

**Project:**  
**Plant Health Services *initiative* (PHS<sub>i</sub>) in Bangladesh**

**Report on**  
**Participatory Qualitative Survey on Plant Health Problems**

**Season: Summer-I, 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 decimal
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
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

This report summarizes the results of a survey undertaken for the purpose of better understanding the extent of farmer's knowledge about plant health problems. The work was undertaken by Agricultural Advisory Society (AAS) in behalf of CABI Bioscience, U.K. The survey was conducted at 30 villages in 6 upazilas of Natore (Boraigram and Sadar upazila), Norsingdi (Raipura and Shibpur upazila) and Moulvibazar (Shrimangal and Sadar upazila) districts during Summer-I, 2004. AAS conducted the survey over the course of three different cropping seasons; i.e., Summer-I, Summer-II and Winter of 2004.

In Summer-I season, the survey was conducted from 13 March to 14 June 2004. A total of 820 farmers including 213 females participated. The survey was undertaken in each village over a two-day period. During the first day, a listing was made of the crops grown during three different seasons. According to farmers' opinion a notation of the area covered by each crop and the status of insect, disease and soil problems (on a scale of 0 to 5) for each of the crops in three crop-growing seasons. On the second day, farmers were divided into small groups to collect representative samples of major plant health problems from the selected crops. In a 'focused-group-discussion', farmers were asked to express their opinion on local name, identifying characters, nature of damage or symptoms and preferred problem management practices most commonly applied to resolve the particular problems encountered.

During the survey it was found that farmers used one or more local names to identify their plant health problems and were often unable to tie the commonly used, popular name, to any specific meaning. In certain other cases the local names were found which have translatable, literal meanings. Farmers used different local names on the basis of morphological characters, infestation characteristics or symptoms. Some of the local names of insects such as 'Mazra puka', 'Leda puka', 'Acha puka', 'Bolla puka', 'Katui puka' etc. were found comparable in all survey areas; whereas some local names were found to be unique to specific localities. In case of disease problems, farmers generally used the terms 'Pochan rog', 'Mora rog', 'Jhora rog' as they observed the ultimate result of disease infections. In the survey areas, there were more local names of insects in comparison to diseases.

Farmers identified about 20 crops in Natore district, 17 crops in Norsingdi district and 16 crops in Moulvibazar district including fruit trees, which have chronic, serious health problems. In Natore district, some crops are highly susceptible to damage from insects such as Rice (Rice stem borer), Sugarcane (Sugarcane stem borer), White gourd, Sweet gourd, Bitter gourd (Cucurbit fruit fly), Brinjal (Brinjal shoot and fruit borer), Pointed gourd, Cucumber (Lepidopteran larvae), Chilli, Groundnut (Cutworm), Ribbed gourd, Teasle gourd (Epilachna beetle), Jack fruit (Jack fruit stem borer), Banana (Banana leaf and fruit beetle), Mango (Mango stem borer and Mango hopper) etc. In Norsingdi district, Brinjal (Brinjal shoot and fruit borer), Cucumber and Brinjal (Red mite), Ribbed gourd, Teasle gourd, Pointed gourd (Epilachna beetle, Cucurbit caterpillars), Banana (Banana leaf and fruit beetle) etc. crops were damaged seriously. In Moulvibazar district, Rice (Rice hispa, Rice stem borer), Yard long bean (Aphid), taro / Mukhikachu (Hairy caterpillars) etc. were damaged

seriously. Among the crops of the survey area, Sugarcane, Rice, Garlic, Betel vine, Cucumber, Groundnut, Brinjal, Chilli, White gourd, Coconut, Mango, Jackfruit, Teasle gourd, Yard long bean, Betel nut, Banana suffered serious disease problems.

Farmers were able to identify a range of health problem characteristics, symptoms of damage and signs of infestation. They were equally able to discuss the prevailing pest and disease management strategies being used in each locality (traditional methods, chemical methods or other innovative practices).

To know the actual situation of pesticide application, farmers were asked to give the trade name of chemicals, dosage and the frequency of application. Farmers used some pesticides such as Malathion, Fenfen, Fenitox, Basathrin, Fifanon, Dursban, Schincyper, Cymbush, Tafgor, Marshal, Ripcord, Basudin, Diazinon, Furadan etc. to protect crops and fruits from a variety of pests and diseases. In most of the cases, farmers used available chemicals on the basis of recommendations from their local pesticide dealers. Farmers were found less interested to use chemicals to protect against diseases and were more inclined to use them to protect against insect pests. Some chemicals such as Ridomil, Rovral, Dithane M-45 etc. are used to protect against diseases.

Farmers were asked about innovative methods to minimize plant health problems. **About 35 innovative methods were identified in three districts where farmers successfully controlled a variety of major pests.** Some of the innovative methods were modifications of commonly used indigenous methods in association with modern chemicals. In Natore district, about 20 innovative methods were identified. Of these 5-6 methods gave good results in controlling Adult moth of rice and jute, Cucurbit fruit flies, Cut worm, Rats, Aphids etc. In Narsingdi district, about 15 methods were identified wherein 3-4 methods were found to be very effective in the control of Red mite, Cucurbit fruit fly, Banana leaf and fruit beetle, Aphids etc. In Moulvibazar district, about 10 innovative methods were identified where 2-3 methods were found effective to control the Rice hispa, Cutworm, Rice stem borer etc. About 10 innovative methods were identified which were commonly practiced in three districts. **Some of the farmers used the innovative methods as they were cheap, readily available and where it was difficult to achieve control by chemicals.**

To control most of the major pests, farmers frequently used some common as well as some unauthorized pesticides in a hazardous way. In Natore district, farmers frequently use pesticide to control Sugarcane stem borer, Rice stem borer, Brinjal shoot and fruit borer, Lady's finger shoot and fruit borer, Cucurbit fruit fly etc. In Narsingdi district, farmers applied pesticides at least 1-2 times in a week in all vegetable fields. To protect brinjal from pests, they used pesticides up to 5-7 times in a week. Excess amount of pesticides were applied to control Epilachna beetle, Red mite, Aphids, Cucurbit fruit fly, Brinjal shoot and fruit borers, Lady's finger shoot and fruit borer and some Cucurbit caterpillars. In Moulvibazar district, farmers are happy to use pesticides as they get good results. Only few pests make troubles, to control them by pesticides. In general, farmers of all districts frequently applied excess amount of pesticides to control Brinjal shoot and fruit borer, Epilachna beetle, Lady's finger shoot and fruit borer, Cucurbit fruit flies etc. Farmers also used some unauthorized chemicals to protect against destructive pests. In Natore district, farmers used 'Indian oil' (local name of chemical is "Indian oil" whose trade name is

“Kripcord”) to protect ‘Chera’ (a species of earthworm), heptachlor to protect termites, stem borer of sugarcane. Farmers of Norsingdi district used unlabelled pesticides collected from the local dealers to protect against major pests. In general, it was found that vegetables were sprayed in the field on the day immediately prior to harvest. Farmers sprayed pesticide at the harvesting period of both vegetables and cereal crops if the pest attack was observed. **In spite of the frequent application of pesticides prior to selling their products in the market, farmers in Norsingdi district routinely grow vegetables without using pesticide for their own consumption.**

Necessary information related to plant health problems was collected in a participatory manner. The summary paper was prepared by the compilation of necessary information from the 30 village survey reports of Summer-I crop season in Natore, Norsingdi and Moulvibazar districts; details of which are presented in the following sections.

## 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 results 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 conducted a participatory survey at 30 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 farmer's concept about the problem.
- iv) To know more about the developing health problems of different crops.
- v) To know the pest/disease 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 divided into 3 parts on the basis of crop growing seasons i.e. Summer-I, Summer-II and winter. In Summer-I season, the survey was conducted from 13 March 2004 to 14 June 2004. A total of 820 farmers (607 male and 213 female) participated in the participatory qualitative survey on plant health problems. The survey was conducted at 30 villages in 6 upazilas of Natore (Boraigram and Sadar upazila), Narsingdi (Raipura and Shibpur upazila) and Moulvibazar (Srimangal and Sadar Upazila) districts. The project locations and number of participants of the survey are provided in the following table 1:

**Table1: Participants and locations of the survey**

Duration	Venue		Number of Village Covered	Number of participating farmers		
	District	Upazila		Male	Female	Total
13 March 2004 to 14 June 2004	Natore	Boraigram	10	238	16	254
	Natore	Natore Sadar	8	61	179	240
	Narsingdi	Raipura	4	85	4	89
	Narsingdi	Shibpur	2	70	-	70
	Moulvibazar	Srimangal	4	96	14	110
	Moulvibazar	Moulvibazar Sadar	2	57	-	57
<b>Total</b>			<b>30</b>	<b>607</b>	<b>213</b>	<b>820</b>

## **Methodology**

The participatory qualitative survey was conducted by Agricultural Advisory Society (AAS) at 30 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. A survey guideline was prepared. Overall supervision and guidance 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 crop varieties were grown and the infestation status of pests and diseases was high. Both agriculturally developed villages and agriculturally undeveloped villages were considered. A total of 30 villages were selected from 6 upazilas in 3 districts namely Natore, Narsingdi and Moulvibazar district (10 villages from Boraigram upazila, 8 from Natore Sadar upazila, 4 from Raipura upazila, 2 from Shibpur upazila, 4 from Srimangal upazila and 2 from Moulvibazar Sadar upazila) (Anex-1).

### **Farmer selection**

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

### **Farmer's group formation**

In each selected village, 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.

### **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 any other national day was avoided.

### **Conducting FGD**

In each village, the focused group discussion was organized with 20-30 farmers for two days. On the first day, farmers were asked about cropped-area coverage, status of insect, disease and soil problems of each crop to make a short list of major plant health problems. On the second day, farmers were asked to express their ideas about the prevailing pests and their favored management practices. The following steps were followed for conducting the "focused group discussions".

### **1<sup>st</sup> day :**

- 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 major crops at different crop growing seasons such as winter, Summer-I, Summer-II, annual, homestead and orchards was prepared.
- v) Area covered by each crop at different crop growing season in each village was recorded.
- vi) According to farmers opinion, status of insect, 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). All the information was written on the flip chart.
- vii) According to the area coverage and infestation status of insects, diseases and soil problems, a short list of the important crops was prepared.
- viii) Crop season was identified on the basis of sowing time and the harvesting time at open discussion.

The following format was used for recording the information on a flipchart:

<b>Season</b>	<b>Crops</b>	<b>Area of land</b>	<b>Insect infestation status</b>	<b>Disease infection status</b>	<b>Soil problem status</b>	<b>Rank</b>
Winter						
Summer-I						
Summer-II						
Annual						
Homestead & Orchard						

### **2<sup>nd</sup> day:**

- i) Standing crops in the fields and fruit trees were listed in the flip chart.
- ii) Before the fields visit, the entire farmers group was divided into several sub-groups with a group leader for each sub-group. After group formation, sample collection procedures of plant health problems were explained to the group leaders and the members of each group against each crop. The assigned crop and its season, group and its leaders name were recorded on the flip chart using the following format.

<b>Crop</b>	<b>Season</b>	<b>Group</b>	<b>Name of the group leader</b>

iii) Field visit and sample collection session:

- ✓ To identify the pests, 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 were identified, the sample was send to relevant research station for proper evaluation and diagnosis.

iv) Participatory discussion on collected samples of plant health problem:

- ✓ Any problem faced by the farmers relating to plant health was recorded.
- ✓ Various local names available to farmers and their ideas about the problem were recorded.
- ✓ Management practices adopted by the farmers and other information available to them were also recorded.

The following format was used to record the information in the flip chart during participatory discussion.

<b>Crop</b>	<b>Subject/ problem category</b>	<b>Local name and their meaning</b>	<b>Farmers concept about the problem</b>	<b>Management practices</b>	<b>Common name</b>

v) Discussion on the background of pesticide application and pest management:

In this session, farmers were asked some questions related to pesticide application and pest management, such as –

- ✓ How long ago the use of pesticides is being started and from what time it is being used as large scale?
- ✓ What is the condition or infestation status of the pests and diseases after using pesticide?
- ✓ Are you gained by using pesticide?
- ✓ Is there any bad effect in using pesticide?
- ✓ Do you apply any innovative method to control pests without pesticide? How much these methods are effective?
- ✓ What is your idea about the beneficial insects?

Finally all the information's were recorded in a flip chart. The information collected from different villages was compiled separately. After data compilation, the village wise report was prepared. Final report of a crop season is based on the compilation of 30-village reports.

# Findings

## I. Status of plant health problems in three districts

At the first day of focus group discussion (FGD) in each village, farmers were asked to inform about the crops grown in the different crop seasons. Area covered by each crop at different crop growing seasons was recorded. According to farmers' opinion, status of insect, disease and soil problems were recorded to make a short list of major plant health problems.

Farmers identified about 49 crops in Summer-I crop season, 21 crops in Summer II crop season and 52 crops in Winter crop season in three districts which have problems.

In Summer I crop season, farmers identified about 27 crops in Natore district, 21 crops in Narsingdi district and 20 crops in Moulvibazar district was identified which have chronic, serious health problems.

In Natore district, rice, sugarcane, mango, brinjal, lady's finger, chilli, cucumber, bitter gourd, teasle gourd, pointed gourd, mung bean, sweet gourd, jack fruit, pomegranate, banana etc. crops are damaged seriously by insects. Some of the crops such as garlic, onion, mango, jackfruit, betel vine, groundnut, chilli etc. are found damaged by diseases.

In Narsingdi district, brinjal, teasle gourd, cucumber, bitter gourd, lady's finger, ribbed gourd, pointed gourd, yard long bean, banana, white gourd, chilli, jackfruit etc. are seriously damaged by insect and teasle gourd, brinjal, cucumber, coconut etc. are damaged by diseases.

In Moulvibazar district, rice, yard long bean, taro, lady's finger, brinjal, cucumber, white gourd, pomegranate, jackfruit etc. are highly damaged by insects. Some of the crops such as betel vine, yard long bean, coconut, banana, teasle gourd etc are found seriously damaged by diseases.

In general, some crops grown in three districts, such as rice, brinjal, lady's finger, cucumber, teasle gourd, white gourd, coconut, jack fruit, pomegranate, banana etc. were reported to be highly vulnerable to damage by insects and diseases.

Farmers identified about 39 insects and 35 diseases and soil problems in Summer-I crop season by which the crop's health was suffered seriously. From the participatory survey at 30 villages, it was found that the frequency of some damaging insects was comparatively higher such as cucurbit fruit fly, brinjal shoot and fruit borer, rice stem borer, sugarcane stem borer, pumpkin caterpillar, epilachna beetle, Leaf folder of cucurbit, red pumpkin beetle, jackfruit stem borer, earthworm (chera) etc. On the other hand, the frequency of some diseases such as bud rot of coconut, nutritional deficiency of coconut, clove separation of garlic, Leaf curl of teasle gourd, virus of cucurbit, anthracnose of mango, purple blotch of garlic or onion, foot rot of betel vine, rhizobium rot of jackfruit etc. were comparatively higher. The frequency of plant health problems found from the participatory survey at 30 villages in three districts in the Summer-I crop season in summarized in the Table 2 and 3.

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. On the basis of area coverage and the infestation status of insects, diseases and soil problems, the ranking of major crops grown in three districts in Summer-I season is summarized in the Table 4.

**Table 2: Frequency of plant health problems (insects) at 30 villages in three districts**

<b>Sl. Nr.</b>	<b>Insect</b>	<b>Frequency</b>
1	Cucurbit fruit fly	15
2	Brinjal shoot & fruit borer	12
3	Rice stem borer	12
4	Sugarcane stem borer	12
5	Pumpkin caterpillar	9
6	Epilachna beetle	8
7	Leaf folder of cucurbit	6
8	Red pumpkin beetle	5
9	Jackfruit stem borer	5
10	Earth worm (Chera)	5
11	Cut worm	4
12	Okra shoot & fruit borer	4
13	Pomegranate fruit borer	4
14	Bean aphid	4
15	Rice hispa	4
16	Jackfruit borer	3
17	Aphid (garlic, onion)	3
18	Red mite	3
19	Banana leaf & fruit beetle	3
20	Mango stem borer	2
21	Rhinoceros beetle	2
22	Mango hopper	2
23	Mango fruit borer	2
24	Caterpillar of red amaranth	2
25	Field cricket	2
26	Hairy caterpillar of mung bean	1
27	Gram pod borer	1
28	Termite	1
29	Rice gall midge	1
30	Grass hopper	1
31	Lemon butter fly	1
32	Jassid of lady's finger	1
33	Caterpillar of taro	1
34	Caterpillar of sesame	1
35	Litchi fruit borer	1
36	Mango fruit weevil	1
37	Mole cricket	1
38	Unidentified caterpillar 'grub'	3

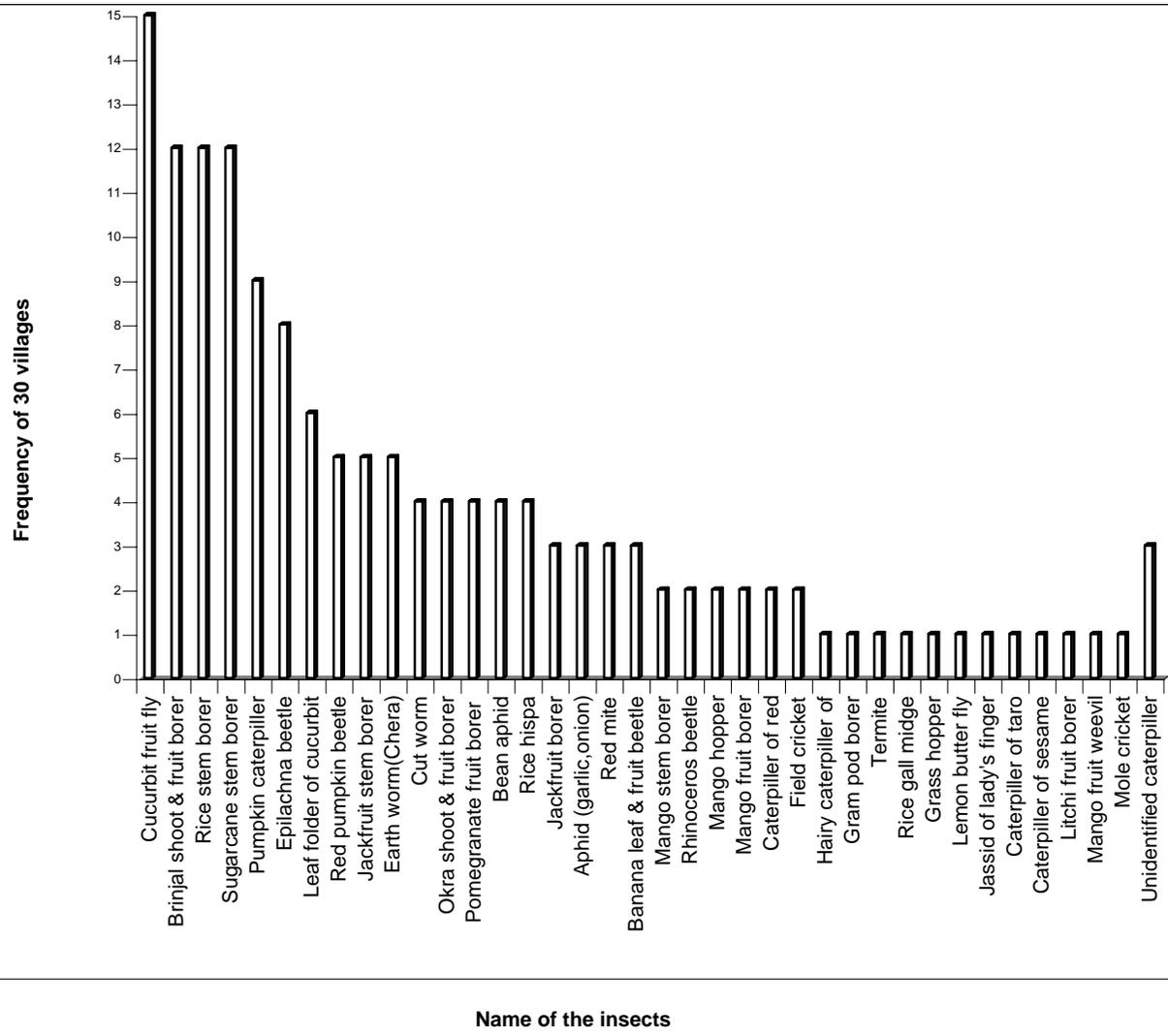


Figure I: Frequency of plant health problems (insects) at 30 villages in three districts

**Table 3: Frequency of plant health problems (diseases and soil) at 30 villages in three districts**

<b>Sl. Nr.</b>	<b>Diseases and soil problems</b>	<b>Frequency</b>
1	Bud rot of coconut	11
2	Nutritional deficiency of coconut	9
3	Unknown garlic problem	5
4	Leaf curl of teasle gourd	5
5	Virus of cucurbit	5
6	Anthracnose of mango	4
7	Purple blotch of garlic	4
8	Foot rot of betel vine	3
9	Rhizobium rot of jackfruit	3
10	Tungro virus of rice	3
11	Fruit rot of cucurbit	3
12	Root knot of brinjal	2
13	Mung bean virus	2
14	Foot rot of groundnut	2
15	Smut of sugarcane	2
16	Die back of mango	2
17	Leaf curl of brinjal	2
18	Red rot of sugarcane	2
19	Root rot of garlic	2
20	Bud rot of betel nut	2
21	Leaf curl of chilli	2
22	Little leaf of brinjal	1
23	Gummosis of lemon	1
24	Panama disease of banana	1
25	Canker of mango	1
26	Sheath blight of rice	1
27	Rust of bean	1
28	Wilt of brinjal	1
29	Foot rot of cowpea	1
30	Stem rot of betel vine	1
31	Foot rot of taro	1
32	Bunchy top of banana	1
33	Nutritional deficiency	4
34	Unidentified diseases of cucumber, banana, gourds	5

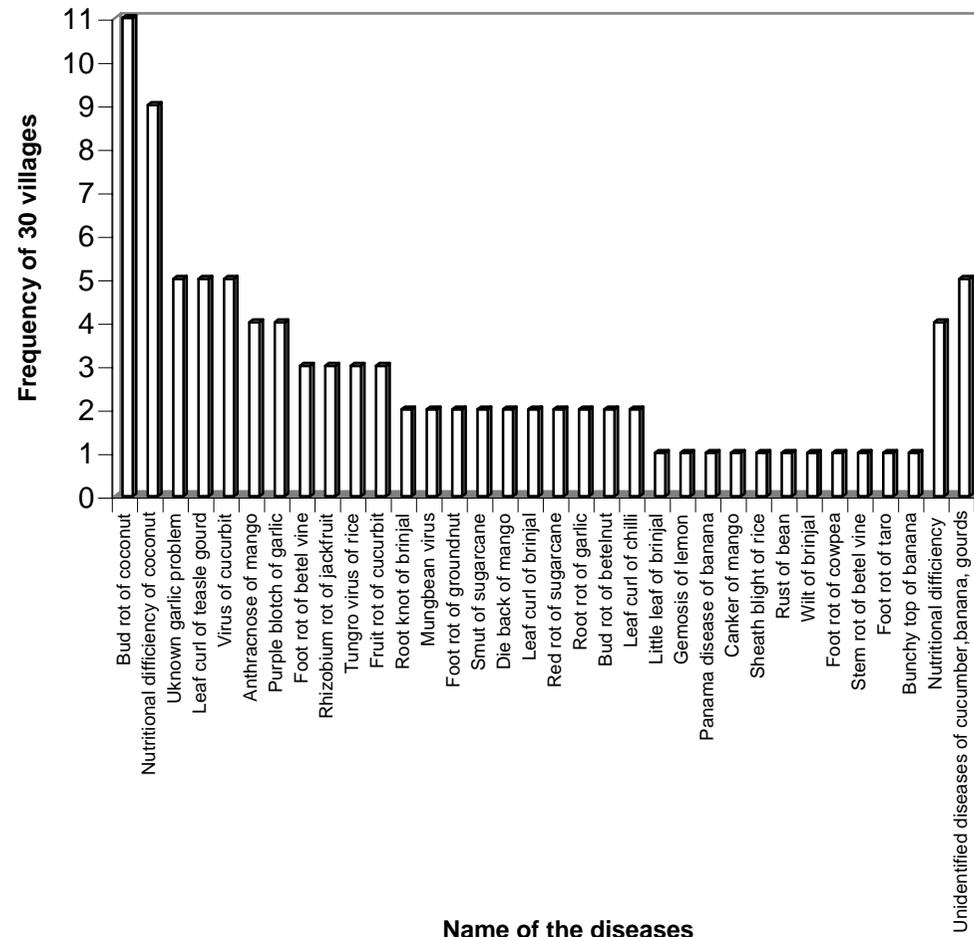


Figure II. Frequency of plant health problems(diseases and soil problems) in 3 districts

**Table 4: Health problem ranking of the selected crops in three districts**

<b>Natore district</b>	<b>Norsingdi district</b>	<b>Moulvibazar district</b>	<b>Rank</b>
Rice	Brinjal	Rice	1
Sugarcane	Teasle gourd	Taro (Mukhi Kachu)	2
Mango	Cucumber	Yard long bean	3
Garlic	Bitter gourd	Lady's finger	4
Onion	Lady's finger	Cucumber	5
Brinjal	Ribbed gourd	Brinjal	6
Chilli	Pointed gourd	White gourd	7
Lady's finger	White gourd	Betel vine	8
Ground nut	Yard long bean	Sweet gourd	9
Cucumber	Snake gourd	Teasle gourd	10
Pointed gourd	Rice	Lemon	11
Teasle gourd	Banana	Coconut	12
Bitter gourd	Sweet gourd	Jack fruit	13
Mung bean	Bottle gourd	Banana	14
Ribbed gourd	Sponge gourd	Pomegranate	15
White gourd	Chilli	Betel nut	16
Sweet gourd	Papaya	Bottle gourd	17
Melon	Jack fruit	Chilli	18
Red amaranth	Coconut	Mango	19
Bottle gourd	Lemon	Carambola	20
Black cumin	Pomegranate		21
Jack fruit			22
Coconut			23
Betel vine			24
Banana			25
Pomegranate			26
Lemon			27

## II. Local names of the plant health problems and their meanings

Farmers used different local names of the plant health problems on the basis of morphological characters, nature of damage, or symptoms. Each of the pests bears one or more local names at the same community. In the participatory survey, farmers were asked to give the local name of the insects and diseases. Farmers were also asked to describe the meaning of the plant health problems. Farmers tried to give the meaning of the local names. Some local names were found to have no definite, translatable meaning.

In Natore district, about 40 plant health problems were identified and found to have more than 80 local names. Among these, rice stem borer, sugarcane stem borer, brinjal shoot and fruit borer, epilachna beetle, cut worm, cucurbit fruit fly, red pumpkin beetle, pumpkin caterpillar, jackfruit fruit borer, lady's finger shoot and fruit borer, die back of mango, rhizome rot of jackfruit, foot rot of vegetables etc. shared many more local names.

In Norsingdi district, about 18 plant health problems were identified as a serious problems. These had more than 30 local names. Among the plant health problems, brinjal shoot and fruit borer, epilachna beetle, pumpkin caterpillars, cucurbit fruit fly, aphid, cut worm, banana leaf and fruit beetle, red mite, lady's finger shoot and fruit borer, die back etc. Each had been given more than one local name.

In Moulvibazar district, about 20 major plant health problems were identified which bears about 32 local names. Among them, rice stem borer, cucurbit fruit flies, epilachna beetle, brinjal shoot and fruit borer, lady's finger shoot and fruit borer, bean aphid, foot rot of betel vine, bud rot of coconut etc. Here too, each had more than one local name.

Some of the local names were found in the specific areas (e.g. "Lauri poka" of yard long bean or "Lohari poka of rice is familiar in Moulvibazar district, "Pipri rog" of teale gourd is well known in Norsingdi district, "Chera" of rice is familiar in Natore district,) etc. Some of the local name of insects such as 'Leda poka', 'Mazra poka', 'Bicha poka', 'Acha poka', 'Katui poka' etc. were common to all survey areas and participants. In some cases, one insect or disease had more than one local name in a specific region. In general, the soft-bodied larva or insects were identified as 'Leda poka' (means cow dung like soft insect), internal insects were identified as Mazra poka and all kinds of hairy insects are identified as "Bicha poka" or Acha poka".

In case of disease problems, farmers generally used some terms 'Pochon rog', 'Gura pocha rog', 'Mora rog', 'Jhora rog' etc. as these names characterized the observed the ultimate result of a particular disease. In the survey area, more local names of insects were identified in comparison to diseases.

The local names of the major insects, diseases and soil problems with their meanings found in three districts are shown in the following Tables 5, 6 and 7:

**Table 5: Meaning of the local name of plant health problems in Natore district**

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Rice (Dhan)	Mazra poka/ Mazkata poka	Central stem insect/ central stem cutting insect	Rice stem borer
	Chatka poka	Jumping insect	Grass hopper
	Chera	Earthworm (All kinds of earthworm locally known as 'Chera')	Earthworm
	Gura pocha rog	Base rot disease	Sheath blight
	Vairus	-	Virus
Garlic (Roshun)	Jab poka/ Menda poka	-	Aphid
	Pata mora rog	Leaf die disease	Purple blotch of garlic
	Sikor pocha rog	Root rotting disease	Root rot
	Gura folea jaua	Over growth of the basal portion (expanding of the basal portion)	Unidentified
Cucumber (Shosha & Khira)	Fol chidrokari poka/ Bolla poka/ Foler poka	Fruit boring insect/ Wasp insect/ Fruits insects	Cucurbit fruit fly
	Acha poka/ Bicha poka	Hairy insect	Caterpillar
	Gora pocha rog	Base rot disease	May be foot rot
Onion (Peaz)	Aga mora rog	Tip die disease	Purple blotch of onion.
Bean (Anaz, Sim)&Yard long bean (Borboti)	Mazra poka/ Leda poka	Central stem insect/ cow dung like (soft) insect	Bean pod borer
	Jab poka	-	Aphid
	Pata dug rog	Leaf spot disease	Rust of bean
Sugarcane (Kushar/ Akh)	Mazra Poka/ Sada kirra	Central stem insect/ white worm	Sugar cane stem borer
	Kala pata rog/ Virus	Black leaf disease/ virus	Smut of sugar cane
Brinjal (Begun)	Baguner kirra/ Mazra poka/ Fol chidrokari/ Begun poka	Worm of brinjal/ Central stem insect/ Fruit borer/ Brinjal insect	Brinjal shoot & fruit borer
Black cumin (Kalo gira)	Leda poka	Cow dung like (soft) insect	Gram pod borer
Mango (Aum)	Pata poka/ Chatka poka	Leaf insect/ Jumping insect	Mango hopper

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

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Mango (Aum)	Tata poka	Hole making insect ("Tata" is one kind of hand making wooden equipment for making holes)	Mango stem borer
	Mora laga rog/ Jaua dhora	Gradually die disease/ Starts of losing	Die back
	Jhora rog	Dropping disease	Anthraxnose
Coconut (Narikel)	Cara poka	Warm like insect (Mealy pad is also known as "Cara")	Grub of rhinoceros beetle
	Jhora rog/ Shukna rog/ Pani Shukna rog	Dropping disease/ Drying disease/ Water drying disease	Nutritional deficiency or bud rot of coconut
Jackfruit (Kathal)	Bhomor poka/ Bhor poka/ Birbira rog	Boring insect/ boring insect/ Gradually increasing disease	Jackfruit fruit borer
	Jhora laga rog/ Fol pochala laga/ Muchi jhora	Dropping initiation disease/ Fruit rot / Bud dropping	Fruit rot
Sweet gourd (Misti Kumra)	Halud machi/ Bolla poka	Yellow fly/ Wasp insect	Cucurbit fruit fly
Bitter gourd (Korola)	Leda poka/ Bolla poka	Cow dung like insect/ Wasp insect	Cucurbit fruit fly
Bottle gourd (Lao)	Sunduri poka/ Lal poka/ Ura poka	Beautiful insect/ Red insect/ Flying insect	Red pumpkin beetle
Melon (Bungi)	Ghura poka	Horse like insect	Pumpkin caterpillar
	Kukra rog	Curling disease	Virus
Chilli (Moris)	Katui poka/ Leda poka	Cutting insect/ Cow dung like soft insect	Cut worm
	Uii poka/ Roi poka	-	Termite
	Thanga poka	Large legged insect	Field cricket
	Pata kokrano rog/ Virus rog	Leaf curling disease/ virus disease	Leaf curl
Teasle gourd (Kakrul)	Sabuj poka/ Ghora poka	Green insect/ Horse like insect	Pumpkin caterpillar
Ribbed gourd (toroi/ Jhinga)	Kathali poka/ Bossonto poka/ Dail poka/ Holde poka	Jackfruit coloured insect/ spring coloured insect/ Pulse like insect/ Yellowish insect	Grub of epilachna beetle
Mung bean (Mug kalai)	Bicha poka/ Changa poka/ Acha poka	No definite meanings (all types of hairy insects are identified by farmers as "Bicha poka" or "Changa poka")	Hairy caterpillar

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Pomegranate (Dalim)	Leda poka/ Fol chidrokari poka/ Foler kirra	Cow dung like insect/ Fruit boring insect/ Worm of fruit	Pomegranate fruit borer
White gourd (Kumra)	Gura pocha rog	Base rot disease	May be the attack of the Grub of red pumpkin beetle
Lemon (Lebu)	Chamra fata rog	Bark cracking disease	Gemosis of lemon
Pointed gourd (Patal)	Ura poka	Flying insect	Cucurbit fruit fly
	Mazra poka	Central stem insect	Pumpkin caterpillar
Ground nut (Badam)	Leda poka	Cow dung like (soft) insect	Cut worm
	Ura poka	Flying insect	Field cricket
	Mora rog	Die diseases	May be foot rot
Lady's finger (Dheros)	Chidrokari poka/ Leda poka/ Ghura poka	Boring insect/Cow dung like (soft) insect/ Horse like insect	Lady's finger shoot and fruit borer

**Table 6: Meaning of the local name of plant health problems in Norsingdi district**

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Brinjal (Begun)	Mazra poka/ Chatkano poka/ Kirra poka/ Fol chidrokarari poka	Central stem insect/ Quick moving insect/ Worm like insect/ Fruit boring insect.	Brinjal shoot and fruit borer
	Side mora	Side die	Die back
Teasle gourd (Kakrul)	Sabuj lomba kirra/ Ghora poka / Fol Chidrokarari kirra/ Foler kirra	Green long worm/ Horse like moving insect/ Fruit boring insect/ Insect of fruits	Pumpkin caterpillar
	Pipri laga/ Pata kokrano rog	Turning into small by curling/ Leaf curling disease	Unidentified
	Holde poka/ Bossonto poka/ Kathali poka	Yellowish insect/ Spring coloured insect/ Jackfruit coloured insect	Grub of epilachna beetle
Cuucumber (Shosha)	Gura poka/ Lal poka/ Hazare poka	Dust insect/ Red insect/ Thousands of insects	Red mite
	Pata moje jaua/ Kukra rog	Damaging of leaves/ curling disease	Unidentified
Lady's finger (Dheros)	Chidrokarari poka/ Dherosher poka	Borer insect/ Insect of okra	Lady's finger shoot and fruit borer
Bitter gourd (Korola)/ White gourd (Jalli)	Chidrokarari poka	Borer insect	Cucurbit fruit fly
	Bossonto poka	Spring (yellow) coloured insect	Grub of epilachna beetle.
Banana (Kola)	Kath poka	Wood insect	Banana leaf and fruit beetle
Snake gourd (Koida/Chich inga)	Gura chidrokarari poka	Basal portion boring insect	Unidentified
Yard long bean (Borboti)	Jab poka/ Pachi poka	Close insect/ Wrapping insect	Aphid
Lemon (Lebu)	Mazra poka/ Pata morano poka	Central stem insect/ Leaf folded insect	Larvae of lemon butter fly
Chilli (Moris)	Sabuj lomba kirra	Green long worm	May be pumpkin caterpillar
Jack fruit (Kathal)	Cancer	The disease where the result is death	May be the attack of jack fruit stem borer

**Table 7: Meaning of the local name of plant health problems in Moulvibazar district**

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Rice (Aus) (Dhan)	Luhari poka	Iron like (hard) insect	Rice hispa
	Munzara poka/ Mazra poka	Central stem cutting insect/Central stem insect	Rice stem borer
White gourd (Jalli)	Bola poka/ Machi poka/ Khude machi	Wasp like insect/ House fly like insect/ Small house fly	Cucurbit fruit fly
Cucumber (Shosha)	Leda poka	Soft bodied insect	Pumpkin caterpillar
Teasle gourd (Kakrul)	Koli shukea jaua rog/ Korri jhora	Bud drying disease/ Young fruit dropping	May be Pollination problem
	Choto bicha poka/ Changa poka	Small hairy insect/ Hairy insect	Grub of Epilachna beetle
Sweet gourd (Misti kumra)	Korri jhora	Bud dropping	Unknown- may be pollination problem
Taro (Mukhi kachu)	Bicha poka	Hairy insect	Unidentified caterpillar
	Gass lal haoa	Reddening the plant	May be nutritional deficiency
Lady's finger (Dheros)	Futi poka/ Mazra poka	Fly insect/ Central stem insect	Lady's finger shoot and fruit borer
Brinjal (Begun)	Mazra poka/ Begurer kirra	Central stem insect/ Worm of Brinjal	Brinjal shoot and fruit borer
Betel vine (Paan)	Gura pocha	Base rot	Foot rot of betel vine
	Kando pocha	Stem rot	Stem rot of betel vine
Yard long bean (Ramaish/ Borboti)	Lauri poka / Leda poka	'Lauri' is one kind of wild fruit which grow very closely and the stem is not visible due to close fruit bearing/ Soft insect	Bean aphid
	Gura pocha/ Pochon rog	Basal rot/ Rot disease	Foot rot of vegetables

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Coconut (Narikel)	Bazragun/ Aga more jua	Thunder shocked symptom/ Top die	May be bud rot
	Isai Khaoa	Drinking by evil	May be nutritional deficiency
Jack fruit (Kathal)	Karul poka/ Korate poka	Hole making insect/ Saw like insect	Jack fruit stem borer
Carambola (Kamranga)	Jhora rog	Dropping disease	Unknown
Pomegranate (Dalim)	Dalimer kirra	Worm of pomegranate	Pomegranate fruit borer
Betel nut (Supari)	Jhora rog	Dropping disease	Bud rot of betel nut
Mango (Aum)	Korate poka	Saw like insect	Mango stem borer
Banana (Kola)	Ghila dhora	Stunted growth disease	Bunchy top of banana

### **III. Major plant health problems and their management practices**

On the second day of the survey, farmers collected samples of major plant health problems and expressed their opinion about these problems. Farmers were asked to give the local name, identifying characters, nature of damage, infestation rate and their management practices.

Farmers collected the insects, infested plant part or the diseased symptom from their fields. In each village, the discussion was made on more than 5 samples of major plant health problems.

To control the pests and diseases, farmers used some traditional methods as well as some pesticides. All the management techniques to control the pests and diseases were recorded. In case of the use of pesticides, farmers were asked to tell the trade name, rate of application, frequency of application and the results obtained from the use of chemicals. Farmer's description about the traditional or indigenous methods of pest management and their effectiveness were also recorded.

A total of 49 crops including fruit trees were recorded in the three districts that grown in Summer-I season. In Natore district, about 43 crops were listed including some winter crops. About 27 crops including fruit trees were identified which suffered seriously by pests and diseases. Among the crops, rice (Rice stem borer), sugarcane (Sugarcane stem borer), brinjal (Brinjal shoot and fruit borer), white gourd, sweet gourd, bitter gourd (Cucurbit fruit fly), pointed gourd (cucurbit caterpillar), chilli (Cutworm) groundnut, ribbed gourd, teasle gourd (Grub of epilachna beetle), mango (Mango stem borer, Mango hopper), jack fruit (Jackfruit fruit borer, Jackfruit stem borer), coconut (Rhinoceros beetle), banana (Banana leaf and fruit beetle), etc. suffered by destructive pests. Some crops such as rice (Sheath blight), sugarcane (Smut), garlic (Purple blotch), chilli (Virus), groundnut, coconut (Bud rot), mango (Anthracnose), jackfruit (Fruit rot), betel vine (Foot rot), betel nut (Bud rot) etc. were suffered by diseases.

In Norsingdi district, a total of 38 crops including fruits trees were listed that grown in Summer-I season. More than 21 crops were highly damaged by insects and diseases. Among the crops, brinjal (Brinjal shoot and fruit borer), cucumber (Red mite) ribbed gourd, teasle gourd, pointed gourd, (Epilachna beetle and Cucurbit caterpillars), banana (Banana leaf and fruit beetle) etc. were seriously infested by insects. Some crops such as teasle gourd, brinjal, jackfruit etc. were found suffered by diseases.

In Moulvibazar district, 32 crops including fruit trees were identified where 20 crops are found more infested by insects and diseases. Among the crops, rice (rice hispa and stem borer), Yard long beans (Aphid), taro (Lepidopteron larva), Pomegranate (Pomegranate fruit borer), white gourd, sweet gourd (Cucurbit fruit fly) etc. were found more infested by insects. Some of the crops such as Yard long bean (foot rot), Betel vine (foot rot and stem rot), coconut (bud rot), betel nut (bud rot), banana (bunchy top) etc. were found seriously suffered by diseases.

In three districts, some crops such as sugarcane, rice, garlic, cucumber, brinjal, chilli, ground nut, white gourd, coconut, mango, yard long bean, betel vine, betel nut, banana etc. were found more affected by diseases.

Some of the insects and diseases were found unidentifiable which caused considerable damage to crop. In Natore district, farmers identified a species of earthworm (locally known as "Chera") as a serious pest of irrigated rice field, which is appeared as a major pest in the last 4-5 years. The garlic bulb containing 5-6 separate stems (the problem is locally known as "Gura fulea jaoa") is a major problem in garlic production, which is noticed in recent years. In Norsingdi district, the production of Teasle gourd is reduced up to 50% by an unknown disease, which is locally known as "Pipri laga" and noticed as a serious problem in the last 4-5 years.

Some of the major plant health problems found in three districts with the farmers concept about the problem and their management practices are given in the following Tables 8,9and 10:

**Table 8: Major plant health problems and their management practices in Natore district**

**Problem category: Insect**

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Rice	Chera	<ul style="list-style-type: none"> <li>- It is worm like, red coloured and small insect</li> <li>- It remains itself at the upper layer of the soil</li> <li>- It eat the young roots and the plant can not grow well</li> <li>- The plant can not uptake fertilizers and turned into reddish coloured</li> <li>- This problem starts from 4-5 years</li> <li>- It is only appeared in Boro season (irrigated rice field)</li> </ul>	<ul style="list-style-type: none"> <li>- Sun drying the field</li> <li>- If sun drying is not possible, granular insecticides such as Basudin, Furadan etc are applied.</li> <li>- “Indian gas” gives (Cripcord or Cymbush group) good result. After 1 hour of application of this chemical, it comes out from soil.</li> </ul>	May be a species of Earth worm (BRRI & BSMR University helped to identify the species)
Rice	Mazra poka	<ul style="list-style-type: none"> <li>- It cut the main stem of rice</li> <li>- It attacks from the early stage and remains up to harvesting.</li> <li>- It is the main pest of the irrigated rice field and cut the central part.</li> <li>- Initially it enters inside the stem by the basal portion</li> <li>- The central leaf is dried and can be pulled out easily</li> <li>- Same insect infest sugarcane, brinjal etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Put on stick</li> <li>- Use of hand net</li> <li>- Use of granular insecticides such as Basudin, Furadan, Carbofuran Diazinon, Sunfuran etc. for 1-3 times @ 1 Kg/Bigha.(1 Bigha= 33 decemel)</li> <li>- After 15 days, liquid chemical is sprayed for 1-2 times.</li> <li>- Sometimes molasses is used as a trap keeping in a pot lifted by bamboo.</li> <li>- Crust naphthalene mixing with urea fertilizer is used which gives good result.</li> </ul>	Rice stem borer

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

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Sugarcane	Mazra poka/ Mazkata poka	<ul style="list-style-type: none"> <li>- It cuts the central part (Maize) of the cane, as a result the central part is died and then the whole plant may die.</li> <li>- It attacks at the early stage and remains up to harvesting.</li> <li>- In case of large cane, it attacks the soft portion and the plant is died.</li> <li>- Inside the stem red coloration occurred and gives unpleasant odour.</li> <li>- It is responsible for Futi poka (fly insect) and the infested leaf can be pulled out easily</li> <li>- During rainy season its infestation is high.</li> </ul>	<ul style="list-style-type: none"> <li>- Cutting and removing the infested cane</li> <li>- Granular insecticides such as Furadan, Basudin etc. are applied during land preparation after rain @ 1-3 Kg/Bigha.</li> <li>- Heptachlor or other unauthorized chemicals are also sprayed.</li> <li>- Sometimes bleaching powder is sprayed mixing with water.</li> </ul>	Sugarcane stem borer
Mango	Pata poka/ Chatka poka	<ul style="list-style-type: none"> <li>- It is brownish coloured small insect.</li> <li>- When the plant part is shacked, the insect moved as jumping.</li> <li>- It attacks the inflorescence, leaf and other soft portion.</li> <li>- If sucks the green portion and the plant part turned into pale colour.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of pesticides such as Cymbush for 1-2 times in a season.</li> <li>- Application of water in the small trees.</li> </ul>	Mango leaf hopper
Mango	Acha poka/ Bicha poka	<ul style="list-style-type: none"> <li>- It is reddish coloured hairy insect with 1-2" long</li> <li>- It eats the leaves.</li> <li>- In attack the plant is a gregarious from.</li> <li>- In case of severe infestation, it eats all the leaves and then attacks another plant.</li> <li>- It is generally shown when the plant bears new leaves.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measure is not taken.</li> <li>- Straw or stables are burned to produce smoke and heat resulted fall down of caterpillar.</li> <li>- Sometimes kerosene oil is applied</li> </ul>	Mango defoliator

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Lady's finger	Leda poka/ Ghora poka	<ul style="list-style-type: none"> <li>- It is dark coloured small kirra (larvae), which eat the tender part.</li> <li>- When flower blooms, it enters inside it and eats the soft portion.</li> <li>- It also bore the fruit, which cannot grow well, sometimes curved like structure is shown.</li> <li>- Same insect bore the brinjal.</li> <li>- The infested part is wilted during the sunny day.</li> <li>- It is the main pest of Dheros (Lady's finger).</li> </ul>	<ul style="list-style-type: none"> <li>- Hand picking and removing of infested plants and fruits.</li> <li>- Insecticides such as Sumithion, Basathrin Dursban, Fenfen, Sunvelarate, Cymbush etc. are sprayed for 1-4 times in a week @ 5-15 ml/ 10 L water.</li> </ul>	Lady's finger shoot and fruit borer.
Chilli	Thanga poka`	<ul style="list-style-type: none"> <li>- It is large legged reddish insect lives in the soil.</li> <li>- It bore holes in the soil.</li> <li>- It cut the plant and the root.</li> <li>- It generally attacks at the young stage of the plant.</li> <li>- It cannot tolerate water.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of excess water for 1-3 hours.</li> <li>- Sometimes granular pesticides such as Basudin are applied but get no results.</li> </ul>	Field cricket.
Chilli	Katui poka/ Leda poka	<ul style="list-style-type: none"> <li>- It is dark coloured and soft-bodied insect with ½ to 1" long.</li> <li>- It always remains itself under the soil.</li> <li>- It cut the basal portion of the plant.</li> <li>- Its infestation is serious during sunset and sunrise.</li> <li>- It also cut the seedlings of brinjal, cabbage and cauliflower.</li> <li>- Its infestation is serious in the soft and dry soil.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of excess water.</li> <li>- Application of Cymbush mixing with molasses and khoi (fried rice).</li> <li>- Hand picking, it is generally hidden under the cut plant.</li> <li>- Sawdust, gur and Cymbush is applied by mixing with properly which gives good result</li> <li>- Application of crust ripen chilli mixing with water</li> </ul>	Cut worm

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Brinjal	Baguner kirra/ Mazra poka/ Fol chidrokaripoka	<ul style="list-style-type: none"> <li>- This insect does maximum damage of brinjal.</li> <li>- Small brown colored kirra (worm) eat the tender shoot of the plant and then this portion is died.</li> <li>- It attacks the young fruits and inside the brinjal, the portion is rotten.</li> <li>- Maximum infestation is found during flowering and fruiting stage.</li> <li>- The black spoiled part of the fruit is visible.</li> <li>- The shape of the brinjal is curved.</li> <li>- During sunny day, the infested portion becomes wilted.</li> </ul>	<ul style="list-style-type: none"> <li>- Removing the infested plant part by cutting.</li> <li>- Insecticide such as Ripcord, Cymbush, Fenfen Malathion etc. are sprayed @ 10-15 ml/10 L water for 2-3 days interval.</li> <li>- It cannot be controlled without frequent application of pesticide. At the time of serious infestation, the field is sprayed up to 7 times in a week.</li> <li>- Application of ashes with kerosene oil.</li> </ul>	Brinjal shoot and fruit borer.
Groundnut	Ura poka	<ul style="list-style-type: none"> <li>- It is 1" long winged insect and lives under soil and can fly.</li> <li>- It produces sound at night.</li> <li>- It bears very strong mouthparts.</li> <li>- It is brownish to dark reddish brown coloured.</li> <li>- It eats the root and cut the stem.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measures are not adopted.</li> <li>- Insecticides such as Furadan, Basudin, Nogos, Indian oil etc. are sprayed</li> <li>- When the plant grow large, it is difficult to apply chemicals because the leaves are burnt.</li> </ul>	May be field cricket (the insect was not available in the field)
Khira (Cucumber)	Acha poka	<ul style="list-style-type: none"> <li>- It is green coloured small hairy insect.</li> <li>- Initially hundreds of insect present on the lower surface of the leaf.</li> <li>- It eats the green leaf and also eats the young fruit.</li> <li>- The leaves become whitish coloured and the plant cannot grow large.</li> <li>- It becomes serious for 3-4 years and also found in Teasle gourd, Bitter gourd</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measures are not adopted.</li> <li>- Sometimes insecticides such as Malathion, Cymbush etc. are sprayed.</li> </ul>	Unidentified caterpillar  - Yellowish marking present at dorsal area.

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Cucumber/ Sweet gourd	Folchidrokari poka/ Machipoka/ Holde machi	<ul style="list-style-type: none"> <li>- It is small wasp like yellowish or reddish coloured insect.</li> <li>- It bore the fruit by its sting and the place is rotten.</li> <li>- The fruit turned into yellowish coloured and then rotten.</li> <li>- If the infested fruit grow large, its shape is deformed.</li> <li>- When it bore the fruit, glutinous substance is secreted.</li> <li>- Sometimes worms (larvae) are found inside the fruit.</li> <li>- It also attacks white gourd, melon, sweet gourd, pointed gourd, bitter gourd etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ash.</li> <li>- Removing the infested fruit.</li> <li>- Pesticides such as Malathion, Taigor, Marshal etc. are sprayed for 2-3 times in a week @ 10-15 ml/ 10 L water.</li> </ul>	Cucurbit fruit fly
Pointed gourd, Melon, Teasle gourd	Mazrapoka/ Pata morano poka/ Ghurapoka/ Sabuj poka	<ul style="list-style-type: none"> <li>- It is soft bodied, greenish coloured kirra (larvae) It folds the leaf and eats inside it.</li> <li>- It also eats the tender shoot and young fruits.</li> <li>- It also attacks melon, teasle gourd etc.</li> <li>- If the folded leaf is opened, spider web like structure is found.</li> </ul>	<ul style="list-style-type: none"> <li>- Insecticides such as Regent, Cymbush, Sumithion etc. are sprayed for seven days interval @ 10-15 ml/ 10 L water and continued up to the entire fruiting period.</li> </ul>	Unidentified caterpillars which is now causing serious damage
Teasle gourd, Ribbed gourd	Kathalipoka/ Dail poka/ Bosontopoka/ Holde poka	<ul style="list-style-type: none"> <li>- It is round, yellowish, soft insect, hairs present on its body.</li> <li>- It eats the green portion of the leaf as well as the tender parts of the vine.</li> <li>- Growth of the plant is reduced and it cannot bear much fruit.</li> <li>- It remains itself at the lower surface of the leaf, so it is difficult to control by chemicals.</li> </ul>	<ul style="list-style-type: none"> <li>- Insecticides such as Malathion, Fifanon, Indian oil etc. are sprayed @2-3corks/10 L of water for 10-15 times depending on infestation rate.</li> <li>- Crushed naphthalene with ashes are used</li> </ul>	Grub of epilachna beetle.

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Sweet gourd, Cucumber	Sunduri poka/ Lal poka/ Ura poka	<ul style="list-style-type: none"> <li>- It is red coloured small insect.</li> <li>- It eats the leaf making round holes.</li> <li>- The infested leaf become pale coloured and the plant can not grow large</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ash.</li> </ul>	Red pumpkin beetle.
Chilli/ Sugarcane	Uii poka/ Roi poka	<ul style="list-style-type: none"> <li>- It lives in soil.</li> <li>- It is soft bodied but cannot be easily controlled with insecticide.</li> <li>- It cut the roots and also lifts the soil up near the stem and takes juice from it.</li> <li>- The plant cannot grow well or incapable to bear fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Applications of water, but better results are not obtained.</li> <li>- Put on stick where it eats the stick instead of plant.</li> <li>- Sometimes Heptachlor is applied which gives good result.</li> </ul>	Termite
Pomegranate	Leda poka/ Fold chidrokari poka/ Foler kirra	<ul style="list-style-type: none"> <li>- It is worm like insect, which bore the fruit soon after flowering stage.</li> <li>- The infested part turned into blackish coloured and with in few days it is dropped.</li> <li>- If the fruit can grow large, the inner portion turned into blackish coloured.</li> <li>- Its infestation is high at hot weather and can damage up to 90% fruit.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measures are not taken.</li> <li>- Sometimes wrapping the fruits.</li> <li>- In some case, insecticides such as Malathion are applied.</li> </ul>	Pomegranate fruit borer.
Jackfruit	Bhomor poka/ Bhor poka/ Birbira rog/ Fol pocha rog.	<ul style="list-style-type: none"> <li>- It is dark or reddish coloured insect, which bore the fruit at the young stage.</li> <li>- It bore the fruit at any part where brown to black glutinous substances is secreted.</li> <li>- At later stage, the fruit is rotten and the fruit cannot grow large.</li> <li>- Blackish lesion is appeared.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measure is not taken</li> </ul>	Jackfruit fruit borer.
Coconut	Cara poka	<ul style="list-style-type: none"> <li>- It is about 3" long whitish coloured insect.</li> <li>- It bore the tender part of the stem and eats inside the stem by cutting as a saw.</li> <li>- Sometimes it eats the soft leaves by cutting the edges. Within few days the plant become weak and finally died.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measure is not taken.</li> <li>- Sometimes kerosene oil is applied with the help of a rope.</li> </ul>	Grub of Rhinoceros beetle.

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name &amp; identification</b>
Banana	Kut poka/ Dad rog	<ul style="list-style-type: none"> <li>- It is small blackish coloured hard insect.</li> <li>- It eats the green portion of the leaves.</li> <li>- It also attacks the inflorescence and sucks the sap of young fruits.</li> <li>- It spreads the scar disease (<i>Dad rog</i>), which reduce the fruit size and market value.</li> <li>- The young leaves turned into yellow coloured.</li> <li>- During day time, it hidden itself inside the mid rib of the leaf.</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticide such as Malathion, Sumithion etc. are applied but not give good results.</li> <li>- Application of ash.</li> </ul>	Banana leaf and fruit beetle.
Yard long bean Cow pea, Bean	Jab poka/ Menda poka	<ul style="list-style-type: none"> <li>- It is very small, brown coloured and soft insect.</li> <li>- It does not move and suck the juice from the young vine, leaf and fruits.</li> <li>- The plant cannot grow large and the pod is dropped.</li> <li>- It is the most damaging insect of the yard long bean.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ash.</li> <li>- Application of soap water.</li> <li>- Hand scraping.</li> <li>- Application of pesticides such as Malathion, Dursban etc.</li> </ul>	Aphid.

### Problem Category: Disease & Soil Problem

Crop	Local name	Farmers description	Management practices*	Common name and identification
Sugar cane	Kala pata rog/ Virus dhora rog	<ul style="list-style-type: none"> <li>- The tender leaf turned into blackish coloured, which bear ash like substance.</li> <li>- When this substance fall on another plant, it also infested.</li> <li>- The plant turned into yellowish coloured, cannot grow properly and bears low tillers.</li> <li>- It is generally found in hot day, and lower during rainy season.</li> </ul>	<ul style="list-style-type: none"> <li>- Cutting and removing the infested plant part.</li> </ul>	Smut of Sugarcane
Rice	Gora pocha rog.	<ul style="list-style-type: none"> <li>- It is generally found during tillering stage.</li> <li>- The basal portion is rotten making spots.</li> <li>- The plant turned into yellowish coloured and then die.</li> <li>- When water is available in the field, it is generally found.</li> <li>- It is generally found in Aman season but now it is found in Boro rice (irrigated rice).</li> </ul>	Generally control measure is not taken.	May be sheath blight of rice
Garlic	Gura fula jaoa	<ul style="list-style-type: none"> <li>- The basal portion (slightly upper from the bulb) is scattered or expanded instead of remaining one stem.</li> <li>- Each clove contains one plant and the bulb contains 4-7 plants.</li> <li>- The production is greatly hampered.</li> <li>- It is observed for 4-5 years in large scale.</li> <li>- In case of severe infestation, 5-10% bulbs are damaged.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measures are not taken</li> <li>- Sometimes MP fertilizer is used.</li> </ul>	<ul style="list-style-type: none"> <li>- Unidentified.</li> <li>- The leaves are found pale coloured with yellowish patch</li> <li>- About 1-2%plants were infested</li> </ul>
Garlic, Onion	Pata mora/ Pata pura/ Aga mora	<ul style="list-style-type: none"> <li>- When the plant grows slightly, the upper portion of the leaf is dried.</li> <li>- The symptoms gradually increased towards the lower portion of the leaf and gradually turned into yellowish coloured.</li> <li>- In some cases, the whole plant is dried.</li> <li>- The plant is dried for 15 days to one month ago.</li> <li>- The bulb is small in shape.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ashes.</li> <li>- In some cases, Ridomil (fungicide) is sprayed but it does not give good results.</li> </ul>	Purple blotch of onion.

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
Cucumber (Khira)	Gurapocha rog	<ul style="list-style-type: none"> <li>- The basal portion or the root zone is rotted.</li> <li>- It gradually enlarged toward the upper portion.</li> <li>- Ultimately the plant may die, yellowing of the plant is occurred.</li> <li>- It also appeared in other seedlings.</li> </ul>	Generally control measures are not taken	May be foot rot.
Brinjal	Chipta rog / Chithadhora	<ul style="list-style-type: none"> <li>- It is generally found in the matured plant.</li> <li>- The leaves of the plant turned into yellow coloured.</li> <li>- The plant cannot bear fruits or flowers.</li> <li>- The plants cannot uptake fertilizers.</li> <li>- The stem near the root zone is cracked and then dried and finally the plant starts to die.</li> </ul>	Pesticides are used according to dealer's suggestion but these cannot recover the disease.	<ul style="list-style-type: none"> <li>- May be the attack of Nematode.</li> <li>- At the root region of the plant, root knot was available</li> </ul>
Brinjal	Gasfulajaoa/ Virus rog	<ul style="list-style-type: none"> <li>- The disease starts from the fruiting stage.</li> <li>- The leaf is very small, thin and have too many branches in a plant.</li> <li>- The plant turned into dense bushy structure.</li> <li>- Plant can bear low flowers, but get no fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooted the plants.</li> <li>- Generally chemicals are not used.</li> </ul>	Little leaf of brinjal
Chilli	Virus rog/ Patakikranorog	<ul style="list-style-type: none"> <li>- The leaf is curled and turned into yellow coloured.</li> <li>- The plant cannot bear flowers or fruits.</li> <li>- Mosquito like insect also sucks juice.</li> </ul>	Uprooted the plants	May be virus
Groundnut	Moralaga	<ul style="list-style-type: none"> <li>- The plant initially turned into reddish coloured.</li> <li>- The infected plant bears fewer roots.</li> <li>- Finally the whole plant is died.</li> <li>- The symptom is appeared at all growth stage.</li> <li>- Sometimes tremble like insects are present at the root zone.</li> </ul>	-Insecticide such as Malathion, Fenfen or fungicide Ridomil, Kumulas etc are sprayed	<ul style="list-style-type: none"> <li>- Unidentified</li> <li>- May be foot rot</li> <li>- Whitish mycelium appeared at the basal portion.</li> </ul>
Sweet gourd	Cancer rog	<ul style="list-style-type: none"> <li>- The leaves have uneven patch of green and yellowish colour.</li> <li>- The leaves are small and hard and sometimes wrinkled.</li> <li>- The plant rarely bears fruits and flowers and the skin of the fruit is wrinkled.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ash</li> <li>- Cutting the infested plant part.</li> </ul>	Virus

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices*</b>	<b>Common name and identification</b>
White gourd	Gura pocha	<ul style="list-style-type: none"> <li>- The basal portion of the plant initially rotten, secreting glutinous substance.</li> <li>- The rotten part gradually enlarged.</li> <li>- The plant turned into yellowish coloured and finally the whole plant is died.</li> </ul>	Control measures are not taken.	<ul style="list-style-type: none"> <li>-May be the attack of the grub of red pumpkin beetle</li> <li>-Infestation symptom of grub was appeared.</li> </ul>
Mango	Jaua dhora/ Jhora pata	<ul style="list-style-type: none"> <li>- When the young fruit is peanut sized, disease infection is started.</li> <li>- Spike let turned into blackish coloured to yellowish coloured.</li> <li>- Finally young fruit is dropped.</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticides such as Sevin powder and Sungard is sprayed by mixing with water @ 1 spoon/ 10 L water for two times</li> <li>- One during flowing stage and another during peanut stage.</li> </ul>	Anthracnose of mango
Coconut	Jhora rog/ Shukna rog/ Pani shukna rog.	<ul style="list-style-type: none"> <li>- The young fruit sheds soon after flowering.</li> <li>- The young fruit is cracked and dropped after drying.</li> <li>- Sometimes coconut is visually fresh, but contains no water.</li> <li>- Sometimes the coconut bears no kernel or uneven kernel.</li> </ul>	<ul style="list-style-type: none"> <li>- Control measure is not adopted.</li> <li>- Sometimes bricks are hanged with the inflorescence</li> </ul>	May be bud rot and nutritional deficiency,
Jack fruit	Thora laga rog/ Fal pocha laga/ Machi jhora.	<ul style="list-style-type: none"> <li>- Initially the spike let of the bud turned into reddish coloured, then the young fruit turned into blackish coloured and finally dropped.</li> <li>- Power like black substance is found on the infected young fruit.</li> <li>- When the young fruit is about 2-4" length, it is affected, but matured or large fruits are not affected.</li> </ul>	Without application of water at the basal area, no control measures are taken.	Rhizome rot of jackfruit.
Mung bean	Vairus rog/ Pata kukrano rog	<ul style="list-style-type: none"> <li>- It is the most damaging disease of this crop.</li> <li>- The plant turned into yellow coloured</li> <li>- Leaves of the plant are curled.</li> <li>- The plant cannot bear fruits.</li> <li>- This disease is appeared at the matured plant.</li> </ul>	Chemicals (such as Malathion) are applied but not give effective result.	Virus

**Table 9: Major plant health problems and their management practices in Narsingdi district**

**Problem category: Insect**

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and Identification</b>
Brinjal	Mazra poka/ Chotkano poka/ Kira poka/ Fol chidrokari poka	<ul style="list-style-type: none"> <li>- When the plant is about 1 ft. height, this insect generally infests it.</li> <li>- Initially it bore the tender shoots and dried symptom occurs.</li> <li>- During sunny period, the infected plant part is appeared wilting symptom.</li> <li>- It is available all the year round.</li> <li>- Fruits are seriously affected by this pest and without using pesticide it is quite impossible to grow crop.</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticide such as Dursban, Fenten, Cym bush, Fifanon, Indian liquied, Melfen, Basathrin etc. are sprayed for 2-5 times in a week @ 15-20 ml/ 10 L water.</li> <li>- During the rainy season or serious infestation, these pesticides are sprayed up to 7 days in a week.</li> <li>- Sometimes piper dust is applied by boiling with salt and water.</li> </ul>	Brinjal shoot and fruit borer
Teasle gourd, Chilli / Pointed gourd	Sabuj lamba kerra/ Ghora poka/ Foler kirra/ Fol chidrokari kera	<ul style="list-style-type: none"> <li>- It is green coloured like the leaves</li> <li>- It eat the young leaves and fruits, infested leaves are folded to hide the insect inside it.</li> <li>- When the flower turned into young fruits, its infestation is serious.</li> <li>- During fruiting period, its infestation is serious, it eat the flower portion and young fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Hand picking during artificial pollination</li> <li>- When infestation is high, liquid insecticides such as Ripcord, Cymbush, Fifanon Dursban etc. are sprayed.</li> </ul>	- May be pumpkin caterpillar which was found inside the folded leaf
Teasle gourd, Bitter gourd	Holde poka/ Bossonto poka/ Kalali poka	<ul style="list-style-type: none"> <li>- Yellowish coloured, round, soft-bodied insect, upper portion of the body bears soft hairs.</li> <li>- It laid eggs at lower portion of the leaf, which is light yellowish.</li> <li>- It cannot fly, remain in the lower portion of the leaves and destroy the leaves eating on it.</li> <li>- It also eats the leaves of pointed guard, bitter gourd.</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticide such as Syfanol, Malathion Dursban, Ripcord, Cymbush etc. is sprayed @ 20-30 ml/ 10 L water for 2-3 times in a week.</li> <li>- To control this insect, excess amount of pesticide is necessary because it always remains itself under the leaves.</li> </ul>	Grub of epilachna beetle

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and Identification</b>
Cucumber	Gura poka/Lal poka/Hazari poka	<ul style="list-style-type: none"> <li>- Very small reddish insect, one leaf can bears thousands of insects.</li> <li>- In only appeared at the lower parts of the leaf.</li> <li>- It sucks the sap of the leaf, which gradually turns into yellowish coloured.</li> <li>- The infested leaf turned into fox like symptom and gradually curled.</li> <li>- Within short day it severely destroy the crop production.</li> <li>- It is seriously appeared for 5-6 years and also infests brinjal.</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticides such as Edfen Actara, Asataf etc. are sprayed @ 10-20 ml/ 10 L water for 2-4 times in a week.</li> <li>- In case of serious infestation, the plant is uprooted.</li> </ul>	Red mite.
Bitter gourd	Bolla poka	<ul style="list-style-type: none"> <li>- It is small honeybee like flying insect not rest in a place for a long time.</li> <li>- It bears a sting behind the body, by which the insect punches the young fruit.</li> <li>- The infested fruit secret glutinous substances.</li> <li>- Worm can be found inside the infested fruit.</li> <li>- Same insect infests sweet gourd, bottle gourd, white gourd, and cucumber.</li> </ul>	Pesticide such as Malathion, Fifanon, Dursban, Cymbush etc. are sprayed @ 10-15 ml/ 10 L for 1-3 days in a week and is sprayed for 10-15 times.	Cucurbit fruit fly
Yard long bean	Jab poka/Pachi poka	<ul style="list-style-type: none"> <li>- It is small, dark coloured, soft insect that makes a cover like structure over the tender vine and young fruits.</li> <li>- It sucks the juice from the soft portion.</li> <li>- The tender vine and young leaf is curled.</li> <li>- The fruit is curved and deformed.</li> <li>- It also attacks beans.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ash.</li> <li>- Insecticides such as Malathion, Cymbush Marshal, Tafgor etc. are sprayed @ 20 ml/ 40 L water.</li> <li>- Application of crust naphthalene with ash gives good result</li> </ul>	Aphid.
Snake gourd	Gura chidrohari poka	<ul style="list-style-type: none"> <li>- It punches the basal part of the visit and glutinous substance is secreted.</li> <li>- Gradually the infected place is dried and finally</li> </ul>	<ul style="list-style-type: none"> <li>- Dithane M- 45 is sprayed but gives no result.</li> </ul>	Unidentified. (The insect was not available but the symptoms

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and Identification</b>
		<p>the whole plant may die.</p> <ul style="list-style-type: none"> <li>- This insect may stay in soil, when it ride to the vine, it punch it.</li> </ul>		of insect damage were present)
Banana	Kath poka	<ul style="list-style-type: none"> <li>- It is very hard, dark coloured insect that suck the sap from tender shoot and fruits.</li> <li>- When inflorescence comes out, its infestation is high.</li> <li>- When the hard insect sit on the young fruit, it produces scab like disease</li> <li>- The skin of infested fruit is slightly thickened and market value is reduced.</li> </ul>	<ul style="list-style-type: none"> <li>- Insecticide such as Malathion is sprayed for 3-4 times in a week at the time of inflorescence stage @ 15 ml/ 10 L water</li> <li>- Wrapping the inflorescence at young stage.</li> </ul>	Banana leaf and fruit beetle
Lady's finger	Fol chidrokari poka/ Mazra poka	<ul style="list-style-type: none"> <li>- It is slightly reddish coloured kirra (larvae or worm), which is observed.</li> <li>- Generally infestation starts during fruiting stage, it also bore the tender shoot.</li> <li>- Infested fruit bears 1-3 insect.</li> <li>- In drought condition its infestation is high.</li> </ul>	<ul style="list-style-type: none"> <li>- Removing the infested part by hand picking.</li> <li>- Insecticide such as Fenten, Melfen, Basathrin etc. are sprayed @ 10 ml/ 10 L water for 3-4 times in a week.</li> </ul>	Lady's finger shoot and fruit borer.
Banana	Kath poka	<ul style="list-style-type: none"> <li>- It is dark colour and hard insect.</li> <li>- It eats the young leaves and young fruits.</li> <li>- It hidden itself inside the leaf blade during day time and infest at night</li> <li>- It is the most damaging insect of banana.</li> <li>- 5-10 years ago, it generally attacked the old trees but now it infest the new plants</li> </ul>	<ul style="list-style-type: none"> <li>- Generally Malathion, Cymbush etc. are sprayed and wrapping the inflorescence</li> </ul>	Banana leaf and fruit beetle

**Problem category: Disease and soil problems**

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and identification</b>
Teasle gourd	Pipri laga/ Kukrano rog	<ul style="list-style-type: none"> <li>- Leaves are curled, and turned into very small in size and the growth of the plant is stopped.</li> <li>- Infested part becomes hard and when pressed by hand, produce cracking sound.</li> <li>- The upper layer of the fruit bears no elongation or spine like structure and turned into smooth surface.</li> <li>- Sometimes chilli is infested.</li> <li>- It is appeared seriously for 2-3 years.</li> <li>- Naturally this disease is reduced within 15-20 days, but in the mean time production is hampered seriously.</li> <li>- It can damage the crop up to 50% and in case of severe attack the whole crop field can not bear fruits.</li> </ul>	Fungicides are applied but give no good results.	<ul style="list-style-type: none"> <li>- Unidentified.</li> <li>- May be nutritional deficiency (as identified by DAE, plant protection wing)</li> </ul>
Brinjal	Side mora	<ul style="list-style-type: none"> <li>- Among the branches, one of the side branches first died.</li> <li>- Next time, the whole plant gradually died.</li> <li>- The disease is spreaded by wind. The plant, which is on the way of wind, is rapidly affected.</li> </ul>	Fungicide such as Dithane M-45, Riedomil @ 45 g/ 10 L water for 1-2 times in a week and sprayed for 2-4 times.	May be wilt.
Jack fruit	Cancer	<ul style="list-style-type: none"> <li>- Initially the bark of the plant bears round black spot.</li> <li>- Small holes are present on this area, which bears dust like parts.</li> <li>- At the later stage, the infected part is died and the tree cannot bear fruits.</li> <li>- Sometimes the whole plant may die.</li> <li>- The symptom mostly appeared at the lower part of the plant.</li> </ul>	Liquid pesticides are sprayed but gives no results	<ul style="list-style-type: none"> <li>- Unidentified</li> <li>- May be the infestation of stem borer.</li> </ul>

**Table 10: Major plant health problems and their management practices in Moulvibazar district**

**Problem category: Insect**

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and identification</b>
Rice	Lohari poka	<ul style="list-style-type: none"> <li>- Very hard small black insect like iron</li> <li>- It scraps the leaf, which make whitish coloured and dried.</li> <li>- After 15 days of transplanting, its attack started.</li> <li>- The field looks whitish like sunhamp.</li> <li>- It remains in the field up to flowering stage.</li> </ul>	<ul style="list-style-type: none"> <li>- Use of hand nets.</li> <li>- Use of kerosene oil by the rope.</li> <li>- Insecticide such as Schincyper, Malathion, Quinalfos, Dimecron etc. @ 150-200 ml/ Bigha for 3-5 times.</li> </ul>	Rice hispa
Rice	Mazra poka/ Mangara poka	<ul style="list-style-type: none"> <li>- It is whitish coloured worm like insect which initially attack the lower portion of the plant</li> <li>- Infestation starts immediate after transplanting and remains up to harvesting.</li> <li>- The infested central stem is died and can be pulled out easily.</li> </ul>	<ul style="list-style-type: none"> <li>- Insecticides such as Furadan, Basudin, Diazinon, Marshal, etc. are sprayed @ 1-1.5 kg/ Bigha for 1-2 times.</li> <li>- Application of naphthalene crush mixing with fertilizers.</li> </ul>	Rice stem borer
Taro (Mukhi Kachu)	Bicha poka	<ul style="list-style-type: none"> <li>- It is greenish coloured, 1-1½" long hairy insect.</li> <li>- It attacks the leaf at night.</li> <li>- During daytime, it hidden itself comparatively in cool places.</li> <li>- It sucks juice from the leaf and also cut the stem.</li> </ul>	Malathion @ 10-15 ml/ 10 L water is sprayed for 10 days interval but does not give good result.	Unidentified caterpillar.
Yard long bean	Lauri poka/ Leda poka	<ul style="list-style-type: none"> <li>- Very small, blackish or brownish coloured insect that suck juice from leaves, tender shoots and fruits.</li> <li>- During flowering stage, the infestation rate is very high.</li> <li>- The infested part is curled.</li> </ul>	<ul style="list-style-type: none"> <li>-Insecticides such as Malathion, Dursban, Fifanon etc. are sprayed for 3 times in a week @ 20-25 ml/ 10 L water.</li> <li>-Application of ashes.</li> <li>- Sometimes liquid</li> </ul>	Aphid.

Crop	Local name	Farmers description	Management practices	Common name and identification
		<ul style="list-style-type: none"> <li>- Black out also attack at the same time.</li> <li>- It also found in bean.</li> </ul>	cow dung is also sprayed	
Lady's finger	Foti poka/ Mazra poka	<ul style="list-style-type: none"> <li>- It is small soft insect remain itself at the lower portion of the leaf.</li> <li>- Each leaf contains 50-60 insects.</li> <li>- It suck juice from the leaf resulted curling.</li> <li>- If the plant shakes, it flies way.</li> </ul>	Insecticide such as Malathion, Dursban, Curaterr, Cymbush, Karate @ 10 ml/ 10 L of water for 2-3 times in a week.	Jassid.
Lady's finger	Mazra poka	<ul style="list-style-type: none"> <li>- It infests the tender part as well as fruit.</li> <li>- Reddish brown larvae is found when the infested and shoot is broken.</li> <li>- Young fruits are curved and focus is found.</li> <li>- Some insect found in brinjal.</li> </ul>	Insecticide such as Malathion, Agromethion, Melfen is sprayed @ 10-15 ml/ 10 L water for 2-3 times in a week.	- Lady's finger shoot and fruit borer.
Brinjal	Mazra poka	<ul style="list-style-type: none"> <li>- It bore the tender shoot and within few days the infested part is died.</li> <li>- Fruit is seriously infested.</li> <li>- It is most damaging insect of brinjal.</li> <li>- Wilting symptom appeared during sunny day.</li> </ul>	Insecticide such as Cymbush, Marshal, Dursban, Fenfen, Regent, Curaterr etc. are sprayed for 2-4 times in a week @ 15-20 ml/ 10 L water.	Brinjal shoot and fruit borer.
Cucumber	Leda poka	<ul style="list-style-type: none"> <li>- Green coloured, slender, remain at lower part of the leaf.</li> <li>- It eats the green portion of the leaf remaining net like structure.</li> <li>- When the leaf forms, its attack starts.</li> </ul>	<ul style="list-style-type: none"> <li>- Hand picking</li> <li>- Liquid insecticides are used when the infestation is serious.</li> </ul>	Unidentified caterpillar
White gourd/Bitter gourd	Bolla poka/ Machi poka/ Khudi machi	<ul style="list-style-type: none"> <li>- It is wasp like yellowish insect, which have sting behind the body.</li> <li>- It punches the young fruit and secretes juicy substance.</li> <li>- Fruits cannot grow large, gradually turned into yellowish and finally rotten. Matured fruit is slightly curved.</li> <li>- It is the most damaging insect of it.</li> </ul>	- Insecticides such as Dursban, Tafgor, Fenfen, Synsyfer etc. are sprayed for 1-2 times in a week.	Cucurbit fruit fly.

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and identification</b>
Teasle gourd	Changa poka/ Bicha poka	<ul style="list-style-type: none"> <li>- Light yellowish coloured, hairy and round.</li> <li>- It such the juice of the leaf.</li> <li>- It remains at the lower part of the leaf.</li> </ul>	Pesticide such as Regent, Dursban, Malathion, Betothrin, Synsyfer for 1-2 times in a week @ 10-15 ml/ 10 L water.	Grub of epilachna beetle.
Mango	Korate poka	<ul style="list-style-type: none"> <li>- It bore the stem and eats inside the stem.</li> <li>- Infested part secrete glutinous substances</li> <li>- Sawdust like substance is found on infested part.</li> <li>- Infested part is dried and broken during windy day.</li> </ul>	Control measures are not adopted.	Mango stem borer.
Jack fruit	Karul poka/ Korate poka	<ul style="list-style-type: none"> <li>- It punch the jack fruit from young stage</li> <li>- Infested portion becomes black and dry.</li> <li>- 1" long kirra (larvae) with red coloured are found inside the fruit.</li> <li>- When rainwater enters, the fruit is rotten.</li> </ul>	Control measures are not adopted.	Jackfruit fruit borer.
Pomegr anate	Dalimer kirra	<ul style="list-style-type: none"> <li>- It is reddish brown kirra (larvae) bore the young fruits and when the flower just blooms.</li> <li>- As the fruit grows, the larvae also become large.</li> <li>- Inside the fruit comes black.</li> <li>- 80-90% young fruits are rotten and dropped by this insect.</li> </ul>	<ul style="list-style-type: none"> <li>- Generally control measures are not adopted.</li> <li>- Sometimes, Malathion, Agromition etc. are sprayed.</li> <li>- Wrapping the fruits</li> </ul>	Pomegranate fruit borer

**Problem category: Disease and Soil Problems**

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and Identification</b>
Yard long bean	Gura pocha/ pochon rog.	<ul style="list-style-type: none"> <li>- When the plant bears 3-4 leaves, its infestation starts.</li> <li>- Initially the foot region is rotten, that gradually enlarged.</li> <li>- When the rot enlarged about 2", the whole plant is died.</li> <li>- Rotten area becomes sticky.</li> <li>- This disease appeared up to flowering stage.</li> </ul>	Pesticide such as Aimcozin is sprayed @ 10 g/ 10 L water for 4 days interval. -Copper sulphate mixing with water is sprayed at the basal portion	Foot rot of vegetable.
Betel vine	Gura pocha	<ul style="list-style-type: none"> <li>- This is the most damaging disease of betel vine.</li> <li>- The disease is of two kinds, one is black rot and another is white rot.</li> <li>- In case of black rot, black spot appeared in leaves and finally the plant is rotten. Burned smell is present and infestation is very rapid.</li> <li>- In case of white rot, the foot region of the plant become whitish and rotten smell present, finally the plant is died. Infection is slow.</li> </ul>	<ul style="list-style-type: none"> <li>- Fungicide such as Dithane M-45, Ridomil, Sandomil etc are sprayed @ 2-5 g/ 1 L water for 7-15 days interval.</li> <li>- Application of cow dung reduces white rot and increase black rot.</li> </ul>	May be foot rot of betel vine.
Betel vine	Kando pocha	<ul style="list-style-type: none"> <li>- The rot symptom starts from tender portion of the vine and gradually the whole plant is infected.</li> <li>- During the rainy season, this disease spreads rapidly.</li> </ul>	Fungicides such as Ridomil, Dithane M- 45 etc. are applied.	May be stem rot of betel vine.
Coconut	Bozra-gun/ Aga more jaoa	<ul style="list-style-type: none"> <li>- It is the most damaging disease of the coconut.</li> <li>- About 2" long, worm, whitish with black headed insect.</li> <li>- It cut the central part of the stem and gradually the tender part is died.</li> <li>- This insect eats the young leaves.</li> </ul>	<ul style="list-style-type: none"> <li>-Control measure is not adopted.</li> <li>-Sometimes bricks are hanged by ropes with the inflorescence</li> </ul>	Farmers described about the Grub of rhinoceros beetle but the plant bears the symptoms of bud rot of coconut
Coconut	Isai khaoa	<ul style="list-style-type: none"> <li>- The fruit bears no water.</li> <li>- The kernel of coconut is uneven.</li> <li>- From the outer surface, it is impossible to detect the</li> </ul>	<ul style="list-style-type: none"> <li>- Cow dung or other fertilizers are used</li> <li>- Sometimes</li> </ul>	Unidentified - May be nutritional deficiency.

<b>Crop</b>	<b>Local name</b>	<b>Farmers description</b>	<b>Management practices</b>	<b>Common name and Identification</b>
		diseased fruit. - Sometimes the fruit bears little water with unpleasant odour. - Sometimes young fruits are dropped with cracking.	bricks crushes are applied at the basal portion	
Carambola	Jhora rog	- Flowers are shaded. - If the plant bears fruit, it also dropped at early stage. - The mature fruit is curved.	Control measure is not adopted.	Unidentified.
Betel nut	Jhora rog	- Initially the spike-let of bud is turned into blackish or reddish coloured and then the young bud is dropped. - Fruits cannot grow large. - About half of the fruits are dropped.	Control measures are not taken	Bud rot of betel nut.
Banana	Gaila dhora	- The leaves are very small and state. - The plant bears no fruit. - The leaves are narrow and the height of the plant is small.	Control measure is not adopted.	May be Bunchy top of banana

#### **IV. Farmer's innovative knowledge on plant health problems**

Farmers may use chemicals or some traditional method (such as putting stick in the field to scare away birds, application of ash) to protect their crops from the infestation of pests or diseases. But when these fail, they try to find an alternative way to control the pests. Some pests, which cannot be controlled by chemicals due to high resistance to pesticides, are often controlled by farmer's innovative methods. Innovative methods are those where a farmer wants to do something to protect the pest with his own intelligence or creativity. Sometimes farmers use some traditional methods (e.g. application of ash, cow dung, neem extract, etc) and chemicals with some modifications. Skilled farmers always try to find the most effective, easiest and most economical process to control the pests.

Due to frequent application of pesticides with high doses, some pests have already gained resistance against pesticides. On the other hand, farmers often use some pesticides, which are banded by the government due to their toxicity and high residual effect. As a result it effects on environment and makes health hazards. Due to use of broad-spectrum pesticides, some beneficial insects are eliminated. One of the main factors that are responsible to break down the natural balance is the elimination of pest enemy or beneficial insects. A non-chemical method of pest management can preserve the beneficial insects and can help to conserve biodiversity.

At present, farmers have to spend a large amount of money for buying chemicals to protect their crops from pest attacks. Most of the innovative techniques are based on cheap materials. Effective innovative methods can reduce the production cost. As farmers have long time experience in crop production, they try to control the pests by their innovative techniques on the basis of nature of damage or the behaviour of pests. If any effective and economical method is identified, it will be helpful to suggest the farmers of another region where the pest is a major problem that cannot be controlled by suitable way.

To know the effective, alternative way of pest control action, farmers were asked about their innovative methods during the last session of the survey. These findings may help to identify effective pest control measures where it is difficult to control them by chemicals or other traditional ways.

In the 3 districts, about 35 innovative methods were identified by this participatory survey. In Natore district, about 20 innovative methods are identified where 5-6 methods gave considerable result in controlling adult moth of rice, jute, fruit flies, cut worm, rats, aphids etc. In Norsingdi region, about 15 methods are identified where 3-4 methods gave good results to reduce to attack of red mite, cucurbit fruit fly, banana leaf and fruit beetle, aphids etc. In Moulvibazar region about 10 innovative methods were identified where 2-3 methods showed considerable results against rice hispa, cutworm, rice stem borer etc. The innovative methods identified in three districts are described in the following Tables 11, 12 and 13:

**Table 11: Farmers innovative pest management practices in Natore district**

Source/ Location	Crop	Name of the pest	Farmers innovative management practices
Parkul (06.04.04)	Tomato, Rice, Jute	Adult moth	Soft, liquid <i>Gur</i> (Molasses,) of date palm is used as a trap of moth. About ½ kg liquid <i>Gur</i> is placed in a pot (made by broken coconut) on the top of a bamboo stick. The piece of bamboo should be placed at the same height of crop and only at night. The beetle or moth is attracted by this product, it fall inside the pot and cannot move. Every day the dropped insect should be cleaned.
Coingram (08.04.04)	Wheat	Rat	A large aluminum pot (straight walled) is placed inside the field and near the burrow system. It should be placed at the same level of the field by making a large hole. Inside the pot, some attractive fruits which have good scent (e.g. Banana, Mango, coconut) should be placed. In this method, the trapped rat cannot up lift, as the wall of the pot is very smooth. At a time 3-5 rats can be trapped. Foods are removed every day.
-Do-	Chilli, Cabbage, Brinjal, Cauliflower and other vegetables.	Cut worm	Sawdust, <i>Gur</i> (molasses) and Cymbush (insecticide) are mixed properly and then applied on the upper surface of the soil.
Jamaidigha (11.04.04)	Mango	Mango hopper	Application of water on the inflorescence and young parts.
-Do-	Wheat	Rat	Put on banana plant, which help owl to take rest.
-Do	Rice	Rice stem borer	Naphthalene (crushed) is mixed with urea fertilizer and then sprayed.
Buridaha (13.04.04)	Sugarcane	Sugarcane stem borer	Bleaching powder is sprayed with a sprayer by mixing with water.
-Do-	Mango	Mango stem borer	Kerosene oil is used in the infested plant parts by a rope made of jute fiber.
-Do-	White gourd	Red pumpkin beetle, Epilachna beetle	Application of ashes with crushed naphthalene at early morning that gives good result
Madanhut (15.04.04)	Till (sesame), Jute	Hairy caterpillar	A large rope (made of jute fiber) dipping with kerosene is pulled over the plant. It is done for 3-4 times frequently.

Source/ Location	Crop	Name of the pest	Farmers innovative management practices
-Do-	Pomegranate	Pomegranate fruit borer	The young fruit is wrapped with polythene paper making small punch for proper aeration.
Mazpara (16.04.04)	Coconut	Bud rot	Rice bran, (broken rice) is applied at the basal area.
-Do-	Coconut	Bud rot	Tightening bricks with the stalks of inflorescence to make it curve to protect bud dropping.
Chalk fulbaria (17.04.04)	Brinjal	Brinjal shoot and fruit borer	Application of ashes with kerosene at early morning.
-Do-	Chilli	Cutworm	Molasses, <i>khoi</i> (fried rice) and Cymbush (insecticide) are mixed properly and then applied on the upper soil.
East Haguria (18.04.04)	Rice	Rice stem borer	Crushed Naphthalene is sprayed in the rice field. This also used for storage of rice to protect storage insect.
-Do-	Sugarcane	Jackal	Ripen jackfruit mixing with Ripcord or Malathion is placed inside the sugarcane field.
Vaturia Lambapara (20.04.04)	Mango	Mango defoliator	Under the infested tree, straw stables are burned to produce smoke and heat. The caterpillar is fallen down from the leaf.
West Haguria ( 19.04.04)	Cabbage, Cauliflower, Brinjal	Cutworm	Application of kerosene oil at the basal portion of the plant.
Vaturia Mandalpara ( 21.04.04)	Chilli, Brinjal	Fruit borer, Cutworm	100 gm crushed ripen chilli are mixed with 10 L water and filtered and then sprayed.
-Do-	Rice	Above ground insect	Application of crushed jute seed (Desi) and crushed Naphthalene is mixed properly and sprayed @ 3-4 kg/ Bigha to control all kinds of above ground insect.

**Table 12: Farmers innovative pest management practices in Norsingdi district**

Source/ Location	Crop	Name of the pest	Farmers innovative management practices
Bakhornagar (25.05.04)	Cucurbits	Red pumpkin beetle, Epilachna beetle, aphids.	Crushed Naphthalene and ashes are mixed and sprayed at morning when the plant parts bear little moisture.
-Do-	Cucumber	Red mite	Hot water mixing with little copper sulphate (Tute) is sprayed at the lower portion of the leaves.
-Do-	Seedlings of vegetable	Cutworm	Little kerosene oil is applied at the basal portion of the plant.
Morjal (26.05.04)	Brinjal	Brinjal shoot and fruit borer	Piper dust and salt are boiled for some times and then sprayed on the plant.
-Do-	Yard long bean, bean	Aphid	Application of ashes, water or removing by hand scraping.
Luchanpur (27.03.04)	Teasle gourd	Fruit borer	During artificial pollination (hand pollination), this pest can be easily visible on the floral parts. That time it is collected by hand and destroyed.
-Do-	All crops	All pests	Biskatali plant is dried and then burned. The powded substance is sprayed in field by mixing with water. It is time consuming. So, at present time, it is not generally used.
Bajnabo (28.05.04)	All vegetables	All pests	Neem leaf, soap (cloth washing), Tute (copper sulphate) and water are boiled for half-hour. Then it is sprayed in all kinds of vegetables to protect them from insect and diseases. Sometimes Sohaga (borax) is added.
Char morgal (29.05.04)	Banana	Banana leaf and fruit beetle	Wrapping the inflorescence at young stage (soon after spraying of liquid insecticide) by loosen polythene sheet where the one end of this polythene is tightened with stalk of inflorescence and another end is open, or making small hole on polythene.
-Do-	Seedlings of chilli, cabbage, cauliflower, potato etc.	Cut worm	Making small channel around the seedling. The channel is sometimes opened or sometimes filled with kerosene water. -Covering the seedling by polythene up to 2-3 inches depth of the ground soil so that it can not reach to the plant (when it found the hard brier ,it moves backward.
Dhanua (31.05.04)	Sweet gourd, Bottle gourd, Bitter gourd and other Cucurbit crops	Cucurbit fruit fly	- Cooked rice byproduct is mixed with bright yellow cloth pieces (it attracts the fruit fly) and hanged with a stick. The fruit fly is arrested by this method. - The spike of ripen jackfruit is mixed with liquid pesticide (such as Malathion) and then hanged in the crop field.
-Do-	Cucumber, Brinjal	Red mite	Hot water (at tolerant level) alone or mixing with soap is sprayed on the lower surface of the leaf.
-Do-	Bean, Yard long bean	Aphid	Cloth washing soap is mixed with water and then sprayed on the infested part by spray machine.

**Table 13: Farmers innovative pest management practices in Moulvibazar district**

Source/ Location	Crop	Name of the pest	Farmers innovative management practices
Parertong (06.06.04)	Rice	Rice hispa	A large rope (made of jute) dipping into kerosene oil and then pulled over the rice plant for 3-4 times repetition.
Bongao (08.06.04)	Coconut	Bud rot	Bricks are tightened with the stalk of inflorescence to curve it to protect the dropping of young buds.
Mazergao (09.06.04)	Yard long bean, Bean	Aphid	Application of ashes and liquid cow dung to the infested plant part.
Shahpur (10.06.04)	Pomegranate	Fruit borer	During the flowering stage, available liquid pesticide is sprayed to protect serious infestation, and when young fruits are produced, these are wrapped by polythene making small holes.
Kadupur (12.06.04)	Rice	Stem borer	Crushed Naphthalene mixing with fertilizer is applied to the rice field.
-Do-	Brinjal, Cabbage	Cutworm	Kerosene oil is applied at the basal part of the plant.
Nischintopur (14.06.04)	Yard long bean	Foot rot	Copper sulphate mixing with water is applied in the ground soil around the basal portion of the plant.
-Do-	Jack fruit	Fruit rot	Lime mixing with water is sprayed on the young fruits.
-Do-	Rice	Rice hispa/ Stem borer	A long rope dipping into kerosene is pulled over the fields for 2-3 times frequently. At the same time little kerosene is applied in the field.

## V. Hazardous use of pesticides

Insects or diseases infest most of the crops. When the infestation rate is high, farmers used pesticides or poisons. Due to illiteracy, most of the farmers of our country have no clear concept about the appropriate use of pesticides resulting hazardous situation. The harmful as well as beneficial insects are killed by hazardous use of pesticides that have very harmful effect on human health, environment and biodiversity.

At present more than 17 thousand metric ton pesticides are used every year in our country. Although DAE registers the pesticides, some unregistered, unauthorized pesticides are now available in the local markets.

To know the actual situation of the pesticides, farmers were asked to inform the trade name of chemicals, doses of application and the frequency of pesticide spraying. Farmers frequently used some pesticides such as Malathion, Fenfen, Fenitox, Basathrin, Fifanon, Dursban, Cymbush, Marshal, Schincyper, Tafgor, Ripcord, Basudin, Diazinon, Furadan etc to protect crops and fruits from a variety of pests and diseases. In most of the cases, farmers used available chemicals on the basis of recommendations from their local pesticide dealers. To protect the crops from diseases, farmers used some fungicides such as Ridomil, Rovral, Dithane M-45 etc where they are more inclined to use chemicals protect against insect pests.

Farmers frequently used some common as well as some unauthorized pesticides to control some of the major pests. In Natore district, farmers apply chemicals to control sugarcane stem borer, rice stem borer, brinjal shoot and fruit borer, cucurbit fruit flies, lady's finger, shoot and fruit borer, cucurbit caterpillars etc. Farmers of Narsingdi district applied pesticides at leaf 1-2 times in a week in all kinds of vegetables. To protect brinjal from shoot and fruit borer they used pesticides up to 5-7 times in a week. To control epilachna beetle, red mites, aphids, cucurbit fruit fly, lady's finger shoot and fruit borer and some cucurbit caterpillars they used excess amount of pesticides.

In Moulvibazar district, farmers used comparatively low amount of pesticides where only few pest caused trouble to produce crops including few vegetable crops.

In general, farmers of all districts frequently applied excess amount of pesticides to control brinjal shoot and fruit borer, lady's finger shoot and fruit borer, epilachna beetle, cucurbit fruit flies, cucurbit caterpillars etc.

Farmers also used some unauthorized pesticides to protect some destructive pests. In Natore, farmers used heptachlor to control sugarcane termites or stem borer, Indian gas (a liquid chemical) is used to control some of the major pests in Natore districts.

Use of pesticides to control some of the major pests of selected crops in three districts is explained in the following Tables 14, 15 and 16:

**Table 14: Status of pesticide application for crop protection in Natore district**

<b>Crop</b>	<b>Name of the problem (Insect/ disease)</b>	<b>Management practices</b>
Sugarcane	Sugarcane stem borer	<ul style="list-style-type: none"> <li>- Granular insecticides such as Furadan, Basudin, Curaterr, etc are sprayed for 7-10 days interval @ 1-3 kg/ Bigha.</li> <li>- If infestation is serious, farmers collect some of the unauthorized insecticides such as Heptachlor, Dichlorovos (comes from India)</li> <li>- Malathion is also sprayed when plants have a considerable height.</li> </ul>
-Do-	Termite	<ul style="list-style-type: none"> <li>- Farmers are unable to control this pest by traditional pesticides. So they collect heptachlor up comes from the other side of border, which is effective to reduce this pest.</li> </ul>
Rice	Rice stem borer	<ul style="list-style-type: none"> <li>- Granular insecticide such as Furadan, Basudin, Carbofuran, Sunfuran, Diazinon etc. is sprayed for 1-3 times @ 1-2 kg/ Bigha.</li> <li>- After 15 days of granular application, some liquid chemicals such as Diazinon, Quinalfos, Cymbush etc are sprayed @ 200-250 ml/ Bigha for 1-2 times.</li> </ul>
-Do-	Earthworm (chera)	<ul style="list-style-type: none"> <li>- Traditional granular insecticides give not satisfactory results. They collect "Indian oil" (comes from India) that gives good result and sprayed for 1-2 times @ 1 bottle/ Bigha.</li> </ul>
Brinjal	Brinjal shoot and fruit borer	<ul style="list-style-type: none"> <li>- Pesticide such as Cymbush, Ripcord, Fenfen, Melfen, Dursban etc are sprayed @ 2-3 cork (1 cork = 5ml)/ 10 L water for 2-3 times in a week.</li> <li>- In a crop-growing season, pesticides are sprayed for about 50-60 times.</li> </ul>
Lady's finger	Lady's finger Shoot and fruit borer	<ul style="list-style-type: none"> <li>- Sunvelarate, Basathrin, Daraban, Fenfen etc are sprayed @ 1-3 cork/ 10 L water for 1- 4 times in a week.</li> <li>- During the rainy season it should be sprayed for almost everyday and 20-30 times in a season.</li> </ul>
Teasle guard	Epilachna beetle	<ul style="list-style-type: none"> <li>- Malathion, Fenfen, Indian liquid etc. are sprayed @ 2-3 cork/ 10 L water for 1-3 times in a week and sprayed for 15-20 times.</li> <li>- It cannot be properly controlled because it hidden under the leaf.</li> </ul>
Cucumber (Khira)	Virus	<ul style="list-style-type: none"> <li>- Insecticides such as Dursban as well as fungicide such as Dithane M-45, Ridomil etc. are sprayed.</li> <li>- Dithane M-45, Ridomel etc are sprayed @ 10-20 g/ 1 L water and Dursban is sprayed @ 1-2 cork/ Bigha</li> </ul>
White gourd	Cucurbit fruit fly	<ul style="list-style-type: none"> <li>- Malathion, Tafgor, Marshal etc. are sprayed @ 2-3 cork/ 10 L water for 1-4 times in a week.</li> <li>- These chemicals are sprayed for 10-15 times in a season.</li> </ul>

Crop	Name of the problem (Insect/disease)	Management practices
Mung bean	Virus	<ul style="list-style-type: none"> <li>- Insecticide such as Malathion, Fifanon, Dursban, Asataf is sprayed for 1-2 times in a week @ 1-2 cork/ 10 L water.</li> <li>- Fungicide such as Ridomil, Tilt, Diathen M 45 etc. @ 10-15 g/ 10 L water and sprayed for 1-2 times.</li> <li>- Although they use all types of chemicals, they found very little result.</li> </ul>
Groundnut	Field cricket	<ul style="list-style-type: none"> <li>- Furadan, Basudin, etc are sprayed during field preparation @ 1-2 kg/ Bigha.</li> <li>- Nogos (bend product) Indian oil (comes from India) etc. is sprayed when infestation is serious.</li> </ul>
-Do-	Foot rot	<ul style="list-style-type: none"> <li>- Insecticides such as Malathion, Fenfen etc. are sprayed @ 10-15 ml/ 10 L water.</li> <li>- Fungicide such as Ridomil or Kumulas, etc are sprayed for 2-3 times in a season.</li> </ul>

**Table 15: Status of pesticide application for crop protection in Norsingdi district**

<b>Crop</b>	<b>Name of the problem (Insect/disease)</b>	<b>Management practices</b>
Brinjal	Brinjal shoot and fruit borer	<ul style="list-style-type: none"> <li>- Insecticide such as Basathrin, Melfen, Dursban, Fifanon, Indian liquid etc. for 3-7 times in a week @ 15-20 ml/ 10 L of water.</li> <li>- Some unlabeled insecticides including Indian liquid come from few dealers' gives good result.</li> <li>- In rainy season, the field should be sprayed everyday. In a season at least 40-50 times should be sprayed.</li> </ul>
Cucumber	Red mite	<ul style="list-style-type: none"> <li>- Pesticide such as Actara @ 1-2 tablet / 10 L water, Asataf 10-20 ml/ 10 L water for 2-4 times in a week.</li> <li>- It is difficult to spray chemicals at the lower surface of the leaves, which sometimes causes bed effect on eyes, and other body parts are affected as spraying cursively.</li> <li>- These are sprayed for 20-25 times in a season.</li> </ul>
Pointed gourd/ Teasle gourd	Pumpkin caterpillar	<ul style="list-style-type: none"> <li>- Ripcord, Cymbush, Fenfen, Dursban etc are sprayed for 2-4 times in a week @ 10-20 ml/ 10 L water.</li> <li>- These chemicals are sprayed for 15-20 times in a season</li> </ul>
Cucurbit crops (e.g. Teasle gourd, Bitter gourd, Pointed gourd and Brinjal)	Epilachna beetle	<ul style="list-style-type: none"> <li>- Insecticide such as Fyfanon, Malathion, Dursban, Ripcord, Cymbush are sprayed @ 25-30 ml/ 10 L water for 2-3 times in a week.</li> <li>- These are sprayed for 10-15 times in a crop-growing season.</li> </ul>
Chilli, Brinjal	Cut worm	<ul style="list-style-type: none"> <li>- Insecticide such as Furadan, Basudin, Dursban, are sprayed @ 1-2 kg/ Bigha</li> <li>- Dieldrin, Bidrin, Nogos etc are collected from unauthorized dealers and sprayed to get good result.</li> </ul>
White gourd, Sweet gourd, Cucumber, Bitter gourd	Cucurbit fruit fly	<ul style="list-style-type: none"> <li>- Melathion, Fifanon, Fenfen, Dursban etc are sprayed for 2-3 times in a week @ 2-3 10-15 ml/ 10 L water.</li> <li>- In a crop-growing season, these are sprayed for 10-20 times, but cannot be controlled effectively.</li> </ul>
Chilli	Leaf curt disease	<ul style="list-style-type: none"> <li>- Pesticides such as Dursban, Fenfen, Cymbush etc are sprayed for 1-2 times in a week @ 10-15 ml/ 10 L water.</li> <li>- Fungicide such as Babistin, Rovral etc. @ 10-15 g/ 10 L water.</li> <li>- Although frequent application, these chemicals does not show good results.</li> </ul>
Yard long bean, Cowpea, Bean	Aphid	<ul style="list-style-type: none"> <li>- Malathion, Cymbush, Marshal, Dursban etc are sprayed @ 1-2 times in a week @ 20-25 ml/ 10 L water.</li> <li>- If the chemicals are sprayed, the pest is controlled temporally, within few days it attacks again spraying is done for 10-20 times in a crop-growing season.</li> </ul>

**Table 16: Status of pesticide application for crop protection in Moulvibazar district**

<b>Crop</b>	<b>Name of the problem (Insect/ disease)</b>	<b>Management practices</b>
Rice (Aus)	Rice stem borer	<ul style="list-style-type: none"> <li>- Application of granular insecticide such as Basudin, Furadan, Diazinon, Sunfuran @ 1-1.5 kg/ Bigha for 1-2 times.</li> <li>- Quinalfos, Diazinon, Malathion etc. are sprayed @ 150-300 ml/ Bigha for 1-2 times when the plant grows enough.</li> </ul>
-Do-	Rice hispa	<ul style="list-style-type: none"> <li>- Malathion, Quenalfos etc. are sprayed @ 100-200 ml/ Bigha for 3-5 times in a season.</li> <li>- After application of these chemicals, the pest again attacks within a week.</li> </ul>
Brinjal	Brinjal shoot and fruit borer	<ul style="list-style-type: none"> <li>- Cymbush, Marshal, Dursban, Fifanon, Regent are sprayed for 2-4 times in a week @ 15-20 ml/ 10 L water.</li> <li>- This pest cannot be controlled fully, and within 1-2 days it attacks again. In a season about 30-40 times are sprayed.</li> </ul>
White gourd, Cucumber, Sweet gourd, Bitter gourd	Cucurbit fruit fly	<ul style="list-style-type: none"> <li>- Dursban, Tafgor, Fifanon are sprayed @ 20-25 ml/ Bigha for 1-2 times in a week.</li> <li>- In a season about 10-12 times are sprayed.</li> </ul>
Yard long bean	Aphid	<ul style="list-style-type: none"> <li>- Malathion, Fifanon are sprayed for 1-2 times in a week @ 10-20 ml/ 10 L water.</li> <li>- In a crop-growing season about 20-25 sprays are made.</li> </ul>
Lady's finger	Shoot and fruit borer	<ul style="list-style-type: none"> <li>- Malathion, Dursban, Curaterr are sprayed for 2-4 times in a week @ 15-20 ml/ 10 L water.</li> <li>- These chemicals are sprayed for 20-30 times in a season.</li> </ul>
Brinjal, Cucumber, Bitter gourd, Teasle gourd	Epilachna beetle	<ul style="list-style-type: none"> <li>- Regent, Dursban, Malathin, etc are sprayed for 1-3 times in a week @ 15-30 ml/ 10 L water.</li> <li>- These are sprayed for 15-20 times in a season.</li> </ul>
Betel vine	Foot rot	<ul style="list-style-type: none"> <li>- Fungicides such as Sundomil, Ridomil, Dithane M- 45 etc. are sprayed for 7-15 days interval @ 2-5 gm/ 1 L water.</li> <li>- It should be sprayed all the year round. But during rainy season these chemicals are sprayed at list 1-3 time in a week.</li> </ul>

## **VI. Scenario of pesticide application in three districts**

To know the background of pesticide application and to know the actual situation of the use of pesticides, farmers were asked some questions at the last session of the participatory qualitative survey, these are as follows:

- When did the use of pesticides start?
- From what time was it used on a large scale?
- What is the condition or infestation by the pests and diseases after using pesticide?
- Are you benefited by using pesticides? Is there any bad effect?
- Do you use any innovative method to control pests?
- How effective are these methods?
- Do you know about beneficial insects?

The information collected from three districts related to pesticide application and farmer's innovative methods to protect their crops from pests are summarized separately and presented below:

### **Natore:**

- ✓ Large crop diversity present in this district. Cereals as well as vegetables are grown in this area at large scale.
- ✓ Use of pesticide started 20-25 years ago, but reached maximum levels 7-8 years ago.
- ✓ Farmers are unable to grow some crops (e.g. sugarcane, brinjal) without frequent application of chemicals due to increasing role of pest attack.
- ✓ To grow sugarcane they used some unauthorized pesticides from the border country (e.g. heptachlor is used to control termites in sugarcane).
- ✓ Only few farmers know about beneficial insects that have received training. Most of the farmers identified birds, frogs as the beneficial for their crops.
- ✓ Farmers identified about 20 innovative methods for controlling pests where 5-6 methods gave considerable results in controlling major pests.
- ✓ Considerable farmers are unable to diagnose the problem and used broad-spectrum pesticide.

### **Norsingdi:**

- ✓ It is one of the largest vegetable belts in Bangladesh where maximum farmers are engaged to grow vegetables all the year round.
- ✓ Use of pesticide starts from 25-30 years but maximum application starts from 12-15 years.
- ✓ Some farmers noticed their physical suffering caused by handling and spraying pesticides with their own hands.
- ✓ Almost all the farmers have minimum knowledge about the pest and their management.
- ✓ Farmers identify few beneficial insects but expressed no interest to preserve them.
- ✓ Farmers always depend on pesticides to grow maximum crops, where one third of their income by selling the vegetables is spending against buying pesticides.
- ✓ Sometimes they use pesticide everyday in the same field to protect the most valuable crops from the most damaging pests (e.g. to reduce the attack of brinjal shoot and fruit borer, epilachna beetle etc).
- ✓ Although the farmers frequently use pesticides for selling vegetables in the market, they routinely grow vegetables without using pesticide for their own consumption.
- ✓ Farmers identified about 15 innovative methods where 3-4 methods gave considerable results in controlling major pests.
- ✓ All the farmers realized the bad effect of hazardous chemical application, but there is no alternative way in their hand.

### **Moulvibazar:**

- ✓ Mainly rice grown area, but considerable number of vegetables and fruits are grown.
- ✓ Use of pesticide starts from 15-25 years and maximum starts from 5-6 years.
- ✓ Farmers are much interested to grow crops by using proper pesticides, because they get desirable results by using it.
- ✓ Most of the farmers have no idea about the pests, their management and the beneficial insects.
- ✓ Only few pests make problem to control them by pesticides.
- ✓ Only birds were identified as the beneficial for crop production. Few trained farmers identified the ladybird beetle and spider as the beneficial insects.
- ✓ Farmers identified about 10 innovative methods where 2-3 methods gave considerable results in controlling major pests.

## Lessons learned

- ✓ 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 give more emphasis to use chemicals, instead of other methods, as it is easier and instant result can be obtained.
- ✓ 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
- ✓ Broad-spectrum insecticides are used when one disease of crop cannot be controlled by common insecticides.
- ✓ 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 the insect present in the crop field is harmful.
- ✓ To get more profit, farmers used more insecticides. Farmers were found less interested to use chemicals to protect against diseases and were more inclined to protect against insect pests
- ✓ 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 vegetables like brinjal (egg plant) is sprayed pesticides almost everyday to protect them from pests without recognizing the pests and their infestation rate.
- ✓ 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
- ✓ Some of the farmers used the innovative methods as these are cheap, readily available and effective where it was difficult to achieve control by chemicals.
- ✓ Female farmers expressed more interest about fruit problems and the crops grown in the homestead.
- ✓ Some superstitions also noticed to protect diseases (e.g. to protect bud dropping and empty water symptom (waterless fruit), water prayed by religious person is sprayed or hung the bone of cow to protect evil eyes. Soil made broken pot with few pictures is placed in the field to protect vegetables from the evil eyes.
- ✓ In spite of the frequent application of pesticides prior to selling their products in the market, farmers routinely grow vegetables without using pesticides for their own consumption.

## Conclusion

The survey was undertaken in order to know the consensus opinion of the farmers about their plant health problems. AAS/CABI Bioscience conducted the survey in Summer-I crop season at 30 villages in Natore, Narsingdi and Moulvibazar district. In the survey, farmers were asked to express their opinion on a variety of plant health problems, pest identifying characters, nature of damage or symptoms and the existing management practices. Some of the insects and diseases identified have only begun to be noticed in recent years and, within a short time have become the cause of considerable damage. In the face of greater resistance on the part of insects, farmers are more frequently turning to unauthorized pesticides and are increasingly inclined to apply these in hazardous ways. Some vegetables like brinjal (egg plant) were found to spray pesticides almost everyday to protect them from pests without consideration of the kind of pest being controlled or their infestation rate. For example, sucking and chewing insects can be effectively controlled with bio-systemic insecticides but these can not be safely used on fruits and vegetables. In this case a contact spray is safer and thus more suitable. The survey reveals that these fine technical points are not well understood by most farmers. Moreover, one third of many farmers' vegetable crop revenue is spent on buying pesticides. This is often the result of using the wrong pesticide and doing so excessively. Thus wasting both insecticide and money.

It was interesting to note that a few farmers were able to successfully control a variety of major pests through the use of some innovative and highly personalized methods. A total of 35 innovative methods were identified in three districts where about 12-15 methods were found very effective to control certain pests. The best innovative methods were found to be cost effective, readily available and highly effective in situations where it has become difficult to achieve control with pesticides.

It is difficult to draw generalized conclusions about the overall plant health situation in the survey areas on the basis of a single season's experience. After completion of the survey in three crop growing seasons, it will be possible to know more about the overall situation of the plant health in the survey areas. This report summarizes information about plant health problems encountered during the Summer-I cropping period.

## Recommendations

- ✓ The survey areas should be expanded in order to give a comprehensive 'plant health' view of the entire country.
- ✓ More emphasis should be given to know more about farmers innovative methods of pest control. (Preliminary indications are that such methods can be highly effective)
- ✓ Digital photographs should be used to aide in the identification of plant health problems. Such, relatively low cost facilities should be widely available and used.
- ✓ To accommodate social constraints, female farmers should be surveyed in the context of their homesteads.
- ✓ Priority attention should be given to those insect pests that are known to have acquired high levels of pesticide resistance so that control modalities can be developed without using frequent chemical applications.

**Anex-I: Participating farmers, Group coordinators and Venues of FGDs of the qualitative survey on Plant Health Problems**

Date	Name of the group coordinator	Village	Upazila	District	Number of participating farmers		
					Male	Female	Total
13.03.2004	Md. Joinal Abedin	Agran	Boraigram	Natore	19	-	19
17.03.2004	Md. Ramij Uddin	Merigacha	"	"	22	-	22
18.03.2004	Md. Abdur Rashid	Pasbaria	"	"	28	-	28
21.03.2004	Md. Shaiful Islam	Joari	"	"	20	-	20
22.03.2004	Md. Ashraful Islam	Adhgram	"	"	20	-	20
23.03.2004	Md. Abdus Salam	Notabaria	"	"	22	-	22
25.03.2004	Md. Bazlur Rahman	Mazgram	"	"	19	4	43
06.04.2004	Md. Khalil Mian	Parkul	"	"	19	6	25
08.04.2004	Md. Nazrul Islam	Coingram	"	"	26	-	26
11.04.2004	Md. Abdul Ali	Jamaidigha	"	"	23	6	29
13.04.2004	Mrs. Kayali Begum	Buridaha	Natore Sadar	"	8	22	30
15.04.2004	Mrs. Jarina Begum	Madanhut	"	"	5	25	30
16.04.2004	Mrs. Sohazi Begum	Mazpara	"	"	6	23	29
17.04.2004	Md. Ziaul Hassan	Chalk fulbaria	"	"	6	25	31
18.04.2004	Mrs. Fatema Khanum	East haguria	"	"	10	21	31
19.04.2004	Mrs. Rahimn Khatun	West haguria	"	"	8	21	29
20.04.2004	Md. Abu Bakar Siddek	Vaturia Lambapara	"	"	14	16	30
21.04.2004	Mrs. Sanuara Begum	Vaturia Mandalpara	"	"	4	26	30
25.05.2004	Md. Samsul Haque	Bakhornagar	Raipura	Norsing di	20	-	20
26.05.2004	Md. Abdul Aziz	Morgal	"	"	20	-	20
27.05.2004	Md. Amzad Hossain	Luchanpur	"	"	21	-	21
28.05.2004	Md. Sahay Uddin	Baznabo	Shibpur	"	45	-	45
30.05.2004	Md. Mukter Hossain	Charmorgal	Raipura	"	24	4	28
31.05.2004	Md. Mamtaz Uddin	Dhanua	Shibpur	"	25	-	25
06.06.2004	Md. Ramij Ali	Parertong	Srimangal	Moulvibazar	21	2	23
08.06.2004	Md. Farid Mian	Bongao	"	"	36	12	48
09.06.2004	Sri Puran Deb	Mazer gao	"	"	19	-	19
10.06.2004	Md. Farid Uddin Ahamed	Shahpur	Moulvibazar Sadar	"	37	-	37
12.06.2004	Sri Rakesh Chandra Deb	Kadugram	"	"	20	-	20
14.06.2004	Ronadhir Dath	Nischintopur	Srimangal	"	20	-	20