

Project:
Plant Health Services *initiative* (PHS_i) in Bangladesh

Report on
Participatory Qualitative Survey on Plant Health
Problems

Season: Summer-II, 2004



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Glossary

AAS	=	Agricultural Advisory Society
AC	=	Area Coordinator
ADC	=	Additional Deputy Commissioner
Aman	=	Late Summer rice season
Aus	=	Early Summer rice season
BADC	=	Bangladesh Agricultural Development Corporation
BARI	=	Bangladesh Agricultural Research Institute
1 Bigha	=	33 decimals
Boro	=	Winter rice season
BRRRI	=	Bangladesh Rice Research Institute
BS	=	Block Supervisor
CABI	=	Cooperation in Agriculture and Biological Science International
1 Cork	=	5 ml
DAE	=	Department of Agricultural Extension
DD	=	Deputy Director
DTO	=	District Training Officer
ED	=	Executive Director
FC	=	Field Coordinator
FGD	=	Focus Group Discussion
gm	=	gram
Joli Aman	=	Deep water rice
Kg	=	Kilogram
L	=	Liter
ml	=	Milliliter
MP	=	Muriate of Potash
NEDA	=	Natore Economic Development Association
NGOs	=	Non Government Organizations
PHSi	=	Plant Health Services <i>initiative</i>
PI	=	Principal Investigator
POs	=	Partner Organizations
UAO	=	Upazila Agriculture Officer

Executive Summary

The survey on farmer's knowledge about plant health problems was undertaken by Agricultural Advisory Society (AAS) on behalf of CABI Bio-science, UK. AAS planned to conduct the survey over the course of three different cropping seasons; i.e., Summer-I, Summer-II and Winter. The survey in Summer-I, 2004 and Summer-II, 2004 cropping season has already completed. This report summarizes the results of the survey in Summer-II, 2004 cropping season undertaken at 12 villages in 6 upazilas of Natore (Baraigram and Sadar upazilas), Narsingdi (Raipura and Shibpur upazilas) and Moulvibazar (Srimangal and Sadar Upazilas) district. The work is the continuation of the survey in three different crop seasons at the aim of better understanding the extent of farmer's knowledge about plant health problems.

In Summer-II, the survey was conducted from 11 September 2004 to 9 October 2004. A total of 330 farmers (287 male and 43 female) participated the survey. Initially the existing crops were recorded. According to farmer's opinion, the status of insect, disease and soil problems for each of the crops were recorded (on a scale of 0 to 5) to identify the major plant health problems. To know more information, farmers were divided into small groups to collect representative samples of major plant health problems from the adjacent crop fields. In a 'focused group discussion (FGD)', farmers were asked to express their opinion on local name, identifying characters, nature of damage or symptoms, favourable conditions etc. and preferred problem management practices most commonly applied to resolve the particular problems encountered.

Farmers used one or more local names to identify their plant health problems where some of the common names were found that had no specific meaning. In most of the cases, the local names were found which have translatable, literal meaning. Farmers used different local names on the basis of morphological characters, infestation characteristics or symptoms. Some of the local names were found to be unique to specific localities. Whereas some of the local names of insects such as 'Mazra poka', 'Machhi poka', 'Leda poka' were found comparable in all survey areas. Most of the disease problems have no specific common and local names where farmers generally used some terms such as 'Pocha rog', 'Mora rog', as these names characterized the observed symptom of a particular disease.

Farmers identified about 23 crops in Natore district, 16 crops in Narsingdi district and 16 crops in Moulvibazar district including fruit trees, which have major plant health problems. In Natore district, some crops were found highly damaged by insects such as Rice (Rice stem borer, Rice gall midge), Sugarcane (Sugarcane stem borer), Brinjal (Brinjal shoot and fruit borer), Country bean (Bean aphid), Banana (Banana leaf and fruit beetle), Bitter gourd, White gourd (Cucurbit fruit fly, and Pumpkin caterpillar), Pomegranate (Pomegranate fruit borer) etc. In Narsingdi district, Cabbage and Cauliflower (Cutworm), Brinjal (Brinjal shoot and fruit borer), Country bean (Bean aphid), Bitter gourd, White gourd, Bottle gourd (Cucurbit fruit fly). Yard long bean (Bean pod borer) etc. crops were damaged seriously. In Moulvibazar district, Rice (Rice hispa, Rice case worm), Country bean (Bean aphid), Brinjal (Brinjal shoot and fruit borer) etc crops were found highly susceptible to insect damage. Among the disease problems, Foot rot of vegetables, Sheath blight of rice, Wilt of brinjal, Leaf blight of turmeric, Virus of cucurbits etc. were found to be serious problems of crops. To know the actual situation of pesticide application, farmers were asked to inform the trade name of chemicals, doses, and frequency of application and the effectiveness of these

chemicals against pests. Farmers used some pesticides such as Basudin, Furadan, Malathion, Dursban, Basathrin, Decis, Fenfen, Tafgor, Fenitox, Ripcord, Cymbush, Schincyper, Marshal, etc. to protect their crops from a variety of pest. In most cases, farmers used these chemicals on the basis of the recommendation of pesticide dealers.

Farmers were more interested to protect the insects by pesticides in comparison to disease problems. Some chemicals such as Tilt, Dithane M-45, Ridomil, Rovral, Bavistin, Antracol, Folicur etc. are used to protect the diseases. Farmers were found to use insecticides for disease problems when they failed to identify the problem.

Farmers frequently used some common as well as some unauthorized pesticides to control the destructive pests. Farmers frequently used chemicals to control the Rice stem borer, Rice hispa Rice case worm, Rice gall midge, Brinjal shoot and fruit borer, cucurbit fruit fly, Bean aphid, Bean pod borer, Epilachna beetle etc. To protect the Brinjal shoot and fruit borer, farmers used the pesticides almost everyday and in some cases, 180-220 times in a crop season. In Moulvibazar district, Rice hispa and Rice case worm caused distressing situation for rice cultivation in Aman rice season. To protect these pests, farmers used the pesticides up to 5-15 times in a season. Farmers of Norsingdi district applied pesticides at least 1-3 times in a week to protect their vegetables. In Norsingdi district, the unauthorized 'Indian bish' (comes from India whose trade name is 'Kripcord') becomes very popular to protect 'Brinjal shoot and fruit borer'. Few farmers of Natore and Norsingdi district frequently applied chemicals only for selling their products in the market, not for their own consumption.

Due to devastating flood in Summer-II crop growing season, AAS planned to conduct the survey with representative villages. The summary paper is prepared by the compilation of necessary information from the 12 villages survey reports of Summer-II crop season in Natore, Norsingdi and Moulvibazar districts.

Introduction

Agricultural production accounts for about one third of Bangladesh's gross domestic product and makes up more than 30% of the country's export earnings. Nearly two thirds of the country's population is employed in agriculture; the majority in rice production. Approximately 80% of the country's 130 million people depend on agriculture for their subsistence. Bangladesh is now self-sufficient in food grain production. This is a significant accomplishment as "food security" has long been a major tenant of national policy. Accordingly, there is ample evidence to support the notion that "Agriculture is, indeed, the economic backbone of Bangladesh",

The major crops of the country are rice, wheat, pulses, jute, oilseed, vegetables, potatoes, fruits, sugarcane and cotton. Of these, rice accounts for 75% of the total cultivated area. Fortunately, the production of food grain has increased by more than twice from 11.08 million tons in 1970-71 to 26.94 million tons in 2001-2 and thus the country is effectively self-sufficient in its food grain requirement. Nevertheless, it continues to lag far behind in its capacity to meet the nation's overall nutritional requirements. If the present population growth rate of 1.9% is continued, the country's population will be 153.44 million in 2010, 172.90 million in 2020, and 191.09 million in 2030. In order to maintain "food grain self-sufficiency", production of cereals will have to increase by many folds. Likewise, meeting the nation's nutritional requirement will similarly require sizable increases in the production of vegetables, pulses, oilseeds, fruits etc. Achieving such increases will be a great challenge to the nation. The complexity of the challenge is due to the existence of several, well understood constraints. Of these, resilient Insect pests and diseases (a global concern) are particularly serious threats in Bangladesh.

Estimates of crop losses due to pests vary year by year according to location and kinds of crops. Available reports show losses caused by insect pests, diseases and rodents in rice at 16%, 10% and 1.5% respectively. Under farmers' field conditions, in certain years and in certain places, crop losses reach more than 30% and on rare occasions even up to 80-100%. Similar estimates apply to wheat, jute, sugarcane, pulses, oilseeds, vegetables and fruits. An estimate of annual loss due to insect pests alone has been reported as 16% for rice, 11% for wheat, 20% for sugarcane, 25% for vegetables, 15% for jute and 25% for pulses. Thus weaknesses in Bangladesh's plant health management regime are a known barrier to the achievement of high levels of increased agricultural production. Unfortunately the country is lagging behind in the development and implementation of efficient, eco-friendly plant-health management practices. It is an irony that in spite of the known serious consequences, pesticides, in most cases, still serve as the only method used in protecting crops from massive insect/pest-born losses. Pesticides are often used indiscriminately and at very high rates of application and very frequently without knowing the actual purpose of the pesticide being applied.

About 75% of the total cropped area is under rice cultivation in Bangladesh. The remaining 25% cropped-area is devoted to the production of more than 50 non-rice crops, of which more than 50% are high value cash crops such as vegetables, fruits, spices etc. High value cash cropping has increased tremendously due to favorable market conditions during last 20 years. Marketing of the high value cash crops now faces a new problem; i.e., unduly high production costs in relation to selling prices. It is reported that the production costs in Bangladesh are among the highest in the South Asia region. This is due, in part, to excessive input costs in relation to "farm-gate" market values.

Moreover, the scenario is further complicated by increases in the level of pest and disease infestation. In general farmers are failing to bring to harvest the high yields of good quality of non-rice and rice crops they deserve due to increasingly heavy damage caused by the number of pests and diseases suffered during the cropping cycle. Such damage, especially to high value non-rice crops has become an area of increasing concern among the country's extension and farming communities. In order to protect high value non-rice crops from pest and disease damage, farmers are day-by-day becoming increasingly dependent on the frequent use of dangerous and highly toxic pesticides. Moreover, pesticide adulteration is an increasingly common experience among farmers. In most cases, farmers use pesticides in their fields on the basis of recommendations and advice from their local pesticide dealers. In general, the dealers, themselves are not professional crop/soil/pest scientists and thus we have a situation of the 'blind leading the blind' with certain incentives for both farmers and dealers to advocate the use of inappropriate and/or excessive pesticide levels. Monitoring and supervision of pesticide use by DAE is very minimum at field level. Agricultural research institutes have no role in such monitoring and/or supervision at any level.

Preliminary information indicates, overall, that farmer's knowledge about crop health relating to insects, diseases and soil problems is minimum. Traditionally farmers want to protect their crop with chemicals; this is the result of motivation on plant health management (i.e. crop protection) by DAE, BADC, agricultural research institutes and pesticide companies for the last four decades. By global standards, the plant protection (chemical application) practices of farmers in the country are extremely hazardous. This is becoming an important national issue, because the current low-level of plant protection safety, if left unattended, will cause increased human health risks. Moreover, pesticide use in the current crop protection scenario is almost wholly top-down and gives little consideration to the farmer's role and perception in the overall production/consumption/human health and environment equation. Presently, the consuming civil society is blindly hopeful that chemical usage in crop production will be kept at "Safe and effective" levels. However, on the production side of the equation, farmers are inclined to make maximum and excessive use in order to bring to market the largest quantity of unblemished product possible in the shortest time with the least loss due to insect and disease damage. Thus there are incentives for farmers to use excessive levels of chemicals and disincentives for them to look out for the overall health interests of consumers.

To know the actual situation of plant health problems, Agricultural Advisory Society (AAS) with the funding support of CABI Bioscience, UK planned to conduct a participatory survey over a course of three different crop seasons namely Summer-I, Summer-II and Winter. In Summer-II crop season, the survey was conducted at 12 villages in 6 upazilas of 3 districts namely Natore, Narsingdi and Moulvibazar. Findings of the survey form a baseline for measuring the progress of AAS/CABI Bioscience project on "Plant Health Services *initiative* (PHS)".

Objectives of the Participatory Qualitative Survey

- i) To know more about the local knowledge of plant health problems.
- ii) To identify major insects, diseases and soil problems of different crops.
- iii) To know the level of infestation of the major pests and diseases of different crops and the farmers concept about the problem.
- iv) To know more about the developing health problems of different crops.
- v) To know the pest management practices used by the farmers.
- vi) To know how and why farmers are inclined over use pesticides and how farmers innovated various methods of pest management.

Locations and participants

The participatory qualitative survey on plant health problems is designed to conduct in 3 different crop-growing seasons i.e. Summer-I, Summer-II and Winter. After completion of the survey of Summer-I crop-growing season, the Summer-II survey was conducted from 12 September 2004 to 9 October 2004. A total of 330 farmers (287 male and 43 female) participated in the participatory survey on plant health problems. The survey was conducted at 12 villages in 6 Upazilas of Natore (Baraigram and Sadar Upazilas), Narsingdi (Raipura and Shibpur Upazilas) and Moulvibazar (Srimangal and Sadar Upazilas) district. The devastating flood damaged most of the project area in Summer-II season of this year. For this reasons, representative villages were selected where some new villages were included (except the 30 project villages). Detailed information about the locations, number of participants, name of group coordinators, venues of FGD etc. are shown in Annex-I. Briefly the locations and number of participants of the survey of Summer-II, 2004 crop season are provided in the following Table1

Table1: Locations and Participants of the survey

Duration	Venue		Number of village covered	Number of participating farmers		
	District	Upazila		Male	Female	Total
12 September2004 to 9 October 2004	Natore	Baraigram	4	102	-	102
	Natore	Natore Sadar	4	78	43	121
	Narsingdi	Raipura	1	24	-	24
	Narsingdi	Shibpur	1	21	-	21
	Moulvibazar	Srimangal	1	35	-	35
	Moulvibazar	Moulvibazar Sadar	1	27	-	27
Total			12	287	43	330

Methodology

The participatory qualitative survey was conducted in Summer-II, 2004 crop season at 12 villages in 6 upazilas of 3 districts namely Natore, Narsingdi and Moulvibazar. The researchers in teams of at least two persons conducted the survey. AKM Murshedur Rahman, Entomologist, AAS was the principal surveyor. Initially a survey guideline was prepared. Overall supervision and guideline for the survey was provided by Mr. Harun-Ar-Rashid, Executive Director, AAS. According to the guideline, the following steps were followed:

Village selection

A village was selected where a large number of crops varieties grown and the infestation status of pests and diseases were high. Both agriculturally developed villages and agriculturally undeveloped villages were considered. In Summer-II crop season, a total of 12 villages were selected from 6 upazilas in 3 districts namely Natore, Narsingdi and Moulvibazar district (4 villages from Baraigram upazila, 4 from Natore Sadar upazila, 1 from Raipura upazila, 1 from Shibpur upazila, 1 from Srimangal upazila and 1 from Moulvibazar Sadar upazila) (Annex-I).

Farmer selection

Farmers were selected in such a way that a cross selection of each village could be represented. Farmers who are directly involved in crop cultivation (farmers behind the plough) were selected. Landless and large farmers were avoided and reputable farmers were given priority.

Farmers group formation

In each selected villages, at least 20 farmers were selected. Both male and female farmers were included. Only one member (male or female) was selected from each participating family. Each group selected one group coordinator during group formation.

Schedule and venue selection

A suitable place was selected for meeting (where the communication, logistic and other facilities were available). The date of group discussion was decided by the participants. Festival days, market days or other national days were avoided.

Conducting FGD

In each village, the focused group discussion was organized with 20-40 farmers. Farmers were asked about the status of insects, diseases and soil problems of the existing crops (field crops, homestead crops, fruits etc.). Farmers were also asked to express their ideas about the prevailing pests and their existing management practices. All the information was recorded on a flip chart. The following steps were followed for conducting the "Focused group discussions":

- (i) Registration of the participants.
- (ii) Introductory session to introduce the survey team and the participants.
- (iii) Clarifying the objectives of FGD and purpose of the survey.
- (iv) The list of existing crops (field crops, fruit trees, homestead crops, orchards etc) was prepared.
- (v) According to farmer's opinion, status of insects, disease and soil problems were recorded separately by giving points against each crop (e.g. very high - 5, high - 4, medium - 3, low - 2, rare - 1, nil - 0).
- (vi) Formation of several groups with group leaders for collecting the samples of plant health problems from adjacent field/ homestead by making a priority list of the crops.
- (vii) Explanation of the sample collection procedures to the group leaders and the members of the groups.

The existing crops with the status of insect, disease and soil problems, the priority list of the crops for sample collection, name of sample collection group its leader were recorded on the flip chart using the following format:

Crop	Status of plant health problem			Sample collection group	Name of the group leader
	Insect	Disease	Soil problem		

(ix) Field visits and sample collection:

- ✓ To identify the pest insects, diseases and soil problems of the present crops and to know more information, a field visit was made;
- ✓ During field visit, samples of insects, diseases and soil problems were collected in polythene and petri dishes;
- ✓ If unknown problems identified, the sample was send to relevant research station for proper diagnosis.

(x) Plenary discussion on collected samples of plant health problems:

During participatory discussion, farmer's concept on the following events was recorded in the flip chart.

- ✓ Local name of the plant health problems and its meaning;
- ✓ Identifying character or key character of the pest and disease;
- ✓ Nature of damage or symptoms of the problems;
- ✓ Growth stage of the plant that is initially affected;
- ✓ Stage of the pest that causes serious damage;
- ✓ Initial time of pest infestation and severe infestation period;
- ✓ Favourable condition of the infestation; and
- ✓ Severity of infestation or approximate status of crop damage.

The following format was used to record the farmer's concept about plant health problems using a flip chart:

Crop	Local name of the problem	Meaning of the local name	Description of the problem	Common name

(xi) Plenary discussion on pesticide application for pest management

Discussion was made on the following events:

- ✓ Commercial name of the applied pesticide;
- ✓ Time of application (on the basis of crop stage, time of infestation etc.);
- ✓ Rate of application;
- ✓ Frequency of application in a crop season and total time (if necessary) and
- ✓ Effectiveness of these pesticides.

The following format was used to record the information on a flip chart.

Crop	Pest	Commercial name of pesticides	Application technique (Application time, rate and frequency)	Effectiveness

(xii) Plenary discussion on the background of pesticide application:

Farmers were asked to inform the following information:

- ✓ Starting period of the use of pesticide;
- ✓ Starting use of pesticide on a large scale;
- ✓ After using pesticide, the condition or infestation level of the pest;
- ✓ If the application of pesticide is now beneficial or not; and
- ✓ Concepts on the bad effect of the use of pesticide;

(xiii) Plenary discussion on farmer's innovative knowledge for pest management:

To know the effective modification of traditional methods or the effective use of low-level chemicals with the association of other methods, the participatory discussion was made in this session. Farmers were asked to inform the following information.

- ✓ If any innovative method familiar to them;
- ✓ Local name of the method;
- ✓ By whom and when this method is started;
- ✓ Description of the method;
 - Necessary equipment and elements
 - Application technique
 - Time of application
 - Rate and frequency of application
- ✓ Comparative effectiveness in relation to pesticides; and
- ✓ Amount of cost and benefit.

Information was recorded on a flip chart using the following format:

Crop	Pest	Local name of the method	Description of the method	Effectiveness	Cost	Source

(ix) Other methods of pest management:

- ✓ Any method of pest management such as physical, mechanical, biological adopted by farmers was recorded on the flip chart.

The information collected from different villages was compiled separately. After compilation, the village wise report was prepared. Final report of a crop season is based on the compilation of the village reports.

Findings:

I. Status of plant health problems in three districts

In the focused group discussion (FGD), farmers were asked to express their opinion about the plant health problems of the existing field crops, homestead crops, fruit trees and orchards. According to farmer's opinion, status of insects, diseases and soil problems of existing crops were recorded to make an overall idea of about the major plant health problems in Summer-II crop season.

Farmers identified 30 crops in Summer-II crop season in three districts, which have health problems. Among them 23 crops in Natore district, 11 crops in Narsingdi district and 11 crops in Moulvibazar district was identified which have major health problems.

In Natore district, rice, sugarcane, chilli, banana, pomegranate, etc. crops are damaged seriously by insects. Some crops such as betel vine, groundnut, turmeric, chilli, papaya, onion, brinjal etc are found seriously damaged by diseases.

In Narsingdi district, yard long bean, country bean, cucumber, rice white gourd, bitter gourd etc. were reported to be damaged seriously by insects. The crops, which suffered maximum by disease, are cauliflower, cabbage, bottle gourd, yard long bean etc.

In Moulvibazar district, rice country bean, brinjal, chilli, etc are highly damaged by insects, and lemon, tomato, coconut, betel nut, rice etc. are found seriously damaged by diseases.

In general, farmers of three districts reported some crops such as rice, brinjal, chilli, country bean, bottle gourd, white gourd, turmeric, banana, coconut etc. to be highly vulnerable to damage by insects and diseases.

Farmers identified 24 insects and 31 diseases in Summer-II crop season by which the crop's health were suffered seriously. From the participatory survey at 12 villages, it was found that the frequency of some damaging insects was comparatively higher such as rice stem borer, hispa, rice gall midge, cucurbit fruit fly, bean aphid, brinjal shoot and fruit borer. On the other hand, the frequency of some diseases such as die back of brinjal, sheath blight of rice, foot rot of brinjal, leaf blight of turmeric, leaf curl of chilli, root knot of brinjal etc were comparatively higher. The frequency of plant health problems found from the participatory survey at 12 villages in three districts in the Summer-II crop season in summarized in the Table 2.

According to the farmer's opinion about the infestation status of insects, diseases and soil problems, it was found that rice, brinjal, turmeric, betel vine, bottle gourd, white gourd, banana, coconut etc. have serious health problems (Table 3). On the basis of the infestation status of insects, diseases and soil problems, the ranking of the crops grown in three districts in summer-II season is summarized in the Table 3.

Table 2 (a) : Frequency of plant health problems (Insect) at 12 villages in three districts.

Sl. Nr.	Insect	Frequency
1	Rice stem borer	10
2	Rice hispa	6
3	Rice gall midge	6
4	Cucurbit fruit fly	5
5	Bean aphid	5
6	Brinjal shoot and fruit borer	4
7	Rice case worm	3
8	Epilachna beetle	3
9	Pumpkin caterpillar	2
10	Leaf folder of cucurbit	2
11	Red pumpkin beetle	2
12	Banana leaf and fruit beetle	2
13	Banana weevil	2
14	Sugarcane stem borer	2
15	Field cricket (Rice)	2
16	Fruit borer of betel nut	2
17	Cut worm (Vegetable)	2
18	Grub of rhinoceros beetle	1
19	Pomegranate fruit borer	1
20	Hog palm caterpillar	1
21	Wood apple fruit borer (Kodbael)	1
22	Bean pod borer (Yard long bean)	1
23	Field cricket (Chilli)	1
24	Unidentified (Turmeric)	1

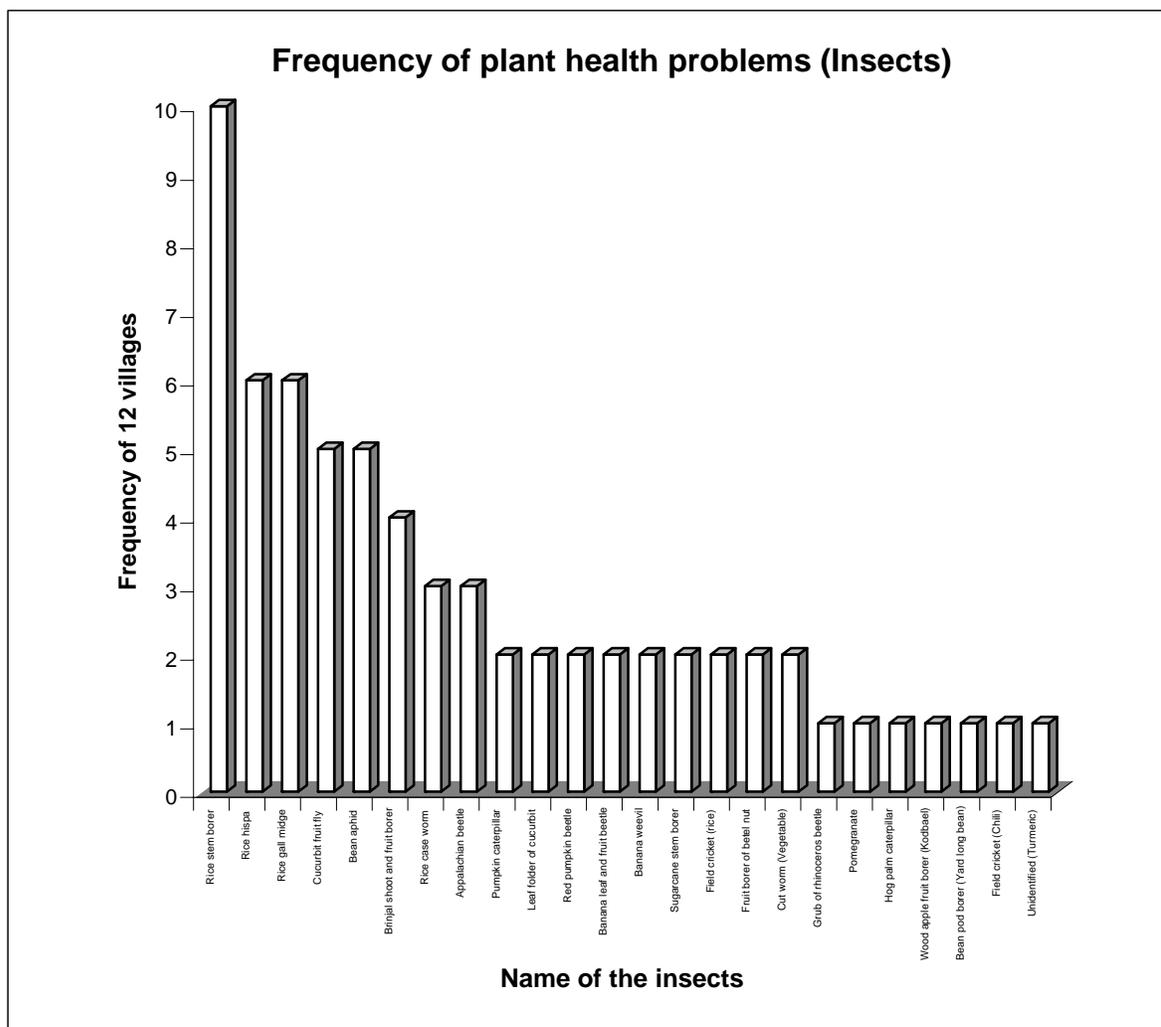


Fig 1. Frequency of plant health problems (insects) at 12 villages in 3 districts

Table 2 (b) : Frequency of plant health problems (Disease and soil problems) at 12 villages in three districts.

Sl. Nr.	Disease and Soil Problem	Frequency
1	Die back/ wilt of brinjal	7
2	Sheath blight of rice	5
3	Foot rot of brinjal	4
4	Leaf blight of turmeric	4
5	Leaf curl of Chilli	3
6	Root knot of brinjal	3
7	Bakanae of rice	2
8	Sheath rot of rice	2
9	Wilt of bottle gourd	2
10	Rust of Yard long bean	2
11	Stem rot of brinjal	2
12	Foot rot of betel vine	2
13	Leaf rot of betel vine	2
14	Virus of papaya	2
15	Virus of cucurbit	2
16	Little leaf of brinjal	1
17	Bud rot of betel nut	1
18	Stem rot of betel vine	1
19	Purple blotch of onion	1
20	Foot rot of onion	1
21	Virus of betel vine	1
22	Foot rot of ground nut	1
23	Red rot of sugarcane	1
24	Fruit rot of cucurbit	1
25	Foot rot of cabbage/cauliflower	1
26	Bud rot of coconut	1
27	Foot rot of tomato	1
28	Scab of lemon	1
29	Leaf blight of rice	1
30	Unidentified disease of lemon /(Anthracnose)	1
31	Unidentified disease of bottle gourd/ (Die back)	1

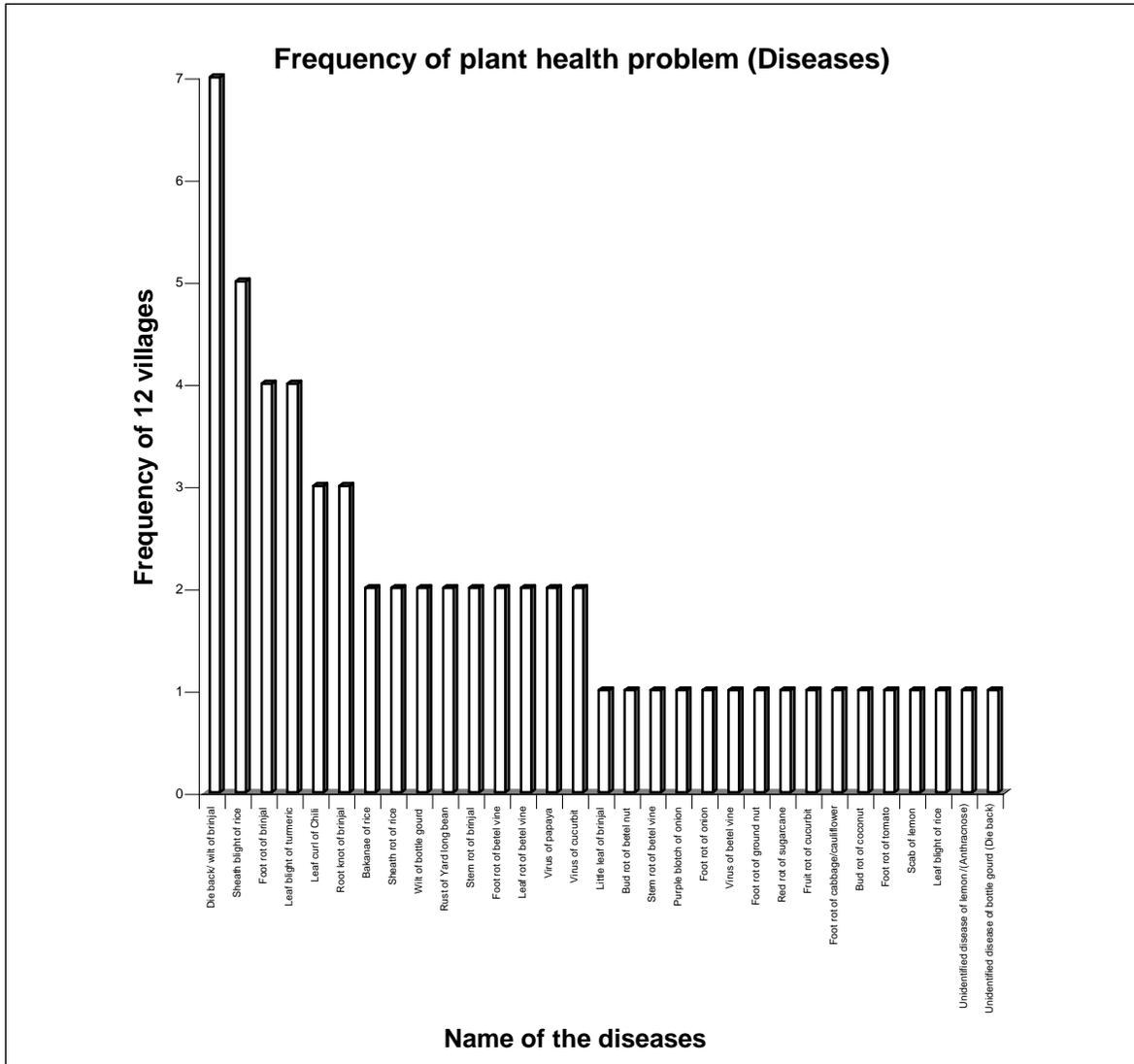


Fig 2. Frequency of plant health problems (diseases) at 12 villages in 3 districts

Table 3: Status of plant health problems (Average) at 12 villages in three districts.

Sl. Nr.	Crop	Average Status of problem (Range 0-5)*			Rank
		Insect	Disease	Soil problem	
1	Rice	5	4	3	1
2	Brinjal	5	4	2	2
3	Bottle gourd	4	5	-	4
4	White gourd	5	4	-	4
5	Country bean	5	3	-	5
6	Yard long bean	4	4	-	5
7	Bitter gourd	5	2	-	6
8	Cauliflower	3	4	-	6
9	Cabbage	3	4	-	6
10	Cucumber	3	4	-	6
11	Tomato	2	5	1	6
12	Onion	0	5	-	8
13	Betel vine	0	5	5	3
14	Turmeric	3	5	2	3
15	Ground nut	3	4	-	6
16	Chilli	2	3	-	6
17	Sugarcane	5	4	-	5
18	Teasle gourd	4	4	-	5
19	Sweet gourd	4	1	-	5
20	Red amaranth	5	2	-	7
21	Indian spinach	2	5	-	9
22	Betel nut	3	5	-	5
23	Banana	4	4	2	3
24	Coconut	4	5	1	3
25	Pomegranate	5	2	-	6
26	Wood apple	5	1	-	7
27	Hog palm	5	0	-	8
28	Lemon	3	4	-	6
29	Ber	4	2	-	7
30	Papaya	0	5	2	6

* 5 =Very high, 4 = high, 3 = medium, 2 = low, 1 = rare, 0 = nil

II. Local name of the plant health problems and their meanings

Each of the plant health problems bears one or more local names at the same community. In the participatory survey, farmers were asked to inform the local name of the insects, diseases and soil problems. Farmers used different local names of the plant health problems on the basis of morphological characters, nature of damage or symptoms. Farmers were also asked to describe the meaning of the local names. Farmers tried to give the meaning of the local names where some of the local names were identified that to have no definite translatable meaning. In the Summer-II crop season, farmers of three districts identified about 55 plant health problems, which contain more than 90 local names.

In Natore district, about 39 plant health problems were identified which bears more than 66 local names. Among the plant health problems, rice case worm, brinjal shoot and fruit borer, banana leaf and fruit beetle, cucurbit fruit fly, epilachna beetle, pumpkin caterpillar, red pumpkin beetle, pomegranate fruit borer, sheath blight of rice, foot rot of vegetables, die back of brinjal, purple blotch of onion, leaf curl of chilli, virus of papaya, red rot of sugarcane etc. shared more local names.

In Norsingdi district, about 14 plant health problems were identified and found to have more than 20 local names. Among the plant health problems, cutworm, virus of cucurbits, bean pod borer, pumpkin caterpillar, cucurbit fruit fly etc. had more than one local name.

In Moulvibazar district, about 14 major plant health problems were identified and found to have more than 21 local names. Among them, bakanae of rice, rice stem borer, bean aphid, brinjal shoot and fruit borer, foot rot of vegetables, sheath blight of rice etc. Each had been given more than one local name.

Some of the local names such as 'Mazra poka', 'Leda poka', 'Dauda rog', 'Gura pocha', 'Jhora rog', 'Machhi poka', 'Kukra rog' etc. were found popular to all survey areas and participants. On the other hand, some of the local names were found common in the specific area (e.g. 'Checur of rice or 'Khauni' of betel vine in Natore districts, 'Pachi poka' of country bean or 'Echi poka' of rice in Norsingdi district, 'Lohari poka', 'Katra poka', of rice, or 'Lauri poka' of country bean in Moulvibazar district. Sometimes one plant health problem contains more than one local name in a small area. In general farmers identified the larva that bore the fruit or stem as 'Mazra poka', the soft-bodied larvae as 'Leda poka' or the foot rot disease as 'Gura pocha'.

Most of the disease problems have no specific common local names where farmers generally used some terms such as, 'Pocha rog' 'Mora rog', 'Jhora rog' as these names characterized the observed symptoms of a particular disease. From the survey in Summer-II crop season, it was found that crops are more damaged by diseases in comparison to insects.

The local names of the major insects, diseases and soil problems with their meanings found from the survey of Summer-II crop season in three districts are shown in the following table 4, 5 and 6.

Table 4: Meaning of the local name of plant health problems in Natore district.

Crop*	Local name of the problem	Meaning of the local name	Common name
Rice (Dhan)	Mazra poka	Central stem insect	Rice stem borer
	Sabuj poka/ Pata kata poka	Green insect/ leaf cutting insect	Rice case worm
	Pamri poka	-	Rice hispa
	Futi poka	Soft fly insect	Adult moth of rice stem borer
	Ghugri poka	Sound producing insect	Mole cricket
	Checur	One kind of weed (Pipe like)	Rice gall midge
	Khul pocha/ Gura pocha/ Pocha rog	Sheath rog/ Foot rot/ Rot disease	Sheath blight of rice
	Pata pocha	Leaf rot	Sheath rot of rice
Brinjal	Mazra poka/ Beguner kirra	Central stem insect/ Insect of brinjal	Brinjal shoot and fruit borer
	Holde poka	Yellowish coloured insect	Epilachna beetle
	Leda poka	Cow dung like (soft) insect	Cut worm
	Fula rog/ Virus rog	Bushy disease/ Virus disease	Little leaf of brinjal
	Gura sukna rog/ Saifty rog/ Gura mora rog.	Foot dry disease/ Rot disease/ Base die disease	Foot rot disease
	Dul mora rog/ Kalo pocha rog/ Aga mora rog	Branch die disease/ Black rot disease/ Tip die disease	Die back of brinjal
	Guti rog	Knot disease	Root know of brinjal
	Saifty rog	Quick rot disease	May be stem rot
Onion (Peaz)	Aga mora/ Aga sukna rog/	Tip die / Tip dry disease	Purple blotch of onion
	Gura pocha rog	Base rot disease	Stem rot of onion
Betel vine (Pan)	Khauni	Being eaten	Foot rot of betel vine
	Sukna khauni	Eaten in dry condition	Stem rot of betel vine
	Tela rog	Rot disease	Leaf spot of betel vine
	Solma rog	Scar like disease	Virus of betel vine
Termaric (Halud)	Pocha rog	Rot disease	Leaf blight of turmeric
Banana (Kola)	Dauda rog/ Dug pora rog/ Salam rog	Scar disease/ Spotted disease/ Scar disease	Banana leaf and fruit beetle.
	Chera laga	Affected by earthworm	Grub of banana weevil.

* Local name of the crop is enclosed with in the first bracket

Crop*	Local name of the problem	Meaning of the local name	Common name
Ground nut (Badam)	Gura pocha	Base rot	Foot rot of ground nut
White gourd (Kumra)	Machhi poka/ Bhomra poka	Fly insect/ Wasp like insect	Cucurbit fruit fly
Chilli (Moris)	Kukra laga/ Thupa dhora/ Virus rog	Being curled/ Turning bunchy/ Virus disease	Leaf curl of chilli
Bitter gourd (Korola)	Leda poka	Cow dung like (soft) insect	Fruit fly
Teasle gourd (Kakrul)/ Bitter gourd (Korola)	Pata morano poka/ Ghura poka	Leaf folded insect/ Horse like insect	Pumpkin caterpillar/ Leaf folder
Yard long bean (Borboti)/ Teasle gourd (Kakrul)	Holde poka/ Kathali poka	Yellow insect/ Jackfruit (coloured) insect	Grub of Epilachna beetle
Papaya (Paepae)	Fula rog/ Virus rog	Bushy disease/ Virus disease	Virus of papaya
Country bean (Sim)	Jaua poka	Gradually destroying insect	Bean aphid
Sweet gourd (Misti kumra)	Fula rog/ Virus rog/ Kukra rog	Bushy disease/ Virus disease/ Curl disease	Virus of papaya
Red amaranth (Lal Shak)	Lal Machhi/ Sunduri Machhi/ Ura poka	Red fly/ Beautiful fly/ Flying insect.	Red pumpkin beetle
Wood apple (Kodbel)	Fall chidrokari poka/ Foler sada poka/ Mazra poka	Fruit boring insect/ White insect of fruit/ Central part insect.	Wood apple fruit borer
Coconut (Narikel)	Mazra poka/ Kirra poka	Central part insect/ Worm insect.	Grub of rhinoceros beetle
Hog palm (Amra)	Pata Khaua poka	Leaf eating insect	Hog palm caterpillar
Pomegranate (Dalim)	Dalimer kirra/ Lal kirra poka/ Mazra poka	Worm of pomegranate/ Red worm insect/ Central part insect.	Pomegranate fruit borer
Sugarcane (Kusher)	Mazra poka (gura pocha/ Kushar mora rog)	Central part insect	Sugarcane stem borer
	Gura pocha/Kusherer mora rog	Foot rot/ Die disease of sugarcane.	Red rot of sugarcane

Table 5: Meaning of the local name of plant health problems in Norsingdi district.

Crop*	Local name of the problem	Meaning of the local name	Common name
Bottle gourd (Lau)	Kando pocha	Stem rot	May be foot rot
	Pakra laga	Being curled	Virus of cucurbit
	Pocha laga	Being rotted	Fruit rot of cucurbit
	Morrok rog	Destructive disease	May be root knot
Cabbage (Badha copy)	Gura pocha	Foot rot	Foot rot
Cauliflower (Ful copy)/ Cabbage (Badha copy)	Katui poka/ Leda poka	Cutting insect/ Cow dung like (soft) insect	Cut worm
Sweet gourd (Misti Kumra)	Virus laga/ Pakra rog	Virus disease/ Curl disease	Virus of cucurbits
Yard long bean (Borboti)	Kirra poka/ Mazra poka	Worm insect/ Central part insect	Bean pod borer
Country bean (Sim)	Pachi poka	Wrapping insect	Aphid
Cucumber (sosha)/ Teasle gourd (Kakrul)	Pata morano poka/ Sabuj kirra	Leaf folded insect/ Green worm	Pumpkin caterpillar
Bitter gourd (Korola)/ White gourd (Jali, Kumra)/ Bottle gourd (Lau)	Bolla poka/ Machhi poka	Wasp insect/ Fly insect	Cucurbit fruit fly
Rice (Dhan)	Mazra poka	Central leaf insect	Rice stem borer
	Echi poka	-	Rice hispa
Banana (Kola)	Dauda poka	Scar insect	Banana leaf and fruit beetle

Table 6: Meaning of the local name of plant health problems in Moulvibazar district.

Crop*	Local name of the problem	Meaning of the local name	Common name
Rice (Dhan)	Chat rog	Weed or wild variety disease	Bakanae of rice
	Katra poka	Cutting insect	Rice case worm
	Chungi chara/ Loti chara	Forming pipe / Forming vine	Bakanae of rice
	Lohari poka	Iron like (hard) insect	Rice hispa
	Mazra poka/ Manzara poka	Central stem insect/ Central stem cutting insect	Rice stem borer
	Bau laga	Bad wind contamination	Leaf blight of rice
	Guri pocha/ Pata pocha	Base rot/ leaf rot	Sheath blight of rice
Lemon (Lebu)	Dauda rog	Scar like disease	Scab of lemon
	Patar kalo bemar	Black disease of leaf	May be anthracnose
Country bean (Sim)	Idla poka/ Lauri poka	Milting insect/ 'Lauri' is one kind of wild fruit that grow very closely on the stem. As a result the stem is not visible.	Bean aphid
Brinjal (Begun)	Baguner kirra/ Mazra poka	Worm of Brinjal/ Central stem insect.	Brinjal shoot and fruit borer
Yard log bean (Borboti)	Bau laga	Bad wind contamination	Rust of bean
Tomato (Tomato)	Jhar mora/ Gura pocha	Hill die/ Foot rot	Foot rot of tomato
Coconut (Narikel)/ Betel nut (Supari)	Jhora rog	Dropping disease	Bud rot of coconut
Chilli (Moris)	Ghugri poka	-	Field cricket

Farmer's concept on major plant health problems

In the participatory survey, farmers were asked to collect the representative samples of major plant health problems to express their opinion more clearly about these problems. Farmers collected the insects, infested plant part or the diseased samples from the adjacent field. If any confusion arrived to identify the pest, the survey team tried to observe the infested field. After sample collection, the discussion was made on the local name of problems, identifying characters, nature of damage, infestation rate, favourable conditions of infestation and their management practices. To control the pest insects and diseases, farmers used some traditional methods, as well as some pesticides. Few farmers controlled some of the major pests with their innovative methods. All the management techniques to control the insects and diseases were recorded.

In Summer-II crop season, a total of 30 crops including fruit trees were recorded in three districts those suffered seriously by insects and diseases.

In Natore district, farmers identified about 22 crops including fruit trees, which are highly damaged by insects or diseases. Among the crops, some were highly damaged by insects. These are rice (Rice stem borer, Rice case worm) brinjal (Brinjal shoot and fruit borer), country bean (Bean aphid) sugarcane (Sugarcane stem borer), banana (Banana leaf and fruit weevil), white gourd, bitter gourd (Cucurbit fruit fly), teasle gourd (Grub of epilachna beetle, Pumpkin caterpillar) etc. Some crops such as rice (Sheath blight), brinjal (Wilt, die back, Little leaf, Root knot), onion (Purple blotch, Stem rot), chilli (Leaf curl), turmeric (Leaf blight), betel vine (Foot rot and Stem rot) groundnut (Foot rot), Papaya (Mosaic virus), etc. were found seriously suffered by diseases.

In Norsingdi district, farmers identified about 11 crops, which are more infested by insects and diseases. Among the crops, yard long bean (Bean pod borer), brinjal (Brinjal shoot and fruit borer), country bean (Bean aphid), teasle gourd, cucumber (Pumpkin caterpillar), white gourd, bitter gourd, bottle gourd (Cucurbit fruit fly) were found seriously damaged by insects. Some of the crops such as bottle gourd (Foot rot, Root knot) cabbage, cauliflower (Foot rot), sweet gourd, bottle gourd (Leaf curl virus) etc. were found suffered by diseases.

In Moulvibazar district, about 11 crops were found highly damaged by insects and diseases. Some of the crops such as rice (Rice hispa, Rice case worm), country bean (Bean aphid), brinjal (Brinjal shoot and fruit borer) etc. were found seriously infested by insects. On the other hand rice (Bakanae, Sheath blight), tomato (Foot rot), lemon (Scab, Anthracnose), coconut (Bud rot), etc. crops were found to be suffered by diseases.

In general, farmers of three districts identified some common plant health problems in Summer-II crop season such as rice stem borer, rice hispa, rice case worm, sheath blight, brinjal shoot and fruit borer, bean aphid, bean pod borer, cucurbit fruit fly, foot rot of vegetables, root knot,, wilt of vegetables etc. In comparison to the survey in Summer-I crop growing season, farmers identified more diseases of crops in the Summer-II crop season.

Some of the major plant health problems were found in the specific area. In Natore district, farmers identified rice gall midge, and sheath blight of rice as the major problems where as in Moulvibazar district; farmers identified rice hispa rice case worm and the bakanae of rice as a serious problem for rice production. In Norsingdi district, farmers are quite unable to protect the foot rot of vegetables. Farmers of all districts were able to explain their major plant health problems including the pest management practices.

Farmer's concept about some of the major plant health problems and their management practices found from the survey in Summer-II crop season in three districts are given in the following table 7, 8 and 9.

Table 7: Farmer's concept about the major plant health problems in Natore district.

Crop	Local name	Description of the problem	Management practices*	Identification
Rice	Mazra poka	<ul style="list-style-type: none"> - It is a worm like insect that cut the central stem - The central leaf is dried and can be easily pulled out - It infest the rice plant after 30-40 days of transplanting - It comes from one kind of flying insect known as 'Futi poka' - It is the main damaging insect of transplanted Aman rice. - Its infestation starts from the tillering stage and remains up to harvesting. 	<ul style="list-style-type: none"> - Application of pesticides such as Kuraterr, Briffer, Basudin, Furadan, Regent Cymbush. - Put on stick - Application of 'wheel power' (washing powder), 'Fitkari', 'Gul' by mixing with fertilizer 	Rice stem borer
-Do-	Pamri poka/ Kaita poka	<ul style="list-style-type: none"> - It scraps the leaf making whitish coloured. - This insect does not affect all the fields, but if a field is affected, it seems to be fire burned. - It is very hard, spiny and small insect. - After one month of transplanting, its infestation starts and remains up to panicle initiation stages. - Few years ago its infestation was not appeared so seriously. But now, it caused considerable damage in some cases. - Generally this pest infests late transplanted rice field. 	<ul style="list-style-type: none"> - Application of insecticides such as Cymbush, Marshal, Faster, Regent. - Application of 'Wheel power' (Washing powder) 'Gul' (Powdered tobacco leaf) and 'Fitkari' by mixing with fertilizers. - A large rope dipping into Kerosene oil is pulled over the field. 	Rice hispa
-Do-	Checur/ Pipe houa	<ul style="list-style-type: none"> - The leaf turned into pipe like structure (round) instead of flattened (like an onion leaf). - It is appeared at tillering stage and the infested tillers cannot bear panicles. - It may be caused by one kind of disease - In case of severe infestation, 10-20% tillers are damaged. - It is first appeared 8-10 years ago but maximum damage is appeared for 2-3 years. - In every hill, 5-12 tillers are 	<ul style="list-style-type: none"> - Control measures are not adopted. - Sometimes fungicides are used but give no result. 	Rice gall midge

* Detailed chemical and innovative pest management is described in other chapter

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>affected and the affected tillers bear no insect.</p> <ul style="list-style-type: none"> - In Aman rice season, this disease is appeared seriously and it favours in dry weather. 		
-Do-	Ghugri poka	<ul style="list-style-type: none"> - It lives under soil. - It cut the rice plant from the underground level. - It is mostly appeared in dry land and generally found near the bend (ail) of the land. - Generally Aman rice fields are affected. 	<ul style="list-style-type: none"> - Application of excess water. - Chemicals are not used. 	Field cricket
-Do-	Sabuj poka/ Pata kata poka	<ul style="list-style-type: none"> - It eats the leaf making whitish coloured. - It also cut the terminal portion of the leaf - The damage of this insect is generally found in Aman rice fields that contained water. - Considerable damage is noticed for 2-3 years ago. 	<ul style="list-style-type: none"> - Application of chemicals such as Basudin, Furadan etc. - Sometimes Acalux, Kinalux, Raison etc are applied. 	Rice case worm
-Do-	Pocharog/ Gurapochar/ Pochakana	<ul style="list-style-type: none"> - It starts from two months after transplanting and remains up to panicle initiation stage - Severe infestation is found during rainy season and hot weather and maximum damage is found during panicle initiation stage. - The rot symptom is found from the middle to lower portion of rice plant and unpleasant odour comes out from the infested field. - It is appeared from 10-12 years ago. 'Shorna dhan' (var. comes from India) is highly affected and BR-11 is moderately affected. 	<ul style="list-style-type: none"> - Chemicals such as Folicur, Tilt etc. are applied - Tute (CuSO₄) mixing with boric powder is applied. 	Sheath blight of rice
-Do-	Pata poch	<ul style="list-style-type: none"> - Leaves are rotted and dried. - Hot weather and standing water favours the disease. - The disease is generally found in young seedlings. 	<ul style="list-style-type: none"> - Control measures are not adopted. 	Leaf blight of rice
Sugarcane	Mazrapoka	<ul style="list-style-type: none"> - After one month of transplanting, its infestation is started and remains up to harvesting. - It bore the soft tender portion and eats inside the cane. - In hot weather, its infestation is 	<ul style="list-style-type: none"> - Chemicals such as Kuraterr. Vriper. Furadan etc. are used. - Cutting and removing the infested plant parts. 	Sugarcane stem borer

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>high. Fertilizer application favours its infestation.</p> <ul style="list-style-type: none"> - The middle leaf of the infested cane can be pulled out easily. - If a cane is splitted several 'kirra' (worm) are found and the middle portion generally turned into reddish coloured. 		
-Do-	Gura pocha/ Kushar mora rog	<ul style="list-style-type: none"> - The inner portion of the cane turned into reddish coloured and gradually the whole cane is affected. - Rot symptom starts from the basal portion. - The plant turned into pale coloured and finally it is died. - It is the main disease of sugarcane and remains all the year round. 	<ul style="list-style-type: none"> - Removing the infested plant parts. - Chemicals are not used. 	Red rot of sugarcane
Brinjal	Mazra poka	<ul style="list-style-type: none"> - It bore the tender shoots and eats inside it. - As the plant bears young shoots, the infestation is started and remains the entire crop season. But maximum infestation is found during flowering and fruiting stage. - Its infestation was available from the beginning of brinjal cultivation, but during the last 10-15 years, it seriously damaged the crop. 	<ul style="list-style-type: none"> - Chemicals such as Ripcord, Cymbush, Acalax, Fenfen, Indian oil (Comes from India) Marshal, Suntap etc are used. - Removing the infested plant parts 	Brinjal shoot and fruit borer.
-Do-	Holde poka	<ul style="list-style-type: none"> - It is yellowish coloured soft spiny insect that eat the green portions of the leaf. - It infests the plant from the seedling stage but maximum in vegetative stage. - It remains itself at the lower surface of the leaf and difficult to control by chemicals. - Growth of the plant is reduced and the plant bears very few fruits. 	<ul style="list-style-type: none"> - Chemicals such as Fenfen, Malathion, Cymbush etc are used. - Application of ash. 	Epilachna beetle
-Do-	Leda poka	<ul style="list-style-type: none"> - It is very soft-bodied insect, which remains itself under the soil surface. - It cut the young seedlings slightly upper from soil surface. - Serious damage is done at morning. 	<ul style="list-style-type: none"> - Application of floodwater. - Hand picking. - Molasses, and rice husk mixing with the pesticide Cymbush is applied. 	Cut worm

Crop	Local name	Description of the problem	Management practices*	Identification
		<ul style="list-style-type: none"> - It cannot tolerate excess water and soft and dry soil condition favours its infestation. 		
-Do-	Fula rog	<ul style="list-style-type: none"> - Leaves turned into small and curled. - The plant bears too much branches and turned into dense bushy structure. - Plants bear few flowers but get no fruits. If fruits are produced, it is deformed. - This disease generally starts from the fruiting stage. 	<ul style="list-style-type: none"> - Chemicals are not used. - Uprooting the infested plant. 	Little leaf of brinjal
-Do-	Gura shukna rog/ Saipti rog/ Gura mora rog	<ul style="list-style-type: none"> - The basal portion of the plant is dried and become narrower. - Roots of the plant are also rotted. - Sometimes black spots are found. The stem is cracked and glutinous substances are extracted. - The plant turned into pale coloured and finally died. - Sometimes fruits are also rotted. - This disease appeared as a serious problem for 3-4 years. - Generally matured plants are affected. 	<ul style="list-style-type: none"> - Application of 'Tute' (CuSO₄) and Lime 	Unidentified may be foot rot.
-Do-	Dul mora rog/ Kalo pochha rog/ Aga mora rog.	<ul style="list-style-type: none"> - The branches of the plant bears black lesion in one side. - Infested branches are dried and the disease gradually enlarged backwardly and finally died. - Severe infected plant bears no leaf. - Considerable damage is observed from the last 4-5 years. 	<ul style="list-style-type: none"> - Uprooted the infested plant. 	Die back
-Do-	Guti rog	<ul style="list-style-type: none"> - The roots of the plant turned into knot like structure. - Most of the roots are damaged - The plant cannot uptake fertilizers. - The plant turned into yellowish colour and bears only few flowers or fruits. - Within few days the plant may die. - It is generally found in matured plants. - From the last 4-5 years it becomes serious pest of brinjal. 	<ul style="list-style-type: none"> - Uprooting the infested plant 	Root knot of brinjal

Crop	Local name	Description of the problem	Management practices*	Identification
-Do-	Saifly rog	<ul style="list-style-type: none"> - Initially the basal stem of the plant bears brown to blackish lesions. - The infested part is died within few days and the whole plant may die. - Sometimes the branches of the plant and the fruits also bear the symptom. - The infested bark may crack and secreted glutinous substances. - It is generally found in matured plants and causes considerable damage for the last 3-4 years. 	<ul style="list-style-type: none"> - Application of Dithane M-45, with glutinous substance. 	May be stem rot
Onion	Aga mora/ Aga sukna rog	<ul style="list-style-type: none"> - It starts from the seedling stage and remains up to harvesting. - Initially the top portion is died and then gradually enlarged downwardly. - During rainy season, its infestation is high. - It is the most damaging disease of onion and considerable damage is noticed from the last 8-10 years. 	<ul style="list-style-type: none"> - Application of chemicals such as Rovral, Antracol etc. 	Purple blotch of onion.
-Do-	Gura pocha	<ul style="list-style-type: none"> - Roots as well as the immature bulb are rotted. - The infested plant can be uprooted easily. - The plant turned into, yellowish colour and wilted. - The rainwater favours the disease. - It is mostly found in the summer season (summer variety) 	-Do-	Stem rot of onion
Betel vine	Khauni	<ul style="list-style-type: none"> - The stem that comes to contact with the newly applied soil is generally infested. - The basal stem turned into whitish or blackish coloured, soft, sticky and rotten symptom appeared with unpleasant odour. - After the rainy season, the disease turned into severe condition. - If oil cake and fertilizers are applied in worm and dumpy, 	<ul style="list-style-type: none"> - Application of pesticide such as Tilt, Bavistin, etc. - Application of sandy soil. - Application of Noin, Cupravit, Vesivax, Agrovax etc. 	Foot rot of betel vine

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>soil, the infestation rapidly increased. The gas produced from the decomposition of oil cake may cause it.</p> <ul style="list-style-type: none"> - The surrounding soils of the infested part become wet. - Generally 10-20 years old gardens are severely infested. 		
-Do-	Shina khouni	<ul style="list-style-type: none"> - Rot symptoms are found near the middle portion of the stem. - Dry rot symptom appears in the stem that may enlarged from 2-4 inches. - Excess fog and worm condition favours the disease. - This disease may be caused by the contamination of stem with the infested blackish root zones. - In case of severe infestation the whole plant may die. 	<ul style="list-style-type: none"> - Application of Noin, Cupravit, Tilt etc. - Application of dry sandy soil. 	Stem rot of betel vine
-Do-	Tela laga	<ul style="list-style-type: none"> - Black to brown spots produced in the leaf. - This disease generally found all the year round, but severe condition is found during the rainy season. - If oil cake is applied in wet soil or excess dry soil, the disease attacks rapidly. - The shed plants influence the disease infestation. Dense shedding or thin shedding favours the disease. - Excess fertilizer application or nutrient deficiency also favours the disease. - About half of the production may hamper in case of severe infestation. 	<ul style="list-style-type: none"> - Uniform shedding of the plant - Lower amount of oil cakes and cow dung are applied. 	Leaf spot of beetle vine
-Do-	Solma rog	<ul style="list-style-type: none"> - Leaves turned into scan like structure and curbed. - This disease starts from the tip portion and gradually spreads the whole plant. - The tip portion becomes narrower. - Warm weather favours the disease. - In case of severe infestation the whole garden may destroyed. 	Uprooting the infested plant.	May be virus

Crop	Local name	Description of the problem	Management practices*	Identification
Termeric	Pocha rog	<ul style="list-style-type: none"> - Leaves are rotted. Initially the top portion of the leaf is dried and gradually enlarged downwardly. - This disease may cause due to soil problem or nutrient deficiency. - The infestation starts from one month after transplanting and remain up to harvesting. - During rainy season, its infestation is high. - This disease caused by a small kirra (worm) known as 'mazra poka'. - Severe damage starts from the last 10-12 years. 	<ul style="list-style-type: none"> - Application of chemicals such as Marshal, Regent, Kuraterr, Furadan, Basudin, etc. - Application of ash. - 	Leaf blight of turmeric
Banana	Dauda rog/ Dugpura rog/ Solma rog	<ul style="list-style-type: none"> - The young leaves as well as the young fruits bear scar like blackish spots. - It may be caused by one kind of black, small hard insect that remain in the leaf blade. - It is generally found in the old garden. - Infested fruits take time to ripe and lower market value. 	Application of chemicals such as Bistaren, Basudin, Brifer etc. mixing with fertilizers.	Banana leaf and fruit beetle.
-Do-	Chera laga	<ul style="list-style-type: none"> - This pest eats the central stem. As a result the central leaf turned into yellowish colour. - This pest also eats roots and the whole plant may die within a few days. - Sometimes the stem may crack. - It is generally found in the old bunch of banana. 	- Do -	May be banana stem weevil
Groundnut	Gura pocha	<ul style="list-style-type: none"> - The roots of the young plants are damaged. - The plant can be uprooted easily. - Within a few days the plant turned into yellowish coloured and finally dried - Dry weather favours the disease. 	<ul style="list-style-type: none"> - Uprooting the infested plant. - Application of water. - Chemicals are not used. 	Foot rot of groundnut.
White gourd	Machhi poka/ Bhomra poka	<ul style="list-style-type: none"> - It is yellowish coloured small fly insect, which have a sting behind the body. - With the help of the sting, it bore the young fruits. - The infested fruits turned into 	Application of chemicals such as Sevin, Dursban, Fenfen, Fifanon, Tafgor etc.	Cucurbit fruit fly

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>yellowish coloured and finally died.</p> <ul style="list-style-type: none"> - If the fruit can grow large, the shape is deformed. - If pesticides are applied, it flies away for a short time and cannot be eliminated. - It is the most damaging pest of white gourd. 		
Chilli	Kukra laga/ Thupa dhora/ Virus rog.	<ul style="list-style-type: none"> - The leaves of chilli is curled and turned into yellowish colour - The plant bears much branches making a bush like structure. - The plant cannot bear flowers or fruits. - Worm weather favours the disease, and summer varieties suffer seriously. - Within a few days the whole field may affected. - From the last 4-5 years, it becomes a destructive disease. 	<ul style="list-style-type: none"> - Uprooting the infested plant. - Application of ash - Application of zinc and Agro grow (Vitamin). 	Leaf curt of chilli
Bitter gourd	Leda poka	<ul style="list-style-type: none"> - It bore the bitter gourd and within a few days, the fruit turned into yellowish coloured and finally rotten. - Whitish worm like insect are found inside the fruit. - Hot and cloudy weather favours the infestation of this insect. - In case of severe infestation 50% of the fruits are damaged. 	<ul style="list-style-type: none"> - Application of chemicals such as Cymbush, Fifanon, Decis etc. - Application of ash. 	Dipteran larva
Teasle gourd/ Bitter gourd	Pata morano poka/ Ghura poka	<ul style="list-style-type: none"> - Larvae are folded and the pest remains itself inside the folded leaves. - It is greenish coloured worm like insect that eat the leaf as well as the tender shoots - As the plant bears some young leaves, its infestation starts and remains throughout the season. - During the last 5-6 years, its infestation is very high. - It also eats the young fruits. Dry wealthy favours the infestation. 	<ul style="list-style-type: none"> - Application of chemicals such as Fenfen, Dursban, Cymbush, Regent, Sevin, etc. - Hand picking during artificial pollination. 	Pumpkin caterpillar/ Leaf folder
Yard long bean/ Teasle gourd	Holde poka/ Kacte poka	<ul style="list-style-type: none"> - It is yellowish coloured round insect which have soft spines - It eats the young leaves remaining net like structure. - It also eats the tender shoots and young fruits. 	<ul style="list-style-type: none"> - Application of Malathion, Dursban, Decis etc. - Application of ash. - 	Grub of epilachna beetle

Crop	Local name	Description of the problem	Management practices*	Identification
		<ul style="list-style-type: none"> - It remains itself at the lower surface of the leaf. - Growth of the plant is reduced and cannot bear much fruits. - Hot weather favours the infestation. - It is identified as a serious pest for the last 6-7 years. - Infestation starts from one month after transplanting and remain all over the season. 		
Papaya	Fula rog/ Virus rog	<ul style="list-style-type: none"> - Initially the young leaves turned into yellowish coloured and curled. - Gradually all the leaves are curled. - Growth of the plant is reduced. - Length of the stalk of leaves in reduced. - The plant cannot bear flowers or fruits. - If a plant is affected in a garden by this disease, it rapidly spreader to another plants. 	<ul style="list-style-type: none"> - Uprooting the infested plant - Application of water. 	Virus
Bean	Jaua poka	<ul style="list-style-type: none"> - It is brown to blackish coloured insect that suck the juice from the tender shoots, young leaves and fruits. - Growth of the plant and the fruits is stopped. - Some insect attacks the yard long bean. - The infested fruit is curved and deformed. - Cold weather favours the infestation of this pest. 	<ul style="list-style-type: none"> - Application of chemicals such as Cymbush, Fifanon, Fenfen, Melathion etc - Application of ash mixing with kerosene oil. - Application of the extract of tobacco leaf. - 	Bean aphid
Sweet gourd	Fola rog/ virus	<ul style="list-style-type: none"> - The leaves turned into yellowish coloured and the virus of the leaf becomes whitish. - Sometimes the leaves are curled. - The plant can not bears fruits or flowers. - If the plant bears fruits, it becomes sprinkled and with in a few days it is spoiled. - The disease generally affect in summer season. 	<ul style="list-style-type: none"> - Application of ash. - Uprooting the infested plant. 	Virus
Red amaranth/ Indian	Lal Machhi/ Sunduri	<ul style="list-style-type: none"> - It is red coloured fly insect. - It eats the leaves making round holes. 	<ul style="list-style-type: none"> - Application of Melathion, Fifanon, etc 	Red pumpkin beetle.

Crop	Local name	Description of the problem	Management practices*	Identification
Spinach	Machhi/ Ura poka	<ul style="list-style-type: none"> - As the plant bears leaves, its infestation starts. - The plant cannot grow large and reduce the market value. 	<ul style="list-style-type: none"> - Application of ash. 	
Wood apple (Kodbel)	Fall chidrokari poka/ Foler sada poka	<ul style="list-style-type: none"> - It is whitish coloured worm like insect. - It makes round hole on the fruits and eat the internal portion. - The internal portion turned into blackish coloured and makes it unfit for consumption. - In case of severe infestation 30-40 fruits are destroyed and it is the most damaging pest of this fruit. 	Control measures are not adopted.	Wood apple fruit borer.
Coconut	Mazra poka/ Kirra poka	<ul style="list-style-type: none"> - It is whitish worm like large pest that bore the soft part of the top portion and eat inside it. - The central portion is destroyed. As a result the central leaf is died and within a few days the whole plant may die. - It also eat the young leaves. - The infestation is available all the year round. 	Control measures are not adopted.	Grub of Rhinoceros beetle
Hog palm	Pata khaua poka	<ul style="list-style-type: none"> - When the young leaves are emerges, its infestation starts. - It is a worm like hairy insect. - In case of severe infestation the plant bears no leaves. - Except the mid ribs, the pest eats the entire leaves. 	<ul style="list-style-type: none"> - Chemicals are not used. - Hand picking - Using smoke by twisted straw inserting dry chits. 	Hog palm caterpillar
Pomegranate	Dalimer kirra/ Lal kirra poka/ Mazra poka	<ul style="list-style-type: none"> - Its infestation starts from the flowering stage. - It bore the flowers and the young fruits making circular hole and inside the fruit, worm like red insect is available. - The infested part turned into blackish coloured and within few days it is dropped. - The internal portion of the fruit turned into blackish colour. - It can damage up to 80-90% fruits in case of severe infestation. - Hot weather favours the infestation. 	<ul style="list-style-type: none"> - Application of Malathion, Fifanon, Cymbush, etc. - Wrapping the fruits. 	Pomegranate fruit borer.

Table 8: Farmer's concept about the major plant health problems in Norsingdi district.

Crop	Local name	Description of the problem	Management practices*	Identification
Bottle gourd	Morrok rog	<ul style="list-style-type: none"> - The disease is available from the flowering stage. - The main root is rotted and the roots contain knot like structure. - Initially the top portion of the plant is died and gradually the whole plant is died. - If this disease infests a field, two-third of the crops are destroyed. - It caused serious damage for the last 4-5 years. 	<ul style="list-style-type: none"> - Application of Bavistin, Tilt, Noin, Dithane M-45 etc. 	Unidentified, may be root knot.
-Do-	Kando pocha	<ul style="list-style-type: none"> - The vine is cracked and glutinous substances are secreted. - Within a few days the infected portion turned into blackish coloured and become narrower. - The infested part is turned into yellowish coloured and finally died. - Initially the top portion is died and then hanged down. The foot region is rotted. 	<ul style="list-style-type: none"> - Do - 	May be foot rot.
Cabbage	Gura pocha	<ul style="list-style-type: none"> - The dry symptom found at ½" lower from soil surface to ½" upper from soil surface. - The skin of basal portion is dried. - The plant is wilted during daytime and turned to fresh at night. - It is generally found from the seedling stage. - It is the most damaging disease of cabbage and cauliflower. 	<ul style="list-style-type: none"> - Application of Bavistin, Dithane M-45. - Removing excess water from field. - Application of water 	Foot rot.
Couli flower	Kalui poka/ Leda poka	<ul style="list-style-type: none"> - It is soft-bodied insect that remains itself under the soil surface. - It cuts the seedlings slightly upper from the soil surface. - It cuts the seedlings slightly upper from the soil surface. - It comes out from soil at morning and evening. - It can be found the soil near the cut plant. - It also cuts the seedlings of other Winter crops. 	<ul style="list-style-type: none"> - Application of water. - Application of pesticides such as Tafgor, Basudin etc. - Wrapping the seedling by polythene. - 	Cutworm
Bottle gourd/ Sweet gourd	Pakra laga/ Virus laga	<ul style="list-style-type: none"> - The leaves turned into yellowish colour and curled. - The vines of the leaf turned into whitish coloured. - Growth of the plant is reduced and 	<ul style="list-style-type: none"> - Uprooting the infested plant. - Application of Bavistin, Dithane M-45 etc. 	Virus

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>the plant cannot bear so much fruits and flowers.</p> <ul style="list-style-type: none"> - The fruits are small in size and deformed. 	<ul style="list-style-type: none"> - Application of Melathio 	
Yard long bean	Kirra poka/ Mazra poka	<ul style="list-style-type: none"> - It bore the fruit and eats the internal portion. - It is dark, brownish coloured worm like insect. - It is just like the worm of country bean. - It is only available at the fruiting stage. - In case of severe infestation it can damage up to 50% of the fruits. - During the last 4-5 years it becomes difficult to control and it by chemicals. 	<ul style="list-style-type: none"> - Application of chemicals such as Fenfen, Milfen, Basathrin, Tafgor, Relothrin, Fentox, etc. - Application of Fenfen (chemical) mixing with crushed naphthalene. 	Bean pod borer
Country bean	Pachi poka	<ul style="list-style-type: none"> - It is small insect that suck juice from the young shorts and fruits. - In a plant, thousands of this insect attacks at a time. - Growth of the plant is hampered and the flowers are shaded. - Severally infested to plants bear only few fruits which are deformed. - It is generally found in Winter crops such as yard long bean and country bean. But from the last 2-3 years it also found in summer crops. 	<ul style="list-style-type: none"> - Application of chemicals such as Malathion, Fenfen, Tafgor, Dursban, Cymbush etc. - Application of ash. 	Bean aphid.
Cucumber/ Teasel gourd	Pata morano poka	<ul style="list-style-type: none"> - It is green coloured long insect that fold the leaves. - It eats the young under shoots and leaves and hides itself inside the folded leaves. - It also bore the young fruits. - After one month of transplanting its infestation started and remains up to entire crop season. 	Application of Dursban, Decis, Cymbush etc.	Pumpkin caterpillar
Bitter gourd/ White gourd/ Bottle gourd	Bolla poka/ Machhi poka	<ul style="list-style-type: none"> - It is yellow coloured fly insect that more the young fruits. - Glutinous substance is secreted from the infested part. - The fruit turned into yellowish colour and then rotted. - The shape of the fruit is deformed. - During the last 5-6 yeas, it makes unable to grow the crop without using pesticides. 	Application of chemicals such as Fenfen Dursban, Sevin, Cymbush, Fifanon, Tafgor etc.	Cucurbit fruit fly
Rice	Mazra poka	<ul style="list-style-type: none"> - It is worm like insect that enters inside the rice stem from the basal portion. 	Application of pesticides such as Basudin, Furadan,	Rice stem borer

Crop	Local name	Description of the problem	Management practices*	Identification
		<ul style="list-style-type: none"> - It cuts the central portion of rice plant. - The infested part is died and can be pulled out easily. - 'Machhi poka' (adult moth) is the mother of this insect. - The rice plant is damaged by this worm as well as "Machhi poka". - It is the most damaging pest of rice plant and the infestation starts from tillering stage and remains up to panicle initiation stage. 	Sunfuran, Furafuran, etc.	
Rice	Echi poka	<ul style="list-style-type: none"> - It is hard, small, blackish coloured insect, which have spines in its body. - It eats the leaf remaining the straw. - Considerable damage is observed for the last 5-6 years. - It is generally found in rice season. 	Generally chemicals are not used.	Rice hispa
Brinjal	Mazra Poka	<ul style="list-style-type: none"> - It is the most destructive pest of brinjal. - Its infestation starts from soon after branching and remains the entire crop season. - It bore the tender shoot resulting the wilting symptom. - With frequent application of pesticides it is quite impossible to control. - If chemicals are not applied, it can damage up to 80-100% of fruits. 	<ul style="list-style-type: none"> - Application of Cymbush, Marshal, Fenfen, Ripcord, Dursban, Basathrin, Fenitox, and Indian oil. - Application of neem extract mixing with Cymbush. - Cutting and removing the infested plant part. 	Brinjal short and fruit borer.

Table 9: Farmer's concept about the major plant health problems in Moulvibazar district.

Crop	Local name	Description of the problem	Management practices*	Identification
Rice	Lohari poka	<ul style="list-style-type: none"> - Small, black, hard insect, which scrap the leaf making whitish coloured. - It severely attacks the rice in aman rice, but now it also attack the boro rice and jolly aman. - It attacks the field gregariously and within a week the whole field is fully damages. - Initially the fields are infested in one side and then gradually attack the whole field. - After destroyed one rice field, it attacks another and gradually destroy the entire area. - From distance, the infested fields seem to be burned by fire. - It is the most destructing pest of aman rice for the last 3-4 years. - Although pesticides are used, these give no results. 	<ul style="list-style-type: none"> - Application of chemicals such as Malathion, Relothion, Ustad, Fedy etc. - Application of crushed Naphthalene, Kerosene oil etc. - A large rope dipping into kerosene oil is pulled over. - 	Rice hispa
Do	Katra poka/ Katra rog	<ul style="list-style-type: none"> - It is whitish coloured insect with black head. - It scraps the leaf making whitish coloured. - It cut the leaves of rice plant and it swims in the standing water with the help of these cut leaves. - From a distance, the infested field can be easily distinguished by its whitish colour. - Its infestation is very high from the last 3-4 years. - Generally this pest mostly affects late transplanted rice fields. - This pest favors the young, dark greenish rice plants 	<ul style="list-style-type: none"> - Removing water from the field. - Application of Malathion, Dursban etc. - 	Rice case worm

Crop	Local name	Description of the problem	Management practices*	Identification
Do	Chungi chera/Lathi chara	<ul style="list-style-type: none"> - Leaves turned into pipe like structure (Like onion leaf). - In a hill, 4-5 tillers are infested. - Panicles cannot emerge from the affected rice tillers. - The damage is comparatively higher in aman rice season. 	Generally chemicals are not used.	Rice gall midge
-Do-	Mazra poka/Manzara poka	<ul style="list-style-type: none"> - It cut the central leaves of rice plant and the infested plant can be easily pulled out. - Both the 'sada foring' (adult moth) and the "kirra" (larvae) damage the rice plant. - The infestation starts from tillering stage and remain up to harvesting. - 	<ul style="list-style-type: none"> - Application of granular pesticides such as Basudin, Furadan, Sunfuran etc. - Application of liquid pesticides such as Malathion, Diazinon etc. 	Rice stem borer
Do	Chat rog/ Agacha	<ul style="list-style-type: none"> - The infested rice plant becomes very tall and the nodes are long - The tallest rice plants can be easily identified by their yellowish green - Panicle can not produced from the infested plant. - If panicles slightly initiates, it cannot bear filled grains. - If this disease affects the fields, it is confirm that this field will produce low amount of grain. - Unhealthy seeds may cause this disease. Comparatively low amount of infestation is found if the seeds are collected from BADC. 	<ul style="list-style-type: none"> - Uprooting the infested plant - Chemicals are not used. 	Bakanae disease of rice
Do	Guri pocha	<ul style="list-style-type: none"> - It is appeared at tillering stage and remains up to panicle initiation stage. - Rainwater and hot temperature favours the disease. - The sheath blade of the 	<ul style="list-style-type: none"> - Generally chemicals are not used. - Sometimes chemicals such as Cupravit are 	Sheath blight

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>rice plant is rotted at the lower area.</p> <ul style="list-style-type: none"> - It is appeared from 5-6 years ago and maximum infestation is found in aman rice. 	used.	
Do	Bau laga	<ul style="list-style-type: none"> - It is caused by bad wind. - Leafs are burned - Generally maximum tillering stage is affected. - The disease is mostly found in aman rice season. 	Control measures are not adopted.	Leaf blight
Country bean	Idle poka/ Laura poka	<ul style="list-style-type: none"> - It is small soft-bodied insect that suck juice from the tender shoots, leaves and young fruits. - Growth of the plant is reduced and the infested plants become pale coloured and curled. - It is identified as the most damaging pest for the last 5-6 years. 	<ul style="list-style-type: none"> - Application of chemicals such as Malathion, Fifanon etc. - Application of ash mixing with crush naphthalene. 	Bean Aphid
Tomato	Thur mora/ Gura pocha	<ul style="list-style-type: none"> - Initially the basal portion of the plant become soft, water soaked lesion is appeared and finally rotted. - The whole plant is rotted within few days. - The roots are also rotted. - Wet condition favours the disease. 	Application of chemicals such as Dithane, Redomil etc.	Foot rot
Brinjal	Kirra poka/ Mazra poka	<ul style="list-style-type: none"> - It bore the fruit as well as the tender shoots and eats the eternal portion. - Infestation starts from the seedling stage and remain all the year round. - The infested shoots are wilted at sunny days. - It is the most damaging insect of brinjal 	<ul style="list-style-type: none"> - Application of chemicals such as Tafgor, Melathion, Cymbush, Dursban etc - Cutting and removing the infested plant parts. 	Brinjal shoot and fruit borer
Lemon	Kalo pata bemer	<ul style="list-style-type: none"> - The upper portion of the leaf turned into blackish coloured. - Growth of the plant is reduced and the plant bears few flowers or fruits. - If the leaf is touched by hand, blackish powder are found. 	Control measures are not adopted.	May be anthracnose

Crop	Local name	Description of the problem	Management practices*	Identification
		<ul style="list-style-type: none"> - The infested leaf becomes dull coloured. - The infestation is comparatively low in rainy season. 		
Do	Dauda rog	<ul style="list-style-type: none"> - The fruits as well as the leaves bears scar symptoms. - The leaves turned into yellowish colour. - Growth of the fruit is hampered and the market value is reduced. - Generally 'Alachi lebu' (large aeromatic lemon) is seriously damaged by this disease. 	Application of chemicals such as Diazinon, Cythion etc.	Scab of lemon.
Country bean/ Yard long bean	Bau laga	<ul style="list-style-type: none"> - Leaves turned into reddish coloured on the upper side. - It is generally found in a mature plant. - Growth of the plant is reduced and it cannot uptake fertilizers. - It may be caused by bed wind. 	Generally control measures are not adopted.	Rust of bean
Coconut/ Betel nut	Thora lara/ Isai khaoa	<ul style="list-style-type: none"> - Immature fruits are dropped. - The outer surface of the coconut remain good, but the inner portions e.g. kernel is deformed. - Sometimes the fruit bears no water. - In case of betel nut, the spike let of bud is turned into blackish coloured or reddish colour and then dropped. - About half of the fruits are dropped. 	<ul style="list-style-type: none"> - Control measures are not adopted - Sometimes cow dung and other fertilizers are applied. 	Bud rot of coconut/ Betel nut.
Chilli	Ghugri poka	<ul style="list-style-type: none"> - It is brownish coloured hairy insect, which have strong mouthparts. - It always remains under the soil surface. - It cut the roots as well as stems of young seedlings. - Its infestation is serious in loosed soil. 	<ul style="list-style-type: none"> - Chemicals are not used. - Application of excess water. 	Mole cricket.

IV. Use of pesticides for pest management

Farmers used pesticides when the infestation rate of insects or diseases is high. Most of the farmers of this country have no clear concept about the appropriate use of pesticides. For this reason, the harmful as well as the beneficial insects are killed by excessive use of pesticides that have the harmful effect on human health, environment and biodiversity. At present about 17 thousand metric ton pesticides are used every year in our country. According to dealers suggestions, farmers used authorized as well as some unauthorized pesticides those are available in the local market to protect their crops from pests.

To know the actual situation about the use of pesticides, farmers were asked to inform the trade name of pesticide, rate of application, frequency of pesticide spraying and their effectiveness. Farmers of three districts frequently used some insecticides such as Malathion, Duraban, Cymbush, Marshal, Schincyper, Fenfen, Fenitox, Basathrin, Fefanon, Tafgor, Ripcord, Basudin, Diazinon, Furadan, Sunfuran, Admair etc. to protect crop and fruits from a variety of pests and diseases. In some cases, farmers used some unlabelled and unauthorized pesticides. In most cases, farmers used pesticides on the basis of recommendations from their local pesticide dealers. Farmers used some fungicides such as Dithane M-45, Rovral, Ridomil, Bavistin, Antracol, Hinosan, Folicur, Tilt etc. to protect crops from diseases. In general, farmers are found more interested to use pesticide to protect insects in comparison to diseases.

In Natore district, farmers frequently apply insecticides to control rice stem borer, brinjal and fruit borer, bean aphid, sugarcane stem borer, leaf folder of cucurbits, red pumpkin beetle fruit fly etc. Farmers frequently used some fungicides to control sheath blight of rice, purple blotch of onion, foot/ stem rot of betel vine etc. Farmers used insecticide to control disease infestation (e.g. granular insecticides are used to control leaf blight of turmeric). In some cases, farmers applied pesticides almost everyday to control few destructive pests. To control brinjal shoot and fruit borer, it was found to apply pesticides up to 180-220 times in a crop season.

In Narsingdi district, farmers used excess amount of pesticides to control brinjal shoot and fruit borer, bean pod borer, bean aphid, cucurbit fruit fly, farmers generally applied pesticides at least 1-2 times in a week in all most of the vegetables and it raised up to 6-7 times in a week on the basis of pest severity (e.g. brinjal shoot and fruit borer) and weather (e.g. rainfall). To control foot rot of vegetables, die back and wilt of cucurbits or brinjals, farmers frequently used fungicides.

In Moulvibazar district, rice hispa and rice case worm caused the havoc situation for rice cultivation in 'Aman' crop season. Although farmers used some pesticides up to 5-10 times, they failed to control these pests. Farmers also frequently applied pesticides to control brinjal shoot and fruit borer, bean aphid, foot rot of vegetables etc.

In Summer-II crop season, farmers of all districts frequently applied excess amount of pesticides to control, brinjal shoot and fruit borer, bean pod borer, bean aphid, cucurbit fruit fly etc. Some of the unauthorized and unlabelled pesticides are found to be used to control few major pests. The 'Indian oil' (Comes from India whose chemical name is Kripcord) became very popular for the last 1-2 years to control some of the destructive pests in Natore and Narsingdi district.

Use of pesticides to control some of the major pests in three districts is explained in Table 10,11 and 12.

Table 10: Use of pesticides for pest management in Natore district

Crop	Pest	Commercial name of the chemicals	Application technique	Effectiveness
Rice	Rice stem borer	- Kuraterr, Briffer, Cymbush, Regent, Basudin, Furadan, Bistaren.	After one month of transplanting, the granular pesticides are used @ 1-1.25 kg/Bigha for 1-3 times and the liquids are used @ 10-20 ml/10 L water for 1 times.	Effective results are found
-Do-	Rice hispa	- Marshal, Cymbush, Faster, Ripcord	After 20 days of transplanting, these are used @ 50 gm/ Bigha in case of dry chemicals and 5-10 ml/ 10 L water in case of liquid chemicals and these are applied for 2-3 times.	Average effectiveness is found.
-Do-	Case worm	- Basudin, Furadan	As the infestation starts, these are used @ 2-3 kg/Bigha for 1 times.	These give good results.
-Do-		- Acalax, Kinalax, Raison	These are used @ 30 ml/ 10 ml water for 1 times.	“
-Do-	Sheath blight	- Folicur, Tilt	These are used for 1-2 times @ 10 ml/ 10 L water as the infestation starts.	If this disease severally infests the field, these cannot give good results.
Brinjal	Brinjal shoot and fruit borer	- Ripcord, Cymbush, Acalax, Fenfen, Indian oil (Comes from India), Marshal, Suntap.	Application of these chemicals starts as the plant bears branches and applied for 10-20 days in a moth @ 10-20 ml/ 10 Lt water for 3-4 times in a year. These chemicals are used all the year round. On an average, these chemicals are applied for 50-70 times is a crop season but in some case it may raise up to 180-200 times. During rainy season, pesticides are applied almost every day.	It is quite impossible to grow brinjal without frequent pesticide application. Pesticide application can stop the infestation of this pest only for 1-2 days
Banana	Banana weevil	Bistaren, Basudin, Breffer	Chemicals mixing with fertilizers are applied for 2-3 times @ 1-1.25 kg/Bigha at 15 days interval.	Desirable results are not found.

Crop	Pest	Commercial name of the chemicals	Application technique	Effectiveness
Bean	Aphid	Cymbush, Fyfanol, Fenfen, Malathion	When the infestation starts, these are used for 3-7 times @ 15-25 ml/10 Lt water at 15 days interval.	Although the pest is eliminated, but these can not protect the repeated infestation.
Onion	Purple blotch of onion.	Rovral, Antracol	As the infestation starts, these chemicals are applied for 2-3 times @ 30g/ 10 L water at 15-20 days interval.	
Betel vine	Foot rot/ Stem rot	Tilt, Cymbush	Application starts at the beginning of season and remains up to Winter @ 10 ml/ 10 Lt.	In case of severe infestation, these cannot give good results.
		Noin, Cupravit, Vesivax, Agrovax.	Application of these chemicals for 2-3 times and 100 g/ 1002 water.	Satisfactory results are not found.
Turmeric	Stem borer	- Marshal, Regent, Kuraterr, Furadan, Basudin.	If the infestation starts, these are used for 1-3 times at 15-20 days interval @ 2 kg/ Bigha.	Average results are found. 50% infestation can be controlled.
Chilli	Leaf curl	Zinc, Agro grow (vitamin)	These are applied for 1-2 times @ 5-10 ml/ 10 Lt water.	Gives no results. The rest plants become healthy but the infested curled plant cannot be show results.
Sugarcane	Sugarcan e stem borer	Vriper, Kuraterr (from sugar mill) Furadan	After rain, these are applied for 1-2 a times @ 16 kg/ Acre as the infestation starts.	Effective results are not found.
Teasle gourd	Leaf folding caterpillar	Fenfen, Daraban, Cymbush, Regent, Sevin.	As the pest noticed in the field, these are used for 3-5 times @ 5-10 ml/ 10 L water.	- Average results are found - Comparatively regent gives good results.
Bitter gourd	Lepidopteran larvae/ Fruit fly	Cymbush Fifanon, Decis	Soon after flowering stage, it is applied for 10-15 times in a season at 10-15 days interval @ 10 ml/ m10 L water.	Effective results are found.
Bitter gourd	Lepidopteran larvae/ Fruit fly	Cymbush Fifanon, Decis	Soon after flowering stage, it is applied for 10-15 times in a season at 10-15 days interval @ 10 ml/ 10 L water.	Effective results are found.
Red amaranth	Red pumpkin beetle	- Malathion Fifanon	These are applied for times in a season @ 20 ml/ 10 L water.	Insects cannot be properly controlled.

Table 11: Use of pesticides for pest management in Norsingdi district

Crop	Pest	Commercial name of the chemicals	Application technique	Effectiveness
Yard long bean	Bean pod borer	Fenfen, Milfen, Basathrin, Tafgor, Relothrin, Fentox	<ul style="list-style-type: none"> - These are applied from fruiting stage for 2-3 times in a week @ 3-4 cork/ 10 L water. - In a crop season about 15-20 sprays are made. 	Frequent application can give results.
Bitter gourd/ White gourd/ Bottle gourd	Cucurb it fruit fly	Fenfen Dursban, Sevin, Cymbush, Fifanon, Tafgor.	<ul style="list-style-type: none"> - These are sprayed for 1-3 times in a week @ 2-3 cork / 10 L water. - In a crop-growing season about 15-20 sprays are made. 	<ul style="list-style-type: none"> - It cannot be controlled effectively. After 1-2 days of application, the pest attack again. - Comparatively Tafgor gives better result.
Country bean	Aphid	Malathion, Fenfen, Tafgor, Dursban, Cymbush	<ul style="list-style-type: none"> - As the infestation starts, these are applied for 1-2 times in a week @ 3-4 cork/ 10 ml water. - In a crop season, spraying is done for about 10-15 times. 	These chemicals can temporally control the pest.
Brinjal	Brinjal shoot and fruit borer	Dursban, Fenfen, Fifanon, Basathrin, Milfen, Ripcord.	<ul style="list-style-type: none"> - These are used for 3-7 times in a week @ 10-20 ml/ 10 Lt. water. - In rainy season, spraying is made almost every day. In a crop season, pesticides are sprayed for about 50-70 times. 	No chemicals are found so much effective against this pest.
Bottle gourd	Wilt/ die back	Bavistin, Dithane M- 45 Tilt	<ul style="list-style-type: none"> - As the infestation starts, these are used for 1-2 times in a week @ 2-2.50 spoon/ 10 L water. - Although spraying is done for 5 to 6 times, it cannot show results in case of severe infestation. 	Application of chemicals cannot give good results.
Cauliflower / Cabbage	Foot rot	Dithane M-45 Bavistin	<ul style="list-style-type: none"> - These are applied for 1-3 times during the seedling stage @ 1.5-2.5 spoon/ 10 L water. 	Considerable results are not found.
Rice	Rice stem borer	Basudin, Furadan, Sufuran, Furafuran	<ul style="list-style-type: none"> - After 30-10 days of transplanting, these are used by mixing with fertilizers for 1-2 times @ 1-1'25 kg/ Bigha 	Effective results are found.

Table 12: Use of pesticides for pest management in Moulvibazar district

Crop	Pest	Commercial name of the chemicals	Application technique	Effectiveness
Rice	Rice hispa	Malathion, Relothrin, Ustad, Fedy	<ul style="list-style-type: none"> - These are sprayed for 4-5 times @ 10-15 ml/ 10 L water. - After application of these chemicals, the pest attack within 2-3 days. - In case of severe infestation it is impossible to control the pest. 	It cannot be controlled by any chemicals.
-Do-	Rice stem borer	<ul style="list-style-type: none"> - Basudin, Furadan, Sunfuran - Malathion, Diazinon 	<ul style="list-style-type: none"> - After one month of transplanting these chemicals are used @ 1-1.25 kg/ Bigha for 1-2 times. - When the plants grow enough (e.g. panicle initiation stage). These are applied for 1 times @ 10-15 ml/ 10 L water. 	Pest can be controlled by using these pesticides
-Do-	Sheath blight	Cupravit	<ul style="list-style-type: none"> - When the symptom appeared, it is sprayed for 1-2 times @ 10-15 ml/ 10 L water. 	It cannot show considerable result.
Brinjal	Brinjal shoot and fruit borer	Tafgor, Malathion, Cymbush, Dursban	<ul style="list-style-type: none"> - These are applied for 1-4 times in a week @ 10-20 ml/ 10 Lt water. - After 1-2 month of transplanting, spraying is started and continued the entire season. - In a season, spraying is made, for about 40-50 times. 	The past cannot be fully controlled by chemicals.

V. Background of pesticide application in three districts

In three survey areas, Natore district contains large crop diversity where cereals, fruits, sugarcane, vegetables etc. are grown at large scale. The Narsingdi district is one of the largest vegetable belts in Bangladesh where maximum farmers are engaged to grow vegetable all the year round. The Moulvibazar district is mainly rice grown area, but considerable number of vegetable and fruits are grown in this area. Due to different crop cultivation practices, there was a difference in using the pesticides for pest management in three districts. To know the background of pesticide application and to know the actual situation of the use of pesticides, the participatory discussion was made on the following events.

- Starting period of the use of pesticides
- Starting use of pesticides on a large scale
- After using pesticides on a large scale, the condition or infestation level of pest.
- Application of pesticides for pest management is now effective or not.
- Bad effect of the use of pesticide.
- Information about beneficial insects.

The information collected from three districts related to pesticide application are summarized separately and presented below:

Natore:

- ✓ Use of pesticides starts from 20-30 years ago and frequent application starts from the last 8-9 years.
- ✓ Farmers are unable to grow some crops (brinjal, country bean) without frequent application of chemicals.
- ✓ Increasing pesticide application resulted the increasing role of pest attack, e.g. Bean aphid could be successfully controlled by the application of ash at 5-7 years ago. But present time it is quite impossible to grow bean without pesticide application.
- ✓ To control the brinjal shoot and fruit borer, the 'Indian oil' comes from India whose chemical name is 'Kripcord' is frequently used as it can protect the pest for 3-4 days.
- ✓ Few farmers produce brinjal only for selling in the market, not for their own consumption.
- ✓ Considerable farmers were unable to diagnose the problem and used broad-spectrum pesticides.
- ✓ Farmers identified only the birds and frogs as the beneficial for their crops.
- ✓ Farmers mentioned the excess pest attack, excluding of frog and fish and human body disorder as the result of excess application of pesticides.

Norsingdi

- ✓ Use of pesticides starts from 20-30 years ago and frequent application starts from the last 10-12 years.
- ✓ About one third of the farmer's revenue from selling vegetables is spending against buying pesticides.
- ✓ Increasing pesticide application resulting increasing infestation of pest. Farmers claimed the low quality pesticides are responsible for this situation.
- ✓ Most of the farmers used pesticides in their vegetable fields at least 2-3 times in a week.
- ✓ In some cases, they used pesticides almost everyday in the same field to protect their crops from major pests (e.g. Brinjal shoot and fruit borer).
- ✓ Some farmers frequently used pesticides for selling their vegetable whereas they routinely grow few vegetables without application of pesticides for their own consumption.
- ✓ The unauthorized 'Indian bish' becomes popular from the last 1-2 years as it can be used to protect most of the vegetables from pest attack.
- ✓ Few trained farmers identified the spider, ladybird beetle as the beneficial insect, but they had no interest to protect them.
- ✓ Physical sufferings, severe pest attack etc. problems were mentioned as for excess application of pesticides.

Moulvibazar

- ✓ Use of pesticides starts from 15-20 years ago and frequent application of pesticides starts from the last 5-6 years.
- ✓ Farmers are unable to control the 'Rice hispa' and 'Rice case worm' by using chemicals for the last 3-4 years. For this reason they claimed for low quality pesticides.
- ✓ Most of the farmers have no idea about the pest and their management.
- ✓ Farmers are interested to grow crops by using proper pesticides.
- ✓ Farmers identified the excessive pest attack as the natural calamity.
- ✓ Only birds are identified as the beneficial for crop production.
- ✓ Farmer's identified the elimination of fishes, physical sufferings as the results of excess application of pesticides.

V. Farmers innovative knowledge on pest management

Farmers generally use some traditional method (e.g. application of ash, cow dung, neem extract, putting stick in the field to scare away birds etc.) to protect their crops from the infestation of insects and diseases. From the last decade, farmers were being interested about pesticides as they got considerable instant results against the pest and easy to use. Due to frequent application of pesticides with excessive doses; some of the pests have already gained high resistance against pesticides. For this reason, farmers are now often failed to control some of the most destructive pests by chemicals. On the other hand, farmers have to spend a large amount of money for buying chemicals to protect their crops from pest attack.

When farmers failed to protect their crops by the traditional methods or by using frequent application of pesticides, they try to find an alternative way to control the pest. As farmers have long time experience in crop production, they try to control the pests by some innovative techniques on the basis of nature of damage or the behaviour of pests. Sometimes farmers use some traditional methods and chemicals with some effective modification with their own intelligence. Skilled farmers always try to find the most effective, economical and easiest process to control the pests.

From the survey in Summer-I crop season, it was found that few farmers of three districts successfully controlled a variety of major pests. Most of the innovative methods were found economical, readily available and helpful to conserve biodiversity. It will also be helpful to suggest the farmers of another region where it is difficult to control the pest by suitable way.

To know the effective, alternative way of pests control action, farmers were asked about their innovative methods for pest management. About 20 methods were identified from the survey of Summer-II crop season in three districts. Among them, 15 methods in Natore district, 3 methods in Narsingdi district and 1 method in Moulvibazar district were identified where 7-8 methods showed considerable results against rice stem borer, rice hispa, bean aphid, bean pod borer, cutworm, pomegranate fruit borer etc.

Some of the innovative methods those are repeatedly identified in two crop seasons are not included in this summary paper (Please see the summary paper of Summer-I crop season).

Some of the innovative methods identified in three districts are described in the following table 13.

Table 13: Farmers innovative knowledge on pest management in three districts

Crop	Pest	Description of the method	Effectiveness	Cost	Source
Rice	Rice stem borer	<ul style="list-style-type: none"> - 'Wheel powder' (Cloth washing powder), 'Gul' (Dust tobacco leaf), and 'Fitkari' is mixed together with urea fertilizer and then applied to the field as the pest is appeared. - 4 packets of 'gul' (1 taka per pile), 4 packets 'wheel powder' (2 taka per packet) and 250 g 'fitkari' (white vitriol) are applied in one bigha (33 decimal) of land for one time and this mixture is applied for 1-2 times. 	This pest can be controlled effectively	12 Tk/ Bigha	Abdul Hakim, Father-Late Amir Ali, Vaturia, Natore Sadar
Rice	All insects	<ul style="list-style-type: none"> - The seeds of 'desi pat' (country variety of jute) is to dried in sunlight and crushed to make dust by traditional equipment and sprayed in the rice field @ 3 kg/Bigha. 	Insects can not attack the rice plant	Negligible	Amzad Hossain F-Late Shahdat Ali, Vaturia, Natore Sadar
Rice	Sheath blight/ Sheath rot	<ul style="list-style-type: none"> - 'Tute' (Copper sulphate) and Boric powder is mixed and then applied in the rice field for two times. - 500 gm 'Tute' (42 Taka), 200 gm boric powder (14 Taka) is mixed and applied per Bigha. 	If these are applied before the infestation, it gives good result,	56 Tk/ Bigha	Md. Saiful Islam, F-Akul Pramanik, Vaturia, Natore Sadar.
Country Bean, Yard long Bean	Aphid & other leaf insects	<ul style="list-style-type: none"> - Ash mixing with kerosene oil is applied to the foliage part of the plant at early morning when the plant parts bear moisture. - One basket ash is mixed with 100 ml kerosene oil and applied 3-4 times at 5-6 days interval. 	The pest can be effectively controlled	10-15 Bigha	Abdul Hakim, F-Late Amir Ali, Vaturia, Natore Sadar.
Sesame (Til)	Hairy caterpillar	<ul style="list-style-type: none"> - A long rope dipping into kerosene oil is pulled over the field for 2-3 times frequently. - It is done for 2-3 times at 4-5 days interval. 	Low cost and effective	Negligible	"

Crop	Pest	Description of the method	Effectiveness	Cost	Source
Rice	All kinds of insects	<ul style="list-style-type: none"> - 1 kg neem leaf and 100 gm to tobacco leaf (Ala pata) or 4 packets <i>Gul</i> ('Dust tobacco leaf) is boiled in 4 L water. When the boiled mixture turned into 2 L, the mixture should be cold. After cooling, the mixture is filtered. The solution is applied by a spray Machine mixing with additional water. - 2 kg liquid mixture is mixed with 4 drum of water (1 drum=10 L) and can be sprayed for 1 Bigha of land. - Spraying is made for 3 times in a season. 	It gives very good result and not need to apply pesticides.	8-10 Tk/Bigha	Dr. Nasir Uddin F-Late Md.Foigulla Pramanik, Vaturia, Natore Sadar.
Garlic, Onion	Purple blotch disease	<ul style="list-style-type: none"> - 1 kg 'Tute' (Copper sulphate) and 1 kg 'Fitkari' is mixed with 4 drum of water (1 drum= 10 L water) and sprayed for 1 Bigha of land. - Spraying is done for 1-2 times as soon as the disease symptom appeared. 	Very effective to control this disease	145 Tk/Bigha (1 kg Tutecost of Tk 8), 1 kg Fitkari cost of Tk 65)	Md. Nasir Uddin, F-Late Foigullah Pramanik, Vaturia, Natore Sadar.
Mango	Mango hopper, Defoliat or & other insects.	<ul style="list-style-type: none"> - Straws are twisted together inserting dry chilli and then made fire to produce smoke and heat. If it is burnt under the mango tree, the pest fall down or died. 	In case of mango defoliator, it is very effective.	Negligible	Md. Ali Hossain, F-Mazpara, Dighapotia, Natore Sadar.
Country bean	Bean pod borer	<ul style="list-style-type: none"> - 'Gul' (dust tobacco leaf) mixing with water is sprayed on the infested plant. - 4-5 packed 'Gul' is mixed with 10 Lt water and sprayed for 1-3 times. 	Effective	5-7 Taka/Bigha	Do
Brinjal	Foot rot/ stem rot	<ul style="list-style-type: none"> - When the basal portion is dried and broken by cracking, this method is used. - 100 g Dithane M- 45, 50 g Aqua wint (one kind of glue found from the poultry dealer) is mixed properly in 1-1.5 L water. - A rough cloth is used to 	60-70% disease infestation can be controlled	50 Taka / Bigha	Md. Farid Ahmed, F-Hasan Ali, Agran, Baraigram.

Crop	Pest	Description of the method	Effective ness	Cost	Source
		<p>apply the solution on the infected plant part by a layer. Within few hours, the solution becomes dry and persistent and cannot be removed by water.</p> <ul style="list-style-type: none"> - It is used for 2-3 times when the infestation starts or before the infestation. 			
Country Bean	Bean pod borer/ Bean aphid	<ul style="list-style-type: none"> - 100 g tobacco leaf (Ala pata) dipped into 1 L water for a 1 night. The extract of tobacco leaf is mixed with 40 L water and then sprayed on the infested plant parts. - It can be used against the bean aphid as well as bean pod borer. 	It gives good results.	10-12 Tk/ Bigha	Md. Farid Ahmed, F- Hasan Ali, Agran, Baraigram.
Rice	All insects	<ul style="list-style-type: none"> - Application of 'Gul' (Powdered tobacco leaf) mixing with fertilizers. - It is done for 2-3 times when the urea fertilizer is applied. - 5 packets 'gul' is needed for 1 bigha land. 	Insect infestation is low	10 Tk/ Biha	Md. Abdul Mannan, F- Aftab Dewan, Buridaha, Natore Sadar.
Pome granale	Pome granale fruit borer	<ul style="list-style-type: none"> - During the flowering stage, low-level insecticides (e.g. Malathion) applied to prevent the pest attack. As the flower turned into young shaped, it is wrapped by poly paper. - When the fruit turns to large sized, the Polly paper is removed. 	70-80% pest infestation can be controlled	5-7 Tk/ plant	Mrs. Kazoli H. Badshah Mian, Buridaha, Natore Sadar.
Rice	All insects	<ul style="list-style-type: none"> - Long rope dipping into kerosene is pulled over the field for 2-4 times frequently. - It is done at 5-10 days interval for 3-5 times in a crop season. 	Infestation of pest was found minimum.		Md. Oazed Ali, F- Late Omed ali, East Haguria, Natore Sadar.
Chilli, Brinjal, Cabbage	Soil insects (Cutworm, Mole cricket)	<ul style="list-style-type: none"> - 'Lale' or 'Jula gur' (Molasses), Rice husk and the insecticide Cymbush are mixed properly and then applied by mixing with the upper layer soil. 	Infestation of pest effective to control the pest.	50-60 Tk./ Bigha	Md. Samsul "Alam, F- Late Azimuddin, East Haguria, Natore

Crop	Pest	Description of the method	Effectiveness	Cost	Source
		- It is done for 1-3 times at seedling stage of crops.			Sadar.
Rice	Rice hispa	- Kerosene oil is mixed with pesticides and sprayed in the field. - Sometimes, a long rope dipping into kerosene oil is pulled over the fields for 2-4 times frequently. It is done at 2-3 days interval and for about 7-8 times in crop season.	It gives good results where pesticide alone can not protect the pest attack	60-70 Tk/Bigha/ spray	Sri Jitesh Deb, F. Khitish Deb, Patricul, Srimangal.
Cabbage cauliflower	Cutworm	- The both side open polythene is used to cover the basal portion of the plant up to 2-3 inches depth from the ground level, so that the pest cannot reach to the plant. When the pest feels the hard barrier, it moves backward.	Although it is time consuming and costly, it gives very good result.	100-150 Tk/ Bigha	Md. Salim, F- Abdus Sattar, Pahar Morgal, Raipura.
Brinjal	Brinjal shoot & fruit borer	The extract of Bael leaf (leaf of wood apple), the pesticide Sevin dust are mixed together and then sprayed in the field by mixing with proper water. 20-25 gm Sevin dust, extracts of 1-2 kg Bael leaf extract are mixed with 10 L water	Slightly good results in comparison to pesticide alone	-Without pesticide, the cost is negligible	Mizanur Rahman, F. Abdus Subhan, Pahar Morgal, Raipur.
Country bean	Bean pool borer	1 spoon of naphthalene crush, 10-15 ml of Fenfen (insecticide) are mixed with 10 L water then it is applied to the plant by a sprayer at 5-10 days interval for 4-5 times. The same mixture is used to control the infestation of leaf folder of cucumber.	It shows good results	50-60 Tk./ Bigha/ Spray	Md. Baset Mian, F. Md. Ali Akbar, Paharmorjgal, Raipura.

Lessons Learned

- ✓ Farmers are more interested to know about the effective innovative methods, as these are cost effective, readily available and effective in situations where it has become difficult to achieve control with pesticides.
- ✓ Some vegetables like brinjal is sprayed pesticides almost every day during the rainy season. In a crop growing season, it is sprayed for about 70-80 times on an average and it may rise up to 180-220 times (As observed in Natore district).
- ✓ The unauthorized pesticide 'Indian oil' (comes from India whose chemical name is 'Kripicord') becomes popular in Natore and Narsingdi district for the last 1-3 years to control the destructive pests (e.g. Brinjal shoot and fruit borer).
- ✓ In some cases, the severe infestation of a pest was noticed in a specific area whereas it was identified as a minor pest in other locality. In Moulvibazar district, the rice fields of some area were found fully destroyed by 'Rice hispa' and farmers are unable to control this pest whereas farmers of Natore district identified it as a minor pest.
- ✓ Few farmers were found to apply the pesticides frequently in their vegetables only for selling their products in market at a high rate where they grown few vegetables without using pesticides for their own consumption. To get more profit, they use more pesticides.
- ✓ In Summer-II crop season, farmers of three districts identified more diseases in comparison to the survey in Summer-I crop season.
- ✓ Most of the farmers are depended upon the local pesticide dealers where they advise to apply high doses of their selected pesticides with the aim of selling their chemicals.
- ✓ Farmers used the local name of the pests and diseases on the basis of nature of damage, symptoms and major pest characters where some local names bears no specific meaning.
- ✓ Farmers, who produce vegetables for commercial purpose, give more emphasis to use chemicals, instead of other methods, as it is easier and instant result can be obtained.
- ✓ In comparison to insects, farmers have little concept about disease and their management, the symptoms of disease infection and nutritional deficiency symptoms. Some insects, which are not visible, are identified as disease.
- ✓ Only few farmers have concept about the beneficial insects. Maximum farmers believed that any kind of insect present in the crop field is harmful.
- ✓ Farmers were found less interested to use chemicals to protect against diseases and were more inclined to protect against insect pests. Even farmers used broad-spectrum insecticides when they failed to control some diseases.

- ✓ Farmers wanted to know the appropriate recommendation of pesticide use and more interested to receive training on plant health problems.
- ✓ Some pesticides banned by the government that contains high toxicity and residual effects are available in the market.
- ✓ It was found that farmers sprayed pesticides in their vegetable fields prior to harvesting or selling if the pest attack observed.
- ✓ Some of the farmer's innovative methods to protect pest infestation give considerable results. Most of the innovative methods are used in the specific areas.
- ✓ Some of the effective innovative methods were the modification of some indigenous methods or the association of common chemicals with some traditional techniques
- ✓ Female farmers expressed more interest about fruit problems and the crops grown in the homestead.
- ✓ Few farmers were not interested to explain their effective innovative methods in a group discussion, as they believed that it's a secret technique for better crop production

Conclusion

Necessary information related to plant health problems was collected in a participatory manner to know the consensus opinion of the farmers. After completion of the survey in Summer-I crop season, AAS/CABI Bioscience conducted the survey in Summer-II crop season at 12 villages in Natore, Narsingdi and Moulvibazar districts. In the survey, farmers were asked to express their opinion on major plant health problems, status of the pest infestation, pest identifying characters, nature of damage or symptoms, favourable conditions of pest attack, period of pest severity and the existing pest management practices. In the survey area, some of the insects and diseases were found to be appeared as an epidemic condition in this crop season and noticed the severe damage for the last few years. Farmers of the survey area were inclined to apply some unauthorized highly toxic pesticides as few insects have already gained greater resistance against chemicals. Some vegetables were found to spray pesticides almost everyday to control their infestation. Few farmers were found to spray pesticides frequently only for selling their vegetables in the market and uninterested to consume themselves. Due to application of pesticides excessively or using the wrong chemicals, about one third of the farmer's vegetable crops revenue is spent on buying pesticides.

Besides the frequent pesticide application, few farmers were found to successfully control some major pests through the use of some innovative methods. In the survey of Summer-II crop season, a total of 16 innovative methods were identified in three districts where about 5-6 methods were found to be highly effective to control the pest. Some innovative methods were found to be cost effective, readily available and very effective against the pest where it has become difficult to achieve control by pesticides.

The survey in Summer-I and Summer-II crop growing season has already completed. After completion of the survey in Winter crop growing season, it will be easier to draw a generalized conclusion about the overall plant health situation in the survey areas. This report summarizes the information of the survey undertaken in the Summer-II crop-growing season.

Recommendations

- i) Proper emphasis should be given to know more about farmer's innovative method for pest management. Some villages can be newly included within the survey area instead of old ones to identify more innovative methods.
- ii) Attention should be made to those insect pests that become the most destructive pest throughout a locality as an epidemic form for the last few years (As observed in Moulvibazar district).
- iii) More emphasis should be given to those insect pests that are known to have acquired high level of pesticide resistance so that effective control measures can be developed without using frequent application of pesticides.
- iv) To support the identification of the more confused plant health problems, sufficient digital photographs should be used.
- v) The survey areas should be expanded to other regions in order to give a comprehensive 'plant health' view of the entire country.

Annex I: Participating farmers, Group Coordinators and Venues of FGDs of the qualitative survey on plant health problems.

Date	Venue	Village	Upazila	District	Number of participating farmers			Group Coordinator
					Male	Female	Total	
11.9.04	Joari High School	Joari	Baraigram	Natore	33	-	33	Md. Saiful Islam
13.9.04	Vaturia Govt. School	Varuria	Natore Sadar	Natore	39	12	51	Md. Nasir Uddin
19.9.04	Training Room, NEDA	Mazpara	-Do-	Natore	18	12	30	Mrs. Begum
23.9.04	Adhgram Primary School	Adhgram	Baraigram	Natore	23	-	23	Md. Ashrafur Islam
24.9.04	Sirajul Islam's home	Mazgram	-Do-	Natore	26	-	26	Md. Shahdat Hossain
26.9.04	Aum Bagan, Natun bazar	Agran	-Do-	Natore	20	-	20	Md. Abdus Samad
29.9.04	Kazoli's home	Buridaha	Natore Sadar	Natore	10	10	20	Mrs. Kajoli
30.9.04	Badshah's home	East Haguria	-Do-	Natore	11	9	20	Md. Samsul Alam
3.10.04	Patrikul Primary School	Patricul	Srimangal	Moulvibazar	35	-	35	Md. Shamim Ahmed
4.10.04	Betuakhali Puza Asram	Betuakhali	Moulvibazar Sadar	Moulvibazar	27	-	27	Md. Mohosin Mian
4.10.04	Palpara bazar, Latif's shop	Palpara	Shibpur	Norsingdi	24	-	24	Md. Samsul Haque
9.10.04	Morgal High School	Pahar morgal	Raipura	Norsingdi	21	-	21	Md. Salim Mian

Annex-II

Agricultural Advisory Society (AAS)

House # 8/7, Block-B, Lalmatia, Dhaka-1207

Project: Plant Health Services *initiative* (PHS) in Bangladesh

Schedule of FGD (Sample)

Season: Summer-II, 2004

Number of Participants: 20-40 farmers

Conducted by: Agricultural Advisory Society (AAS)

Funded by: CABI Bioscience, UK

Venue:

Date:

Time (Tentative)	Topic/Event	Presentation Technique	Number of participants	Facilitator
10:00-10:20	Registration	-	20-40 farmers (Male/Female)	FC/BS
10:20-10:25	Introductory session	Presentation	-Do-	Murshed
10:25-10:30	Objectives of FGD	Presentation	-Do-	Murshed
10:30-10:45	Selection of standing crops & fruits and planning for field visit	Presentation & participatory discussion	-Do-	Murshed/ Agronomist/ AC/FC/BS
10:45-11:15	Field visit and sample collection	Field visit	3-4 farmers in a sub group	-Do-
11:15-11:55	Discussion on collected samples of plant health problems	Sample demonstration & open discussion	20-40 farmers (Male/Female)	-Do-
11:55-12:10	Background of pesticide application	Participatory discussion	-Do-	-Do-
12:10-12:40	Discussion on pesticide application for pest management	Participatory discussion	-Do-	-Do-
12:40-1:00	Tea break	-	-	-
12:40-1:20	Discussion on innovative knowledge on pest management	Participatory discussion	20-40 farmers (Male/Female)	-Do-
1:20-1:30	Other methods of pest management	Participatory discussion	-Do-	-Do-
1:30-1:10	Concluding session	-	-Do-	Murshed/ Agronomist