, the initiation point, the pests and pathways of concern and the PRA area has been identified. Relevant information has been collected and pests have been identified as possible candidates for phytosanitary measures, either individually or in association with a pathway.

### **Categorization**

The disease is categorized as prohibited pest.

### **Elements of categorization**

The identified pest is *Ephelis oryzae*, the causal agent of udbatta disease of rice

This pathogen is absent in the PRA area

This is considered as prohibited pest

The environmental condition in Bangladesh is conducive for its establishment and spread in PRA area

### **Identity of pathogen**

*Ephelis oryzae*

### **Presence or absence in PRA area**

This pest is absent in all parts of the PRA area

### **Potential for establishment and spread in PRA area**

The environmental condition in Bangladesh is conducive for its establishment and spread through out the country. For the development of this disease 28°C soil temperature is most favourable. The principal host of this pathogen is rice, which is grown in the PRA area through out the year. Besides the other hosts are also available in the country. Therefore if this could enter in the territory there is every possibility for its establishment and spread.

### **Potential for economic consequences in PRA area**

Reports from the country of origin indicated that this pathogen caused 5-30% yield loss in rice. This information clearly indicates that the pest is likely to have an unacceptable economic impact in the PRA area.

### **Conclusion of pest categorization**

The identified pathogen is a potential quarantine pest.

### **Assessment of the probability of introduction and spread**

Rice seed especially hybrid rice seed is imported regularly from China and India for planting purpose. As the identified pest is seed-borne there is high probability of its introduction with the seed if this disease is present in the seed production area of the country of origin. This pathogen may also come through weed seed if there is any mixture with infected weed seed. Other pathways is not known yet.

### **Probability of the pest being associated with the pathway at origin**

This disease is not present in all the rice growing areas of the country from where it was reported. Therefore the probability of being associated with the pathway depends on the seed growing area. If the disease is present in the seed growing areas, there is high probability of its association with the commodity.

### **Probability of survival during transport or storage**

The inoculum of the pathogen is internally seed-borne and thus it would remain alive as long as the seeds are alive.

### **Probability of pest surviving existing pest management procedures**

Information relating to management option is inadequate so the probability of surviving the pest is high.

### **Probability of transfer to a suitable host**

Beside rice some other grass hosts are available in the PRA area and the organism could easily be transferred to those hosts.

### **Probability of establishment**

Hosts are readily available; the principal host rice is grown in Bangladesh throughout the year. Besides there are number of weed hosts available in the PRA area. Moreover, environment is conducive for the development and proliferation of the disease and there is high potentiality for its establishment.

This could well survive in seed as well as other hosts.

Regarding cultural practices and control measures not much information is available. However, seed-borne inoculum could be controlled by hot water treatment at 54°C for 10 minutes.



### **Availability of suitable hosts, alternate hosts and vectors in the PRA area**

The host and alternate hosts are widely distributed in the PRA area. Alternate hosts include *Isachne elegans*, *Eragrostis tenuifolia*, *Arthraxon ciliaris* var. *coloratus*, *Saccolipsis indica*, *Cynodon dactylon*, *Pennisetum* spp., and rye majority of these are widely available in the PRA area.

The identified pest completes its life cycle in the same host. So, there is no question of the requirement of alternate host for completing the life cycle. Moreover as in the main host, this can also complete its life cycle in any of the other hosts. Although rice is grown in the country throughout the year, even if there is no rice the pest could survive on other hosts. There is no vector for the spread of this pathogen, it spread through wind.

### **Suitability of environment**

Spores of the pathogen germinate at 18-30°C and the optimum are 26°C. Spores on infected kernels are able to overwinter. Infection being initiated at the time of emergence of the panicle. A high soil temperature (28°C) and abundant soil moisture in the nursery bed during the first week after sowing and in subsequent stages were conducive to the disease. Air temperature had no direct impact on seedling infection. Similar environmental conditions also prevail in the PRA area.

### **Cultural practices and control measures**

Cultural practices for rice growing in India, China and Bangladesh are more or less similar. Therefore, there is no possibility of reduced development of the disease due to cultural practices followed in Bangladesh.

Pest control programs for this pest in the PRA area is not available so there are high level probability of establishment of this pest. Therefore, the risk is also high.

### **Other characteristics of the pest affecting the probability of establishment**

These include:

- *Reproductive strategy*: This pest reproduces asexually and survives in the seed. The conidia are wind-borne. A single life cycle is completed in a crop season. From infected seed it transmits to the seedling for which the favourable soil temperature is 28°C. Air temperature has no impact on the epidemiology of the disease. Conidia germinate between 18-30°C. Subsequent seed infection occurs at the time of panicle emergence. Similar environmental conditions prevail in the PRA area thus the pest could reproduce effectively in the PRA area and survive in the seed over season.
- *Genetic adaptability* – Although there are variability Among the host varieties with respect to resistance such variability Among the population of this pathogen is not yet known. However, as the environment is similar of its origin and also there is range of varieties cultivated in the PRA area and there are other alternate hosts there is every possibility of adapting this pest in the PRA area.
- *Minimum population needed for establishment* – The threshold population for establishment of this pest is not known. However, from experience with other seed-borne fungi it is assumed that the internally borne inoculum of this pathogen has very high

probability of transmitting to the seedling. Because of its systemic nature one infected seed should be sufficient to cause the disease and once there is disease in the field the air-borne conidia should spread and cause infection to the emerging panicles and also alternate host and the pathogen become established.

### **Probability of spread after establishment**

This pathogen has a high potential for spread and the means of spread is wind. When the conidia spread by wind it not only cause secondary infection to the main host but also to the alternate host and when such situation arises it becomes very difficult to eradicate the disease. Information from the origin of this disease it could be concluded that

- The environment is suitable for natural spread of the disease
- There is high probability of its movement through commodities (seed)

### **Conclusion on the probability of introduction and spread**

The overall probability of introduction should be expressed in terms most suitable for the data, the methods used for analysis, and the intended audience. This may be quantitative or qualitative, since either output is in any case the result of a combination of both quantitative and qualitative information. The probability of introduction may be expressed as a comparison with that obtained from PRAs on other pests.

### **Conclusion regarding endangered areas**

Any part of the PRA area is suitable for the development and establishment of this disease therefore; the whole PRA area is identified as endangered area.

### **Direct pest effects**

In main host (rice) the level of panicle infection in the field is reported as high as 30%. By nature this disease when infect a panicle the whole panicle become damaged and there is no grain in the infected panicle. Therefore, 30% panicle infection means more or less 30% yield loss.

### **Conclusion of the pest risk assessment stage**

This pest has been considered as quarantine pest and there is high probability of its introduction in the territory of Bangladesh through seed if imported from the area where this disease occurs. The environmental condition of Bangladesh is conducive for the establishment and spread of this important and alternate hosts are available in the country. Considering all these factors it may be concluded that introduction of this pest may cause potential economic consequences to the country.

## **5.3 Pest Risk Management**

The last stage of pest risk analysis is the pest risk management. It refers to the generation and evaluation of management options. Mainly it is based on the information gathered in the pest risk assessment. A list of options for reducing risk to an acceptable level should be assembled. These options will primarily concern pathways and in particular the conditions for permitting entry of commodities. The possible options are: a) inclusion in the list of prohibited pest, b) Phytosanitary inspection and certification prior to export, c) requirements like treatment, origin

from pest free areas, growing season inspection, certification scheme are to be satisfied before export, d) inspection at entry, e) treatment at point of entry, f) detention in post entry quarantine, g) post entry measures, and h) prohibition of entry of specific commodities from specific origins.

The efficacy and impact of various options in reducing risk to an acceptable level should be evaluated, in terms of the following factors:

- a) Biological Effectiveness
- b) Cost and benefit of implementation
- c) Impact on existing regulations
- d) Commercial impact
- e) Social impact
- f) Phytosanitary policy considerations
- g) Time to implement a new regulation
- h) Efficacy of options against other quarantine pests and
- i) Environmental impact

The risk management option as elaborately stated above is equally applicable to the listed quarantine pests of rice in Bangladesh. In all cases, three requirements namely Import Permit, Phytosanitary Certificate and Post Entry Quarantine are compulsory, and in some cases, treatments of imported material as well as additional declaration to Phytosanitary Certificate are necessary.

In cases of exportable items, the export plant materials must be free from Quarantine pests, issue of Phytosanitary Certificate and Treatment of materials, if needed are the requirements before import of any plant material.

### **5.3.1 Pest Risk Management For Insect Pests**

Management practices of quarantine insect pests are described below:

#### **Management of Army worm (*Spodoptera littoralis*)**

1. Light trapping
2. Perching
3. Ploughing the land after harvest, burning and destruction of stubbles
4. Use of recommended insecticides when necessary

#### **Phytosanitary measures for *Spodoptera littoralis*:**

The owner of plant quarantine materials importing into Bangladesh shall respect to phytosanitary conditions as follows:

1. The materials must be accompanied with a phytosanitary certificate issued by Plant Quarantine Authority of country exporter in model stipulated in International Plant Protection Conjunction
2. The materials must be free from plant Quarantine pests and other dangerous pests of Bangladesh. In case of materials damaged by the above pests, the phytosanitary

treatment (includes selecting eliminating, re-processing and cleaning, decontaminating retaining) shall take place prior to importing.

3. Bangladesh plant quarantine authority keep it's right to ask for referring back to the place of origin or destroying plant quarantine materials in case of serious damage that could not be treated

#### **Management of Rice water weevil (*Lissorhoptrusn oryzophilus* (J))**

1. Physical method
2. Sanitation
3. Treatment of seeds with botanical pesticides

#### **Phytosanitary measures for *L. oryzophilus*:**

The owner of plant quarantine materials importing into Bangladesh shall respect to phytosanitary conditions as follows:

1. The materials must be accompanied with a phytosanitary certificate issued by Plant Quarantine Authority of country exporter in model stipulated in International Plant Protection Conjunction
2. The materials must be free from plant Quarantine pests and other dangerous pests of Bangladesh. In case of materials damaged by the above pests, the phytosanitary treatment (includes selecting eliminating, re-processing and cleaning, decontaminating retaining) shall take place prior to importing.
3. Bangladesh plant quarantine authority keep it's right to ask for referring back to the place of origin or destroying plant quarantine materials in case of serious damage that could not be treated

#### **Management of Whorl maggot (*Hydrellia sassakii*)**

1. Draining out of standing water from the field
2. Light trapping
3. Use of recommended insecticide

#### **Phytosanitary measures for *Hydrellia sassakii*:**

The owner of plant quarantine materials importing into Bangladesh shall respect to phytosanitary conditions as follows:

1. The materials must be accompanied with a phytosanitary certificate issued by Plant Quarantine Authority of country exporter in model stipulated in International Plant Protection Conjunction
2. The materials must be free from plant Quarantine pests and other dangerous pests of Bangladesh. In case of materials damaged by the above pests, the phytosanitary treatment (includes selecting eliminating, re-processing and cleaning, decontaminating retaining) shall take place prior to importing.
3. Bangladesh plant quarantine authority keep it's right to ask for referring back to the place of origin or destroying plant quarantine materials in case of serious damage that could not be treated

### 5.3.2 Pest Risk Management For Diseases

Management options of quarantine diseases are described below:

#### **Management of Udbatta disease (*Ephelis oryzae*)**

Not much information is available for the management of this disease. Reports from India indicated that hot water seed treatment (54°C for 10 mins) and application of a fungicide Tecto-60 effectively controlled the disease. Nothing is known about the varietal resistance of the disease.

#### **Phytosanitary measures for *Ephelis oryzae***

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this pathogen is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

#### **Other hosts of this pathogen**

*Isachne elegans*, *Eragrostis tenuifolia*, *Arthraxon ciliaris* var. *coloratus*, *Saccolipsis indica*, *Cynodon dactylon*, *Pennisetum* spp., and rye (Ou, 1985).

#### **Management of Downy Mildew (*Sclerophthora macrospora*)**

Very little works have been reported on the management of this disease. This disease become severe at low temperature and 18-20°C is the optimum. Infected seedlings become healthy after 20 days at 35°C or after 30 days if the night temperature does not fall below 30°C. The disease is more severe in dry seedbed compared to wet seedbed.

#### **Phytosanitary measures for *Sclerophthora macrospora***

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this pathogen is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

#### **Other hosts of this pathogen**

More than 43 genera under family Gramineae, oats, barley, wheat, rye, millet and maize.

#### **Management of blast (*Pyricularia grisea*)**

Integrated approach of cultivating resistant/moderately resistant varieties, cultural management and chemical application is effective against the disease. However most of the popular varieties are susceptible. There is a tendency of the farmers to use more nitrogenous fertilizer, which aggravates the disease severity; therefore all the fertilizers should be used in balanced dose. From initiation of the disease the field should be kept flooded and application of additional Potash fertilizer help slow down the disease spread. Seeds should be free from the pathogen and therefore no seed should be collected from infected field. Recommended fungicides like Trooper/ Zeal/ Hinosan / Tilt etc. may be applied twice at 15 days interval if required.

### **Phytosanitary measures for *Pyricularia grisea***

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. Seed should not be collected from blast infected field. Provision of Seed Health testing following proper sampling and appropriate testing method should be done in the exporting countries and there should be declaration that the seed lot is free from the pathogen.

### **Management of bacterial leaf blight (*Xanthomonas oryzae pv oryzae*)**

The disease can be managed by avoiding cultivating a single variety in a large area rather resistant or moderately resistant varieties should be grown along with popular variety which is susceptible. Excess nitrogenous fertilizer increases the rate of disease development thus fertilizers to be used in balanced proportion and nitrogenous fertilizer to be applied in three equal splits. Urea top dressing just after storm aggravate the disease and this can be used after 7-10 days of storm. At vegetative stage of the crop drying the land for 7-10 days after disease appearance arrest disease development. After harvesting of T. Aman, the residue and stubble should be burnt in the field.

### **Phytosanitary measures for *Xanthomonas oryzae pv oryzae***

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. Seed should not be collected from the disease free field. Provision of Seed Health testing following proper sampling and appropriate testing method should be done in the exporting countries and there should be declaration that the seed lot is free from the pathogen.

### **Management of bacterial leaf streak (*Xanthomonas oryzae pv oryzicola*)**

The disease can be controlled by proper application of fertilizers and proper planting spacing, the use of resistant varieties, and hot water treated seeds.

Practicing field sanitation is important. Ratoons, straws and volunteer seedlings left after harvest can be destroyed to minimize the initial inoculum at the beginning of the season. Providing good drainage system especially in seedbeds can also manage this disease.

Planting of resistant varieties, is the most effective method of controlling bacterial leaf streak. Fallow field and allowing to dry thoroughly is also recommended.

### **Phytosanitary measures for *Xanthomonas oryzae pv oryzicola***

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. Seed should not be collected from the disease free field. Provision of Seed Health testing following proper sampling and appropriate testing method should be done in the exporting countries and there should be declaration that the seed lot is free from the pathogen.

### **Management of Sheath brown rot (*Pseudomonas fuscovaginae*)**

*Pseudomonas fuscovaginae* may be eradicated from seed samples by dry heat treatment at 65 °C, for 6 days (Goto *et al.* 1987). This harsh treatment does not significantly reduce the germination of recently harvested indica rice, which remains high for several months. This treatment is useful for experimental seed lots, and CIAT heat-treats all seed sent to cooperators. The pathogen is also susceptible to kasugamycin.

### **Phytosanitary measures for *Pseudomonas fuscovaginae***

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this pathogen is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

### **Management of virus diseases**

Management of Dwarf disease-Rice dwarf virus

Chemical control of the vector is effective only when the insect population is low, but when the population is very high, use of insecticide may not give any control of the disease. Use of resistant varieties.

### **Phytosanitary measures for Rice dwarf virus**

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this disease is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

### **Management of Stripe-Rice stripe virus**

Chemical control of the vector is effective only when the insect population is low, but when the population is very high, use of insecticide may not give any control of the disease. Use of resistant varieties.

### **Phytosanitary measures for Rice stripe virus**

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this disease is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

### **Management of Grassy stunt**

Chemical control of the vector is effective only when the insect population is low, but when the population is very high, use of insecticide may not give any control of the disease. Use of resistant varieties.

### **Phytosanitary measures for Grassy stunt**

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this disease is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

### **Management of Ragged stunt**

Chemical control of the vector is effective only when the insect population is low, but when the population is very high, use of insecticide may not give any control of the disease. Resistant varieties can be used to control the disease.

### **Phytosanitary measures for ragged stunt**

Importing of planting materials especially seed from the country or region of the country where this pathogen is present should be prohibited. However, seed or planting material from other region of the country where this disease is absent may be imported. In such case necessary field inspection and declaration on its absence is essential.

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## TERMS OF REFERENCE (TOR)

### 1. Background of the program.

Government of Bangladesh has initiated Quarantine Services Strengthening Program (QSSP) for up gradation of Lab facilities & capacity building of quarantine related Personnel.

### 2. Objectives of the Assignment

The objective of the assignment is to conduct Pest Risk Analysis of Rice, Listing of quarantine pests and Pest Risk Analysis of imported hybrid seed.

### 3. Scope of assignment

- a) Survey and summarize the Pest & Diseases with causal organism of Rice (both production & storage level) in Bangladesh (Survey should be done at least 20 Districts and 50 upazilas indicated by under singed).
- b) Listing of Quarantine Pests of Rice.
- c) Pest Risk Analysis of Imported seeds.

The list of Districts & upazilas must be included for survey

Sl. No.	Districts	Upazilas	Remarks
1.	Rangpur	Sadar, Mithapukur, Badargonj	Interview must be done with at least 10 Farmers, one SAAO, one Upazila level Officer per Upazila. One District level officer per district. <i>Interviewing BIRRI Officials located in those areas.</i>
2.	Dinajpur	Sadar, Fulbari, Birampur, Birgonj	
3.	Bogra	Sherpur, Adamdighi, Sibgonj	
4.	Noogaon	Sadar, Patnitala, Sapahar	
5.	Rajshahi	Tanor, Godagari, Baghmara	
6.	Pabna	Sadar, Sujangar	
7.	Sirajgonj	Sadar, Tarash	
8.	Jessore	Monirampur, Bagharpara	
9.	Khulna	Digholia, Batiaghata	
10.	Jhenidah	Sadar, Harinakundu	
11.	Barisal	Bakhergonj, Gournadi	
12.	Faridpur	Sadar, Nagorkanda	
13.	Tangail	Sadar, Modhupur	
14.	Sherpur	Sadar, Nokla	
15.	Mymensingh	Trishal, Fulpur, Ishwargonj	
16.	Kishorgonj	Sadar, Kotiadi, Bazitpur	
17.	Netrokona	Sadar, Purbadhala	
18.	Habigonj	Sadar, Madhavpur	
19.	Comilla	Sadar, Burichong, Barura.	
20.	Chittagong	Mirsharai, Satkania, Putia	

#### 4. List of reports, Schedule of deliveries, period of performance

Sl. No	Report	Time frame
01	Final Report	Within 15 days after the completion of the assignment
02	Others as required by client	As and when needed.

It is noted that payment will be withheld in delay submission of the report.

#### 5. Data, personnel, facilities and local services to be provided by the Client

All required information and documents are available in the office of Program Director, QSSP, PPW, DAE. The consulting firm may ask any report, information or any other related document for ensuring the quality of works. It is noted that the no information and documents can be shared or used by other parties without prior permission of the client.

#### 6. Institutional arrangements

QSSP, PPW, DAE will introduce the consulting firm with the present institutional set-up of DAE. Making all other arrangement for completion of quality works is the responsibility of the consulting firm. QSSP, PPW, DAE will not take responsibility regarding any accident, or any unexpected situation created by the personnel employed by the consulting firm for supervision of works.

**PHOTOGRAPHS OF FIELD VISIT**





**PHOTOGRAPHS OF REVIEW WORKSHOP**



**TENTATIVE SCHEDULE FOR FIELD VISIT FOR DATA COLLECTION**

Team	Team Personal	Name of District	Name of Upazila	Date		Remarks
				From	To	
<b>Team No-1</b>	1. Mozadded Hossain 2. Abdullah Al Madani	Bogra	Sherpur, Adamdighi, Sibgonj	28/3/11	30/3/11	
		Dinajpur	Sadar, Fulbari, Birampur, Birgonj	31/3/11	3/4/11	
		Rangpur	Sadar, Mithapukur, Badargonj	4/4/11	6/4/11	
<b>Team No-2</b>	3. Sarwar Azam 4. Siba Brata	Naogaon	Sadar, Patnitola, Sapahar	28/3/11	30/3/11	
		Rajshahi	Tanor, Godagari, Baghmara	31/3/11	2/4/11	
		Pabna	Sadar, Sujanagar	3/4/11	4/4/11	
		Sirajgonj	Sadar, Tarash	5/4/11	6/4/11	
<b>Team No-3</b>	5. Azad Hossain 6. Liton Debnath	Barisal	Bakhergonj, Gournadi	28/3/11	29/3/11	
		Faridpur	Sadar, Nagorkanda	30/3/11	31/3/11	
		Jhenaidah	Sadar, Harinakundu	1/4/11	3/4/11	
		Jessore	Monirampur, Bagarpara	4/4/11	5/4/11	
		Khulna	Digholia, Batiaghata	6/4/11	7/4/11	
<b>Team No-4</b>	7. Ashimkumar Saha 8. Hanif Uddin	Tangail	Sadar, Madhupur	28/3/11	29/3/11	
		Sherpur	Sadar, Nokla	30/3/11	31/3/11	
		Mymensingh	Trishal, Fulpur, Ishwargonj	1/4/11	4/4/11	
		Netrokona	Sadar, Purbadhala	5/4/11	6/4/11	
<b>Team No-5</b>	9. Shimul Das 10. Jahedul Alam	Chittagong	Mirshorai, Satkania, Potia	28/3/11	30/3/11	
		Comilla	Sadar, Burichong, Barura.	31/3/11	2/4/11	
		Habigonj	Sadar, Madhavpur	3/4/11	4/4/11	
		Kishorgonj	Sadar, Kotiadi, Bazitpur	5/4/11	7/4/11	

**LIST OF FIELD VISITORS OF DAE OFFICIALS**

<b>Group</b>	<b>Name of visitors with designation</b>	<b>Region</b>
Group-A	1. Mr. Md. Saiful Islam. Quarantine Entomologist, PPW, DAE, Dhaka. 2. Mr. Md. Tariqul Islam. Plant Pathologist, PPW, DAE, Dhaka.	Barisal, Jessore and Rajshahi
Group-B	1. Mr. Md. Mansur Alam. Quarantine Entomologist, PPW, DAE, Dhaka. 2. Mr. Azizul Hoque. Lab Assistant, PPW, DAE, Dhaka	Rangpur
Group-C	1. Mr. Md. Abdus Satter Khan. Deputy Director (Quarantine), PPW, DAE, Dhaka. 2. Mr. Md. Ayub Hossain. Program Director, QSSP, PPW, DAE, Dhaka.	Mymensingh
Group-D	1. Mr. Md. Muksedur Rahman. Quarantine Pathologist, PPW, DAE, Dhaka. 2. Mr. Md. Ahsanulla. Quarantine Entomologist, PPW, DAE, Dhaka.	Comilla, Sylhet and Mymensingh



## Annexure-VI

### SURVEY ON INSECT PESTS AND DISEASES OF RICE

#### Questionnaire for Field Survey of Insect Pests/Disease of Rice

A. Farmers Interview

Date of Interview:

1. Name of Farmer:

Village:

Union:

Upazila:

District:

2. Male-1/Female-2:

3. Age:

4. Education (No education=1, Primary=2, Secondary=3, Higher secondary/above=4):

5. Agricultural Farming Experience (No of years.)

6. Are you a member of any farmer's organization (Yes-1, No-2):

If yes, Name ever participates in any Training on Rice (Yes-1, No-2):

7. Did you ever participate in any Training on Rice (Yes-1, No-2):

If yes, where and when

8. Did any insect pests attack your Rice and what are the controls measures taken?

Name of Season	Name of the Insect Pests	Control Measures Taken
Aus.		
T-Aman		
Boro		
Hybrid		
Aus.		
T-Aman		
Boro		

9. Diseases of rice and their control Measures

Name of Season	Name of the diseases	Control Measures Taken
Aus.		
T-Aman		
Boro		
Hybrid		
Aus.		
T-Aman		
Boro		

10. Recorded Insect pests of Rice under stored condition

Insect Pests	Control measure

11. Recorded Diseases of Rice under stored condition

Diseases	Control measure

## Annexure-VII

### SURVEY ON INSECT PESTS AND DISEASES OF RICE

#### Questionnaire for DAE/BRRI Officials

Name of the DAE/BRRI Officials:

Date:

Designation:

Name of Upazila:

District:

1. What are the Major Rice varieties generally grown in your upazila/district?

Aus		T.Aman		Boro	
Hybrid	Others	Hybrid	Others	Hybrid	Others

2. Total Area under Rice in your upazila/district?

Aus		T.Aman		Boro	
Hybrid	Others	Hybrid	Others	Hybrid	Others

3. Recorded Insect pests of Rice and the control measures taken

Crops Season	Insect pests	Control measures
Aus.		
T.Aman		
Crops Season	Insect pests	Control measures
Boro		

Hybrid		
Aus.		
T.Aman		
Boro		

4. Recorded diseases of Rice and the control measures taken

Crops Season	Diseases	Control measures
Aus.		
T.Aman		
Boro		
Hybrid		
Aus.		
T.Aman		

Boro		

5. Major Insect pests & diseases of rice in your District/Upazila/Block

Name of Insect Pests	Name of Diseases

6. Recorded Insect pests under stored condition.

Name of Insect Pests	Control measures

7. Recorded Diseases under stored condition.

Name of Diseases	Control measures



**Annexure-IX**

Format for Field Data collection (Diseases)

Sl No	Variety	Crop stage	Diseases	Parts of Plant affected	Nature of infection	Incidence (%)	Status (High-1 Moderate-2 Low-3)

**Persons Visited**

**Dhaka**

Mr. Md. Hasanul Hoque (Panna), Director, PPW, DAE  
Mr. Md. Abdus Satter, DD, QSSP, PPW, DAE  
Mr. Md. Joynal Abedin, DD, QSSP, PPW, DAE  
Mr. Md. Ayub Hossain, Program Director, QSSP, PPW, DAE  
Mr. Md. Ahsanullah, Quarantine Entomologist, PPW, DAE  
Mr. Md. Moshlehuddin Faruque, Quarantine Entomologist, (L.R), PPW, DAE

**Gazipur**

Dr. Md. Ansar Ali, CSO, Plant Pathology Division, BRRI  
Dr. Mohibul Hassan, PSO, Entomology Division, BRRI

**Rangpur**

Md. Hasanur Rahman, Deputy Director, DAE  
Md. Nur Alam, AEO, Sadar  
Arjun Kumar, SAAO, Sadar  
Md. Khaled Hossain, SO, BRRI  
Mohammad Ali, UAE, Mithapukur  
Mr. Porimol, SAAO, Mithapukur  
Md. Ziaul Haque, UAE, Bodorgonj  
Md. Motiur Rahman, SAPPO, Bodorgonj

**Dinajpur**

Md. Sikander Ali, Deputy Director, DAE  
Md. Abul Hossain Talukder, UAO, Sadar  
Md. Golam Mostafa, SAPPO, Sadar  
Abdur Rashid, UAO, Fulbari  
Md. Mahabubur Rahman, SAPPO, Fulbari  
Md. Shah Alam, UAO, Birampur  
Md. Azmal Hossain, SAPPO, Birampur  
Md. Abdul Barik, SAPPO, Birgonj  
Mr. Promoth Chandro Pal, SAAO, Birgonj

**Bogra**

Md. Ekram Hossain, Deputy Director, DAE  
A.K.M Sadequl Islam, AEO, Sherpur  
Md. Abdus Sattar, SAAO, Sherpur  
Md. Shafiqul Islam, UAO, Shibgonj  
Md. Abdul Hamid, SAPPO, Shibgonj  
Mr. Rowshan Jamal, UAO, Adamdighi  
Md. Abdus Samad, SAAO, Adamdighi



**Naogaon**

Md. Abbas Ali, DD, DAE  
Mr. A.N.M Anwar Hasan, AEO, Sadar  
Md. Moklesur Rahman, SAAO, Sadar  
Md. Akhtaruzzaman, AO, Patnitala

**Rajshahi**

Md. Nurul Amin, DD, DAE  
Dr. Md. E-Tabrij, AO, Bagmara  
Mr. Abdul Barik, SAAO, Bagmara  
Mr. Jafar Iqbal, AEO, Tanor  
Mr. Sultan Selim Ahmed, SAAO, Tanor  
Md. Saiful Alam, AO, Godagari  
Mrs. Tuhia Khatun, SO, BRRI, Rajshahi

**Pabna**

Md. Mannan Hossain, DD, DAE  
Md. Azahar Ali, UAO, Sadar  
Md. Moniruzzaman, SAAO, Sujanagar

**Serajgonj**

Mr. Dulal Chandra Roy, DD, DAE  
Md. Arshed Ali, UAO, Sadar  
Md. Mizanur Rahman, UAO, Taras  
Md. Joinal Abedin, SAAO, Taras  
Md. Amzad Hossain, UAO, Sujanagar

**Jessore**

Mr. Shekh Hemayet uddin, PPS, DAE  
Mr. Partho Protim Saha, UAO, Monirampur  
Mr. Anath Kumar Das, SAAO, Monirampur

**Khulna**

Mr. Mrinal Kanti Das, Deputy Director, DAE  
Md. Hafizur Rahman, UAO, Digholia  
SK. Rafiqul Islam, SAAO, Digholia

**Jhenidah**

Mr. Chaitanya Kumar Das, PPS, DAE  
Md. Abdul Majid, UAO, Sadar  
Mr. Khademul Islam, SAAO, Sadar

**Barisal**

Mr. Debangshu Kumar Saha, Deputy Director, DAE  
Md. Mahabubur Rahman, AAEO, Bakergonj  
Abul Hossan, BRRI, R/S  
Mr. Ratan Kumar Mondal, UAO, Gournadi  
Md. Rafiqul Islam, SAAO, Bakergonj  
Md. Monjur Rashid, SAAO, Gournadi

**Faridpur**

Md. Golam Kibria, Deputy Director, DAE  
Md. Mojibur Rahman, SAAO, Nagarkanda  
Md. Wahiduzzaman, UAO, Nagarkanda  
Md. Haranur Rashid, UAO, Faridpur Sadar  
Ms. Sharmin Akhter, SAAO, Sadar

**Tangail**

S.M. Afazuddin, DD, DAE  
Mir Nurul Alam, UAO, Sadar  
S.M. Ator Hosain, SAAO, Sadar  
Dr. Md. Hajrat Ali, UAO, Modhupur  
Md. Shadat Hossain, SAPPO.Modhupur

**Comilla**

Kbd. Md. Shahid Ullah, D.D, DAE  
Mr. Md Abdul Hye Khan, PPS,  
Mr. Zahirul Islam, UAO, DAE, Sadar  
Mr. Rafiqul Islam, UAO, DAE, Burichong  
Mr. Liaqat Ali. Majumder, UAO, DAE, Barura  
Mr. Humayun Kabir, SAAO, Sadar  
Mr. S.M. Kamruzzaman, SAAO, Burichang  
Mr. Abdul Bari Rathan, SAAO, Barura  
Mr. Md. Abdul Kader, SSO, BRRI  
Mr. Md. Ibrahim Hossain, Scientific Assistant, BRRI

**Mymensingh**

Md. Asadullah, PPS, DAE  
Abdul Majed, UAO, Ishwargonj  
Mostaque Ahmed, SAAO, Ishwargonj  
Md. Saiful Islam, UAO, Trisal  
Md. Ruhul Amin, SAAO, Trisal  
Md. Mofidul Islam, UAO, Fulpur  
Mir Md. Kamrul Hasan, SAPPO, Fulpur

**Kishorgonj**

Md. Abdul Hye, PPS, DAE  
Kbd. Kajol Chandra Pandit, UAO, SADAR  
Abu Md. Enayet Ullah, UAO, Bajitpur  
Md. Atiqur Rahman Sikdar, AEO, Kotiade  
Azizunnahar, SAAO, SADAR  
Bikas Kanti Bhowmik, SAAO, Bajitpur  
Sankar Kumar Sarkar, SAAO, Kotiade

**Netrokona**

Md. Fazlur Rahman, CPS, DAE  
Mir Bazlur Rashid, UAO, Sadar  
Asit Boron Sarker, SAAO, Sadar  
Swapn Kumar Saha, UAO, Purbadhala  
Md. Abdul Monim Khan, SAAO, Purbadhala

**Hobigonj**

J.L. Mojumdar, DD, DAE  
Md. Samsuddin Ahmed, UAO, Sadar  
Md. Jalaluddin, UAO. Madhabpur  
Dr. Monnujan Khanom, PSO. BRRI, Hobigonj  
Abdul Hai, SAAO, Sadar  
Akhtar Hossain, SAAO, Madhabpur

**Sherpur**

Md. Azizullah, PPS, DAE  
Md. Abdul Hamid, UAO, Sadar  
S.M Ali Hosain, SAAO, Sadar  
Md. Ashrafuddin, UAO, Nokla  
Md. Mustafizur Rahman, SAPPO, Nokla

**Chittagong**

Mushtaq Ahmed. DD. DAE  
Saibal Kanti Nandi, UAO, Patia  
Md. Siraj Uddin Hossain, UAO, Satkania  
Ayub Ali UAO, Mirshorai  
Tarun Chowdhury, SAAO, Patia  
Md. Mohiuddin, SAAO. Satkania  
Md. Abdul Hai, SAO, Mirshorai