

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

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

**Season: Winter, 2004**



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## Glossary

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

## Executive Summary

The survey on farmer's knowledge about plant health problems was undertaken by Agricultural Advisory Society (AAS) on behalf of CABI Bio-science, UK. AAS planned to conduct the survey over the course of three different cropping seasons; i.e., Summer-I, Summer-II and Winter. The survey in Summer-I, Summer-II and Winter cropping season of 2004 has already completed. This report summarizes the results of the survey in Winter cropping season undertaken at 17 villages in 6 upazilas of Natore (Boraigram and Sadar upazilas), Norsingdi (Raipura and Shibpur upazilas) and Moulvibazar (Srimangal and Sadar upazilas) district. The work is the continuation of the survey in three different crop seasons at the aim of better understanding the extent of farmer's knowledge about plant health problems.

After completion of the survey in Summer-I and Summer-II cropping season, the survey in Winter season was conducted from 10 December 2004 to 31 December 2004. A total of 441 farmers including 78 females participated. Initially the existing crops were recorded. According to farmer's opinion, the status of insect, disease and soil problems for each of the crops were recorded (on a scale of 0 to 5) to identify the major plant health problems. To know more information, farmers were divided into small groups to collect representative samples of major plant health problems from the adjacent crop fields. In a 'Focused Group Discussion (FGD)', farmers were asked to express their opinion on local name, identifying characters, nature of damage or symptoms, favourable conditions etc. and pest management practices most commonly applied to resolve the particular problems encountered.

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

Farmers identified about 35 crops in Natore district, 22 crops in Norsingdi district and 18 crops in Moulvibazar district including fruit trees, which have major plant health problems. In Natore district, some crops were found highly damaged by insects such as, Country bean (Bean aphid and Bean pod borer), Cabbage and Cauliflower (Larva of cabbage butterfly), Brinjal (Brinjal shoot and fruit borer), Bottle gourd and Sweet gourd (Cucurbit fruit fly), Banana (Banana leaf and fruit beetle), Pomegranate (Pomegranate fruit borer), Rice (Earthworm) etc. In Norsingdi district, Cabbage and Cauliflower (Cabbage butterfly and Cutworm), Brinjal (Brinjal shoot and fruit borer), Country bean and Yard long bean (Bean aphid and Bean pod borer), Sweet gourd and Bottle gourd (Cucurbit fruit fly). Potato (Cutworm), Lemon (Lemon butterfly) etc. crops were damaged seriously by insects. In Moulvibazar district, some crops were found susceptible to insect damage such as, Potato

and Chilli (Cutworm) Country bean (Bean pod borer), Yard long bean (Bean aphid), Cabbage (Cabbage butterfly), Brinjal (Brinjal shoot and fruit borer) etc.

Comparatively more disease problems were identified in the survey of Winter cropping season. In Natore district, farmers identified some disease problems which cause serious damages to crops such as, Purple blotch of onion and garlic, Foot rot of vegetables, Leaf curl of chilli, tomato, cucurbit and papaya, Die back and Wilt of brinjal, Rhizome rot of turmeric, Foot rot of wheat, Bud rot of coconut and betel nut etc. In Narsingdi district, Anthracnose of bean, Wilt, Leaf curl and Anthracnose of cucurbits, Leaf curl of chilli, Foot rot of vegetables, Late blight of potato, Sigatoga of banana, Gummosis and Scab of lemon, Dieback and Wilt of brinjal etc. caused serious damage to crops. In Moulvibazar district, some disease problems, which cause considerable damages to crops such as, Late blight and mosaic of potato, Foot rot of vegetables, Leaf curl and Foot rot of tomato, Scab of lemon, Bud rot of coconut and betel nut etc.

To know the actual situation of pesticide application, farmers were asked to inform the trade name of chemicals, doses, and frequency of application and the effectiveness of these chemicals against pest. Farmers used some pesticides such as Basudin, Furadan, Curaterr, Diazinon, Biesterin, Phaddy, Malathion, Dursban, Basathrin, Decis, Fenfen, Fyfanon, Tafgor, Fenitox, Fastac, Ripcord, Cymbush, Marshal, Schincyper, Karate, Aktara, Marshal, Sevin, Kartap, etc. to protect their crops from a variety of pest. In most cases, farmers used these chemicals on the basis of the recommendation of pesticide dealers.

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

Farmers frequently used some common as well as some unauthorized pesticides to control the destructive pests. Farmers frequently used chemicals to control the Bean aphid, Bean pod borer, Cabbage butterfly, Brinjal shoot and fruit borer, Cucurbit fruit fly, Cutworm, Banana leaf and fruit beetle etc. In Natore district, farmers used pesticides up to 40-50 times to protect Bean pod borer. To protect the Brinjal shoot and fruit borer, farmers used the pesticides up to almost everyday and in some cases, 150-200 times in a crop season. Farmers of Narsingdi district applied pesticides at least 1-3 times in a week to protect their vegetables. In Narsingdi district, the unauthorized 'Indian bish' (comes from India whose trade name is 'Kripcord') becomes very popular to protect Bean pod borer and Brinjal shoot and fruit borer. Few farmers of Natore and Narsingdi district frequently applied chemicals only for selling their products in the market, not for their own consumption.

Necessary information's related to plant health problems were collected in a participatory manner. The summary paper is prepared by the compilation of necessary information from the 17 villages survey report of Winter crop season in Natore, Narsingdi and Moulvibazar districts.

## Introduction

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

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

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

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

Bangladesh are among the highest in the South Asia region. This is due, in part, to excessive input costs in relation to "farm-gate" market values.

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

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

To know the actual situation of plant health problems, Agricultural Advisory Society (AAS) with the funding support of CABI Bioscience, UK planned to conduct a participatory survey over a course of three different crop seasons namely Summer-I, Summer-II and Winter. In Winter crop season, the survey was conducted at 17 villages in 6 upazilas of 3 districts namely Natore, Narsingdi and Moulvibazar. Findings of the survey form a baseline for measuring the progress of AAS/CABI Bioscience project on "Plant Health Services *initiative* (PHS)".

## Objectives of the Participatory Qualitative Survey

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

## Locations and participants

The participatory qualitative survey on plant health problems is designed to conduct in 3 different crop-growing seasons i.e. Summer-I, Summer-II and Winter. After completion of the Survey of Summer-I and Summer-II crop season, the Winter survey was conducted from 10 December 2004 to 31 December 2004. A total of 441 farmers (363 male and 78 female) participated in the participatory survey on plant health problems. The survey was conducted at 17 villages in 6 Upazilas of Natore (Boraigram and Sadar Upazilas), Narsingdi (Raipura and Shibpur Upazilas) and Moulvibazar (Srimangal and Sadar Upazilas) district. The representative villages were selected where largely vegetable grown villages were given priority. Detailed information about the locations, venues of FGD, group coordinators and number of participants are shown in Annex-I. In brief, the locations and number of participants of the survey of Winter crop season are provided in the following Table 1:

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

Duration	Venue		Number of village covered	Number of participating farmers		
	District	Upazila		Male	Female	Total
10 December 2004 to 31 December 2004	Natore	Boraigram	5	125	-	125
		Natore Sadar	5	48	69	117
	Narsingdi	Raipura	3	90	9	99
		Shibpur	2	56	-	56
	Moulvibazar	Srimangal	1	23	-	23
		Moulvibazar Sadar	1	21	-	21
<b>Total</b>			<b>17</b>	<b>363</b>	<b>78</b>	<b>441</b>

## **Methodology**

The participatory qualitative survey in Winter, 2004 crop season was conducted at 17 villages in 6 upazilas of 3 districts namely Natore, Narsingdi and Moulvibazar. The researchers in teams of at least two persons conducted the survey. AKM Murshedur Rahman, Entomologist, AAS was the principal surveyor. Initially a survey guideline was prepared. Overall supervision and guideline for the survey was provided by Mr. Harun-Ar-Rashid, Executive Director, AAS. According to the guideline, the following steps were followed:

### **Village selection**

A village was selected where a large number of crops varieties grown and the infestation status of pests and diseases were high. Both agriculturally developed villages and agriculturally undeveloped villages were considered. In Winter crop season, a total of 17 villages were selected from 6 upazilas in 3 districts namely Natore, Narsingdi and Moulvibazar district (5 villages from Boraigram upazila, 5 from Natore Sadar upazila, 3 from Raipura upazila, 2 from Shibpur upazila, 1 from Srimangal upazila and 1 from Moulvibazar Sadar upazila) (Annex-I).

### **Farmer selection**

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

### **Farmers group formation**

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

### **Schedule and venue selection**

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

### **Conducting FGD**

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

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

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

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

v) Field visit and sample collection:

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

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

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

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

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

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

(vii) Plenary discussion on pesticide application for pest management:

Discussion was made on the following events:

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

The follow format was used to record the information on a flip chart:

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

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

Farmers were asked to inform the following information:

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

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

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

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

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

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

(ix) Other methods of pest management

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

Information's collected from the survey of different villages were compiled separately. After compilation, the village wise report was prepared. Final report of a crop season is based on the compilation of the village reports.

## **Findings:**

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

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

Farmers identified 51 crops in Winter crop season in three districts, which have health problems. Among them 35 crops in Natore district, 22 crops in Narsingdi district and 18 crops in Moulvibazar district were identified which have major health problems.

In Natore district, country bean, tomato, potato, cabbage, cauliflower, turmeric, sugarcane, bottle gourd, sweet gourd, brinjal, banana, pomegranate, etc. crops are seriously damaged by insects. Some crops such as tomato, potato, country bean, Radish, wheat, onion, garlic, turmeric, chilli, bottle gourd, sweet gourd, carrot, brinjal, jackfruit, betel vine, turmeric, chilli, papaya, etc. are found seriously damaged by diseases.

In Narsingdi district, cabbage, cauliflower, potato, country bean, yard long bean, brinjal, bottle gourd, sweet gourd, etc. were damaged seriously by insects. The crops, which suffered maximum by disease, are cauliflower, cabbage, banana, wheat, brinjal, chilli, potato, sweet gourd, bottle gourd, lemon etc.

In Moulvibazar district, country bean, potato, brinjal, cabbage, etc are highly damaged by insects, and potato, lemon, tomato, cauliflower, coconut, Chilli etc. are found seriously damaged by diseases.

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

Farmers identified 34 insect problems and 51 disease problems in Winter crop season by which the crop's health were suffered seriously. From the participatory survey at 17 villages, it was found that the frequency of some damaging insects was comparatively higher such as bean aphid, bean pod borer, cucurbit fruit fly, brinjal shoot and fruit borer, cutworm, mustard aphid, larva of cabbage butterfly etc. On the other hand, the frequency of some diseases such as leaf curl of chilli, anthracnose of bean, stem rot of brinjal, foot rot of wheat, die back of brinjal, foot rot of vegetables etc were comparatively higher. The frequency of plant health problems found from the participatory survey at 17 villages in three districts in the Winter crop season is 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 country bean, brinjal, cabbage, cauliflower, chilli, potato, tomato, teale gourd, banana, bottle gourd, coconut etc. have serious health problems (Table 3). On the basis of the infestation status of insects, diseases and soil problems, the ranking of the crops grown in three districts in Winter season is summarized in the Table 4.

**Table 2: Frequency of plant health problems (Insects) in three districts**

<b>Sl. Nr.</b>	<b>Insect</b>	<b>Frequency</b>
1.	Bean aphid	12
2.	Brinjal shoot and fruit borer	11
3.	Bean pod borer	11
4.	Cucurbit fruit fly	10
5.	Cutworm (potato)	7
6.	Mustard aphid	5
7.	Larva of cabbage butterfly	5
8.	Earthworm (Chera) of rice	4
9.	Cutworm (Chilli)	3
10.	Epilachna beetle	3
11.	Tomato aphid	2
12.	Caterpillar of red amaranth	2
13.	Mango stem borer	2
14.	Field cricket	2
15.	Jackfruit stem borer	2
16.	Pomegranate fruit borer	2
17.	Cutworm (Tomato, Brinjal)	2
18.	Bean leaf miner	2
19.	Cutworm (Garlic)	1
20.	Red mite of brinjal	1
21.	Rhinoceros beetle	1
22.	Mole cricket	1
23.	Betel nut fruit borer	1
24.	Termite (Potato, Sugarcane)	1
25.	Guava fruit borer	1
26.	Red mite of brinjal	1
27.	Jassid of onion	1
28.	Caterpillar of guava	1
29.	Mite of guava	1
30.	Larva of lemon butterfly	1
31.	Red pumpkin beetle	1
32.	Caterpillar of tomato	1
33.	Caterpillar of bean	1
34.	Banana leaf and fruit beetle	1

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

<b>Sl. Nr.</b>	<b>Disease and Soil problem</b>	<b>Frequency</b>
1.	Leaf curl of chilli	9
2.	Anthracnose of bean	7
3.	Stem rot of brinjal	5
4.	Buttoning/ Richyness of cauliflower	5
5.	Foot rot of wheat	4
6.	Leaf curl of brinjal	4
7.	Die back of brinjal	4
8.	Foot rot of tomato	4
9.	Foot rot of cabbage/ cauliflower	4
10.	Purple blotch of garlic	3
11.	Bud rot of betel nut	3
12.	Die back of bottle gourd	3
13.	Late blight of potato	3
14.	Root knot of brinjal	3
15.	Papaya mosaic virus	3
16.	Leaf curl of betel vine	2
17.	Purple blotch of onion	2
18.	Rhizome rot of turmeric	2
19.	Foot rot of brinjal	2
20.	Pollination Problem of sweet gourd	2
21.	Root knot of tomato	2
22.	Fruit rot of bottle gourd	2
23.	Leaf curl of radish	2
24.	Leaf curl of tomato	2
25.	Leaf curl of cucumber	2
26.	Gummosis of lemon	2
27.	Foot rot of potato	2
28.	Leaf curl of potato	2
29.	Bud rot of coconut	2
30.	Virus of sweet gourd	2
31.	Leaf rot of betel vine	1
32.	Stem rot of betel vine	1
33.	Foot rot of betel vine	1
34.	Fruit rot of jackfruit	1
35.	Fruit rot of tomato	1
36.	Foot rot of onion	1
37.	Foot rot of spinach	1
38.	Nutritional deficiency of coconut	1
39.	Bunchy top of mango (unknown)	1
40.	Leaf blight of turmeric	1
41.	Foot rot of lentil	1
42.	Black coloration of carrot	1
43.	Leaf curl of onion	1
44.	Rust of bean	1
45.	Leaf curl of bottle gourd	1
46.	Foot rot of bitter gourd	1
47.	Scab of lemon	1
48.	Foot rot of chilli	1
49.	Fruit rot pomegranate	1
50.	White spot of red amaranth	1
51.	Foot rot of french bean	1

**Table 4: Status of plant health problems (Average) in three districts**

Sl. Nr.	Crop	Average status of problem (Range 0-5)*			Rank
		Insect	Disease	Soil problem	
1	Cabbage	4	4	1	2
2	Cauliflower	4	4	1	2
3	Country bean	5	5	1	1
4	Yard long bean	4	2	-	5
5	Bottle gourd	4	4	-	3
6	Sweet gourd	4	4	-	3
7	Radish	1	3	-	7
8	Carrot	1	3	1	6
9	Brinjal	5	5	1	1
10	Chilli	2	5	2	2
11	Tomato	3	4	1	3
12	Potato	3	5	1	2
13	Rice	4	3	-	4
14	Mustard	3	2	-	6
15	Spinach	1	3	-	7
16	Wheat	1	4	-	6
17	Lentil	1	3	-	7
18	Grass pea	2	0	-	9
19	Black gram	2	2	-	7
20	Onion	2	4	-	5
21	Garlic	2	4	-	5
22	Banana	4	3	1	3
23	Bitter gourd	3	4	-	4
24	Snake gourd	2	3	-	6
25	Coriander	0	1	-	10
26	Lemon	2	4	-	5
27	Coconut	2	4	2	3
28	Cucumber (Khira)	3	3	-	5
29	Cucumber (Shasha)	3	3	-	5
30	Amaranth	3	2	-	6
31	Red amaranth	4	2	-	5
32	Betel nut	2	4	-	5
33	Betel vine	1	5	1	4
34	Kohlrabi	2	2	-	7
35	France bean	3	4	-	4
36	Lai shakh	2	1	-	8
37	Papaya	1	4	-	6
38	Guava	3	3	-	5
39	White gourd	3	2	-	6
40	Maize	1	2	-	8
41	Lady's finger/ Okra	4	4	-	3
42	Jackfruit	3	4	-	4
43	Turnip	2	2	-	7
44	Turmeric	2	4	-	5
45	Pea	3	1	-	7
46	Mustard (Rai)	4	1	-	6
47	Teasle gourd	3	4	2	2
48	Indian spinach	2	2	-	7
49	Mango	4	2	-	5
50	Chick pea	2	2	-	7
51	Pomegranate	4	2	-	5

\* 5 =Very high, 4 = High, 3 = Medium, 2 = Low, 1 = Rare, 0 = Nil

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

Each of the plant health problems bears one or more local names at the same community. In the participatory survey, farmers were asked to inform the local name of the insects, diseases and soil problems. Farmers used different local names of the plant health problems on the basis of morphological characters, nature of damage or symptoms. Farmers were also asked to describe the meaning of the local names. Farmers tried to give the meaning of the local names where some of the local names were identified that to have no definite translatable meaning. In the Winter crop season, farmers of three districts identified about 90 plant health problems, which contain more than 160 local names.

In Natore district, about 55 plant health problems were identified and found to have more than 90 local names. Among the plant health problems, bean aphid, bean pod borer, brinjal shoot and fruit borer, aphid, banana leaf and fruit beetle, cucurbit fruit fly, epilachna beetle, pumpkin caterpillar, red pumpkin beetle, pomegranate fruit borer, foot rot of vegetables, die back of brinjal, purple blotch of onion and garlic, leaf curl of chilli, little leaf of brinjal, mosaic virus of papaya, leaf blight of turmeric etc. shared more local names.

In Norsingdi district, about 32 plant health problems were identified and found to have more than 64 local names. Among the plant health problems, cutworm, virus of cucurbits, bean pod borer, pumpkin caterpillar, cucurbit fruit fly etc. had more than one local name.

In Moulvibazar district, about 18 major plant health problems were identified and found to have more than 32 local names. Among them, leaf curl of vegetables, late blight of potato, bean aphid, bean pod borer, brinjal shoot and fruit borer, foot rot of vegetables, cutworm etc. Each had been given more than one local name.

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

Most of the disease problems have no specific common local names where farmers generally used some terms such as, 'Morok rog', 'Pocha rog', 'Mora rog', 'Jhora rog' etc. as these names characterized the observed symptoms of a particular disease. From the survey in Winter crop season, Farmers identified more disease in comparison to insects.

The local names of the major insects, diseases and soil problems with their meanings found from the survey of Winter crop season in three districts are shown in the following Table 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)	Chera	Earthworm	Earthworm
Brinjal (Begun)	Mazra poka/ Beguner kirra/Doga chidrokari/Machi poka	Central stem insect/ Insect of brinjal/Shoot boring / Fly insect	Brinjal shoot and fruit borer
	Leda poka	Cow dung like (soft) insect	Cut worm
	Fula rog/ Virus rog/Kukra rog	Bushy disease/ Virus disease/ Curl disease	Little leaf of brinjal
	Gura sukna rog/ Saifty rog/ Gura mora rog	Foot dry disease/ Rot disease/ Base die disease	Foot rot disease
	Dul mora rog/ Kalo pocha rog/ Aga mora rog	Branch die disease/ Black rot disease/ Tip die disease	Die back of brinjal
	Guti rog	Knot disease	Root knot of brinjal
	Saifty rog	Quick rot disease	May be stem rot
	Choto lal poka/ Choto sada poka	Small red insect/ Small white insect	Aphid
Onion (Peaz)	Aga mora/ Aga sukna rog/	Tip die / Tip dry disease	Purple blotch of onion
	Gura pocha rog	Base rot disease	Stem rot of onion
	Menda poka	-	Jassid
	Gugri poka	Sound producing insect	Mole cricket
	Pata kukrano rog	Leaf curl disease	Virus
Betel vine (Pan)	Solma rog	Scar like disease	Virus of betel vine
	Khauni	Being eaten	Foot rot of betel vine
	Sukna khauni	Eaten i n dry condition	Stem rot of betel vine
	Tela laga	Rot disease	Leaf spot of betel vine
Turmeric (Halud)	Pata pocha/Pocha rog	Leaf rot / Rot disease	Leaf blight of turmeric
Bottle gourd (Lau)	Machi poka/ Bhomra poka	Fly insect/ Wasp like insect	Cucurbit fruit fly
	Jala mora/ Guti pocha	Immature fruit die/ Young fruit rot	May be pollination problem
Chilli (Moris)	Kukra laga/ Thupa dhora	Being curled/ Turning bunchy	Leaf curl of chilli.
	Leda poka	Cow dung like (soft) insect	Cut worm
Bitter gourd (Korola)	Leda poka	Cow dung like (soft) insect	Fruit fly
Teasle gourd (Kakrul)/ Bitter gourd (Korola)	Pata morano poka/ Ghura poka	Leaf folded insect/ Horse like insect	Pumpkin caterpillar/ Leaf folder
Yard long bean (Borboti)/ Teasle gourd (Kakrul)	Holde poka/ Kathali poka	Yellow insect/ Jackfruit (coloured) insect	Grub of epilachna beetle
Papaya (Paepae)	Kukra matha/ Fula rog/ Virus rog.	Curl headed/ Bushy disease/ Virus disease	Virus of papaya

\* 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>
Country bean (Sim)	Jaua poka/ Echi poka/ Jab poka/ Menda poka	Gradually destroying insect/ - /Close sitting insect/ -	Bean aphid
	Mazra poka/ Lal kirra/ Leda poka	Central part insect/ Red worm/ Cow dung like (soft) insect	Bean pod borer
	Pata mora rog	Leaf die disease	Bean leaf miner
Sweet gourd (Misti kumra)	Fula rog/ Virus rog/ Kukra rog	Bushy disease/ Virus disease/ Curl disease	Virus of papaya
Red amaranth (Lal shak)	Lal machi/ Sunduri machi/ Ura poka	Red fly/ Beautiful fly/ Flying insect	Red pumpkin beetle
Coconut (Narikel)	Fol jhora rog/ Fol fata rog	Fruit dropping disease/ Fruit cracking disease	Bud rot of coconut
	Pani sukna rog	Water drying disease	May be nutritional deficiency
Pomegranate (Dalim)	Dalimer kirra/Lal kirra poka/ Mazra poka	Worm of pomegranate/ Red worm insect/ Central part insect	Pomegranate fruit borer
Banana (Kola)	Dauda poka	Scar disease	Banana leaf and fruit beetle
Radish (Mula)	Pata kukrano rog	Leaf curl disease	Virus
Tomato (Tomato)	Virus dhora	Virus attack	Virus
	Hossi poka	-	Aphid
	Guri sukna/ Gura pocha/ Pochon rog	Base dry/ Basal rot/ Rot disease	Foot rot
	Fol jhora rog	Fruit dropping disease	Fruit rot
Jackfruit (kathal)	Muchi jhora	Bud dropping	Fruit rot
	Kando khaua poka	Stem feeding insect	Jackfruit stem borer
Garlic (Rashun)	Matha lal houa	Reddening of top portion	Purple blotch of garlic
	Gugri poka	-	Mole cricket
Spinach (Palong shak)	Pocha kana/ Gura pocha	Severe rot/ Basal rot	Foot rot
Pointed gourd (Poto)	Holde poka	Yellowish insect	Grub of epilachna beetle
Mustard (Sarisha)	Jaua poka	Gradually destroying insect	Mustard aphid
Lentil (Masur)	Guri pocha	Base rot	Foot rot

**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>
Country bean (Sim)	Pachi poka/ Echi poka/ Menda poka/ Jab poka	Wrapping insect/ - / Close sitting insect / -	Bean aphid
	Mazra poka/ Simer kirra/ Machi poka/ Sada kirra	Central part insect/ Worm of bean/ Fly insect/ White worm	Bean pod borer
	Kando pocha/ Pocha rog/ Pata pocha/ Cancer	Stem rot/ Rot disease/ Leaf rot/ (one kind of disease)	Anthrachnose of bean
	Jhora rog/ Sim jhora	Shedding disease/ Pod dropping	May be anthracnose of bean
	Murga poka	Cock like insect	Epilachna beetle
Potato (Alu)	Morok rog/ Pata mora rog/ Guri sukna rog	Devastating disease/ Leaf die disease/ Base dry disease	Late blight of potato
Bitter gourd (Korola)	Pipri laga	Being curled	Leaf curl of cucurbit
Cucumber (Sosha)	Pakra laga	Being curled	Virus of cucurbit
Guava (Peara)	Leda poka	Cow dung like (soft) insect	Guava fruit borer
	Makorsha	Spider	Mite of guava
Bottle gourd (Lau)	Gas mora/ Mora laga/ Doga mora/ Sukna rog	Plant die/ Being to die/ Tender shoot die/ Dry disease	May be root knot
Chilli (Moris)	Pipri laga/ Pukra laga/ Fula rog/ Virus rog	Being curled/ Forming curled/ Bushy disease/ Virus disease	Leaf curl of chilli
Tomato (Tomato)	Pukra laga	Forming curled	Leaf curl of tomato
	Gura pocha	Base rot	Foot rot of tomato
Brinjal (Begun)	Mazra poka/ Beguner kirra/Doga chidrokari	Central stem insect/ Insect of brinjal/Shoot boring	Brinjal shoot and fruit borer
	Dul mora rog/ Aga mora rog/ Cancer	Branch die disease / Tip die disease/ (one kind of disease)	Die back of brinjal
Cauliflower (Ful copy)	Ful mela rog/ Ful fota rog	Flower opening disease/ Flower blooming disease	Buttoning of cauliflower

<b>Crop*</b>	<b>Local name of the problem</b>	<b>Meaning of the local name</b>	<b>Common name</b>
Cauliflower (Ful copy)/ Cabbage (Badha copy)	Badami kirra/ Kirra poka/ Halud kirra	Brown worm/ Worm insect/ Yellow worm	Larva of cabbage butterfly
	Katui poka/ Leda poka	Cutting insect/ Cow dung like (soft) insect	Cut worm
Sweet gourd (Misti kumra)	Virus laga/ Pakra rog	Virus disease/ Curl disease	Virus of cucurbits
Yard long bean (Borboti)	Pachi poka /Echi poka	Wrapping insect/ -	Bean pod borer
Cucumber (Sosha) / Teasle gourd (Kakrul)	Pata morano poka/ Sabuj kirra	Leaf folded insect/ Green worm	Pumpkin caterpillar
	Pipri laga	Being curled	Leaf curl of cucurbit
Bottle gourd (Lau) / Sweet gourd (Misti kumra)	Bolla poka/ Machi poka/ Pocha laga/ Urailla poka	Wasp insect/ Fly insect/ Starting to rot/ Flying insect	Cucurbit fruit fly
	Pocha laga	Being rotted	Fruit rot of cucurbit
Banana (Kola)	Pata mora	Leaf drying	Sigatoga of banana
Wheat (Gom)	Mora laga	Starting to die	Foot rot of wheat
Lemon (Lebu)	Guri pochha/ Gura fata rog	Base rot/ Base cracking disease	Gummosis of lemon
	Salma rog	Scar like disease	Scab of lemon

**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>
Potato (Alu)	Kukri bamer / Kukra rog	Curling disorder/ Curling disease	Leaf curl of potato
	Pocha rog / Pocha morok / Morki bamer	Rot disease/ Rot devastation/ Devastating disease	Late blight of potato
	Bicha poka	Hairy insect	Caterpillar of potato
Country bean (Sim) / Yard long bean (Romaish)	Idla poka/ Lauri poka/ Jab poka	Milting insect/ 'Lauri' is one kind of wild fruit that grow very closely on the stem as a result the stem is not visible	Bean aphid
	Kirra poka/ Simer kirra	Worm insect/ Worm of bean	Bean pod borer
	Bicha poka	Hairy insect	Caterpillar of bean
Brinjal (Begun)	Baguner kirra/ Mazra poka	Worm of Brinjal/ Central stem insect	Brinjal shoot and fruit borer
Brinjal(Begun) / Chilli (Chilli) / Tomato (Tomato) / Potato (Alu)	Katui poka/ Kala poka	Cutting insect/ Black insect	Cutworm
Tomato (Tomato)	Jhar mora/ Gura pocha	Hill die/ Foot rot	Foot rot of tomato
	Kukra rog	Curling disease	
Red amaranth (Lal shakh)	Sada rog	White disease	White rust
Chilli (Moris)	Gura pocha / Jhar mora	Base rot/ Hill die	Foot rot
Sweet gourd (Misti Kumra)	Kurri Jhora	Immature fruit dropping	May be pollination problem
Cabbage (Badha kopy),	Leda poka	Cow dung like (soft) insect	Larva of cabbage butterfly
French bean (Forash)	Gura pocha	Foot rot	May be the attack of pulse beetle
Pomegranate (Dalim)	Morok rog	Devastating disease	Fruit rot
Cauliflower (Ful kopy)	Gura pocha /Gura sukna	Basal rot/ Basal dry	Foot rot

### **III. Farmer's concept on major plant health problems**

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

In Winter crop season, a total of 51 crops including fruit trees were recorded in three districts those suffered seriously by insects and diseases.

In Natore district, farmers identified about 35 crops including fruit trees, which are highly damaged by insects or diseases. Among the crops, some were highly damaged by insects. These are Country bean (Bean aphid and Bean pod borer), Cabbage and Cauliflower (Cabbage butterfly), Brinjal (Brinjal shoot and fruit borer), Bottle gourd and Sweet gourd (Cucurbit fruit fly), Banana (Banana leaf and fruit beetle), Pomegranate (Pomegranate fruit borer), Rice (Earthworm) etc. Some crops such as Onion, Garlic (Purple blotch of onion and garlic), Tomato, Brinjal, Spinach (Foot rot of vegetables), Chilli, Papaya (Leaf curl), Brinjal (Die back and Wilt), Turmeric (Rhizome rot), Wheat (Foot rot), Coconut, Betel nut (Bud rot) etc. crops were found to suffer by diseases.

In Norsingdi district, farmers identified about 22 crops, which are more infested by insects and diseases. Among the crops, Cabbage and Cauliflower (Cabbage butterfly and Cutworm), Brinjal (Brinjal shoot and fruit borer), Country bean and Yard long bean (Bean aphid and Bean pod borer), Sweet gourd and Bottle gourd (Cucurbit fruit fly), Potato (Cutworm), Lemon (Lemon butterfly) etc. were found seriously damaged by insects. Some of the crops such as Bean (Anthracnose of bean), Bottle gourd, Sweet gourd (Wilt, Leaf curl and Anthracnose of cucurbits), Chilli (Leaf curl of chilli), Tomato, Cabbage, Cauliflower (Foot rot of vegetables), Potato (Late blight of potato), Banana (Sigatoga of banana), Lemon (Gummosis and Scab of lemon), Brinjal (Dieback and Wilt of brinjal) etc. caused serious damage to crops.

In Moulvibazar district, about 18 crops were found highly damaged by insects and diseases. Some of the crops such as Potato, Chilli (Cutworm), Country bean (Bean pod borer), Yard long bean (Bean aphid), Cabbage (Cabbage butterfly), Brinjal (Brinjal shoot and fruit borer) etc. were found seriously damaged by insects. On the other hand, Potato (Late blight and Mosaic of potato), Onion, Garlic (Purple blotch of onion and garlic), Tomato, Brinjal, Spinach (Foot rot of vegetables, Leaf curl), Chilli, Papaya (Leaf curl), Brinjal (Die back and Wilt), Coconut, Betel nut (Bud rot), Lemon (Scab of lemon) etc. crops were found to be suffered by diseases.

In general, farmers of three districts identified some common plant health problems in Winter crop season such as Bean aphid, Bean pod borer, Brinjal shoot and fruit borer, Cucurbit fruit fly, Cabbage butterfly, Cutworm, Mustard aphid, Foot rot of vegetables, Root knot of vegetables, Leaf curl, Wilt of vegetables etc.

Farmers of all districts were able to explain their major plant health problems including the pest management practices. Farmer's concept about some of the major plant health problems and their management practices found from the survey in Winter crop season in three districts are given in the following Table 8, 9 and 10:

**Table 8: Farmer's concept about the major plant health problems in Natore district**

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Garlic	Matha lal houa	<ul style="list-style-type: none"> <li>- The tip portion of the plant is died.</li> <li>- It starts from the seedling stage and remains up to harvesting.</li> <li>- Initially the top portion is died and then gradually enlarged downwardly.</li> <li>- In most cases, the garlic field is seriously damaged where rice is frequently cultivated.</li> <li>- Maximum damage is observed from the last 4-5 years.</li> </ul>	<p>Application of pesticides such as Thiovit, Ridomil, Folicur etc.</p> <p>Application of ash</p>	Purple blotch of garlic/onion
Potato	Leda poka	<ul style="list-style-type: none"> <li>- It is soft-bodied insect that remains itself under the soil surface.</li> <li>- It cuts the seedlings slightly upper from the soil surface.</li> <li>- It comes out from soil at morning and at down.</li> <li>- It can be found in the soil near the cut plant.</li> <li>- It also cuts the seedlings of other winter crops.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of water.</li> <li>- Application of pesticides such as Tafgor, Basudin etc.</li> <li>- Wrapping the seedling by polythene.</li> </ul>	Cutworm
-Do-	Dauda rog	<ul style="list-style-type: none"> <li>- Scar like symptom appears in the skin of potato</li> <li>- The potato can* not grow large</li> <li>- The infected potato can not be stored for long time and with in few days it is rotted</li> <li>- Maximum damage is identified from the last 4-5 years</li> </ul>	<ul style="list-style-type: none"> <li>- Control measures are not adopted.</li> </ul>	Scab of potato
-Do-	Morok rog	<ul style="list-style-type: none"> <li>- Initially few plants of the field are affected and the tender leaves of the affected plant are rotted.</li> <li>- Rapidly this disease is spread and within 2-3 days the whole field is destroyed.</li> <li>- Unpleasant odour comes out from the seriously affected fields.</li> <li>- The foot region and the roots are also rotted.</li> <li>- Deep fog favours the disease.</li> <li>- From the last 4-5 years, it has become quite impossible to grow the crop without pesticides.</li> </ul>	<p>Application of Dithane M-45, Indofil, Ridomil, etc.</p>	Late blight of potato

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

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identificati on</b>
Cabbage, Cauliflower	Leda poka	<ul style="list-style-type: none"> <li>- It is brown coloured long worm, which eat inside the folded leaves.</li> <li>- Cabbage cannot grow large.</li> <li>- Sometimes rot symptoms are found on the card.</li> <li>- Infestation starts from the early stage of the plant but maximum at maturity stage.</li> <li>- From the last 5-6 years, it caused severe damage.</li> </ul>	Application of Diazinon, Milfen, Fenfen, Dursban, Cymbush, Fifanon, Diazinon etc.	Larvae of cabbage butterfly
Bottle gourd, Sweet gourd	Jali mora/ Guti pocha	<ul style="list-style-type: none"> <li>- The immature fruits can not grow large and turned into yellowish colour</li> <li>- The infected fruit is wrinkled and finally dried</li> <li>- Generally this problem is found when the plant bears only few fruits</li> </ul>	Control measures are not adopted	May be pollination problem
-Do-	Bhomra poka/ Daua poka	<ul style="list-style-type: none"> <li>- It is yellowish coloured small fly insect, which have a sting behind the body.</li> <li>- With the help of the sting, it bore the young fruits.</li> <li>- The infested fruits turned into yellowish coloured and finally died.</li> <li>- If the fruit can grow large, the shape is deformed.</li> <li>- If pesticides are applied, the insect flies away for a short time and cannot be eliminated.</li> <li>- It is the most damaging pest of white gourd and sweet gourd.</li> </ul>	Application of chemicals such as Sevin, Dursban, Fenfen, Fifanon, Taigor etc.	Cucurbit fruit fly
Coconut/ Betel nut	Fol jhora rog	<ul style="list-style-type: none"> <li>- Immature fruits are dropped.</li> <li>- The outer surface of the coconut remains good, but the inner portions e.g. kernel is deformed.</li> <li>- Sometimes the fruit bears no water.</li> <li>- In case of betel nut, the spike let of bud is turned into blackish coloured or Radish colour and then dropped.</li> <li>- About half of the fruits are dropped.</li> </ul>	<ul style="list-style-type: none"> <li>- Control measures are not adopted.</li> <li>- Sometimes cow dung and other fertilizers are applied.</li> </ul>	Bud rot of coconut/ betel nut
Jackfruit	Muchi jhora	<ul style="list-style-type: none"> <li>- Initially the spike of the bud turned into reddish coloured.</li> <li>- Gradually the immature fruits turned into blackish coloured and finally dropped.</li> <li>- The damaged immature fruits</li> </ul>	Control measures are not adopted.	Rhizobium rot of jackfruit

Crop	Local name	Description of the problem	Management practices*	Identification
		bear powder like black substances. - Only the immature fruits (1-4" length) are affected.		
Tomato	Vairus dhora	- Leaves are curled and the growth of the plant is reduced. - The plant cannot bear flowers or fruits. - If the plant bears fruits, it cannot grow large. - It may be caused by nutrient deficiency or bed wind contamination. - Since the beginning of tomato cultivation, the infestation of this disease is observed. - Generally matured plants are affected.	Chemicals are not used.  Sometimes ashes are used.	Leaf curl of tomato
-Do-	Hossi poka/ Menda poka	- It is very small black coloured pest - It suck the juice from the leaves, vines and flowers - The plant can not bear flowers and becomes pale coloured - Same pest attacks the brinjal, potato and mustard	Application of Fenfen, Decis, Dursban etc.	Tomato aphid
-Do-	Gura pocha/ Gura sukna/ Pochon rog	- Initially the basal portion of the plant become soft, water soaked lesion is appeared and finally rotted. - The whole plant is rotted within few days. - The roots are also rotted. - Wet condition favours the disease.	Application of chemicals such as Dithane, Ridomil etc.	Foot rot
Chilli	Kukra laga	- The leaves of chilli are curled and turned into yellowish colour - The plant bears much branches making a bush like structure. - The plant cannot bear flowers or fruits. - Worm weather favours the disease, and summer varieties suffer seriously. - Within a few days, the whole field may affect. - From the last 4-5 years, it becomes a destructive disease. - Radish and cucurbits also suffered by this disease.	- Uprooting the infested plant. - Application of ash	Leaf curl of chilli

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
-Do-	Leda poka/ Kalo poka	<ul style="list-style-type: none"> <li>- It is very soft-bodied insect, which remains itself under the soil surface.</li> <li>- It cut the young seedlings slightly upper from soil surface.</li> <li>- Serious damage is done at morning.</li> <li>- It cannot tolerate excess water.</li> <li>- Soft and dry soil condition favours its infestation.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of flood water.</li> <li>- Hand picking.</li> <li>- Molasses and rice husk mixing with the pesticide 'Cymbush' is applied.</li> </ul>	Cut worm
Guava	Foler kirra	<ul style="list-style-type: none"> <li>- It is worm like pest that bore the fruit and eat the inner portion</li> <li>- Its attack starts from the immature stage of the fruit and remains up to matured stage</li> <li>- In case of severe attack, it can damage 50-70% of fruits</li> </ul>	Control measures are not adopted	Guava fruit borer
Rice	Chera	<ul style="list-style-type: none"> <li>- It is very small, red coloured, worm like pest which remains under the soil</li> <li>- It eats the young roots. As a result the plant can not uptake nutrients</li> <li>- Growth of the plant is stopped</li> <li>- It is only appeared in the irrigated rice fields (Boro season)</li> <li>- Severe infestation starts from the last 4-5 years</li> </ul>	<ul style="list-style-type: none"> <li>- Application of 'Indian oil'</li> <li>- Application of granular insecticides such as Furadan, Basudin etc.</li> <li>- Sun drying the field</li> </ul>	May be a species of earthworm
Country bean	Jaua poka/ Echi poka/ Menda poka/ Jab poka	<ul style="list-style-type: none"> <li>- It is brown to blackish coloured insect that suck the juice from the tender shoots, young leaves and fruits.</li> <li>- Growth of the plant and the fruits is stopped.</li> <li>- Same insect attacks the yard long bean.</li> <li>- The infested fruit is curved and deformed.</li> <li>- Cold weather favours the infestation of this pest.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Cymbush, Fifanon, Fenfen, Malathion etc.</li> <li>- Application of ash mixing with kerosene oil.</li> <li>- Application of the extract of tobacco leaf.</li> </ul>	Bean aphid

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
-Do-	Mazra poka/ Lal kirra/ Leda poka	<ul style="list-style-type: none"> <li>- It bore the fruit and eats the inner portion.</li> <li>- It is dark, brownish coloured worm like insect.</li> <li>- It is just like the worm of brinjal.</li> <li>- It is only available at the fruiting stage.</li> <li>- In case of severe infestation it can damage up to 50% of the fruits.</li> <li>- During the last 4-5 years it becomes difficult to control and it by chemicals.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Fenfen, Milfen, Basathrin, Tafgor, Ralothrin, Fentox, etc.</li> </ul>	Bean pod borer
Sugar-cane	Mazra poka	<ul style="list-style-type: none"> <li>- After one month of transplanting, its infestation is started and remains up to harvesting.</li> <li>- It bore the soft tender portion and eats inside the cane.</li> <li>- In hot weather, its infestation is high. Fertilizer application favours its infestation.</li> <li>- The middle leaf of the infested cane can be pulled out easily.</li> <li>- If a cane is splitted several 'kirra' (worm) are found and the middle portion generally turned into reddish coloured.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals such as Kuraterr. Briffer. Furadan etc. are used.</li> <li>- Cutting and removing the infested plant parts.</li> </ul>	Sugarcane stem borer
Brinjal	Mazra poka	<ul style="list-style-type: none"> <li>- It is the main pest of brinjal</li> <li>- It bore the tender shoots and eats inside it.</li> <li>- As the plant bears young shoots, the infestation is started and remains the entire crop season. But maximum infestation is found during flowering and fruiting stage.</li> <li>- Its infestation was available from the beginning of brinjal cultivation, but during the last 10-15 years, it seriously damaged the crop.</li> <li>- During Winter season, its infestation is comparatively low.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals such as Ripcord, Cymbush, Ekalux, Rider, Kartap, Suntap, Fenfen, Indian oil (Comes from India) Marshal etc.</li> <li>- Removing the infested plant parts.</li> </ul>	Brinjal shoot and fruit borer.
-Do-	Holde poka	<ul style="list-style-type: none"> <li>- It is yellowish coloured soft spiny insect that eat the green portions of the leaf.</li> <li>- It infests the plant from the seedling stage but maximum in vegetative stage.</li> <li>- It remains itself at the lower surface of the leaf and difficult to control by chemicals.</li> <li>- Growth of the plant is reduced and the plant bears very few fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals such as Fenfen, Malathion, Cymbush etc. are used.</li> <li>- Application of ash.</li> </ul>	Epilachna beetle

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identificati on</b>
-Do-	Leda poka	<ul style="list-style-type: none"> <li>- It is very soft-bodied insect, which remains itself under the soil surface.</li> <li>- It cuts the seedlings slightly upper from soil surface.</li> <li>- Serious damage is done at morning.</li> <li>- It cannot tolerate excess water and soft and dry soil condition favours its infestation.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of floodwater.</li> <li>- Hand picking.</li> <li>- Molasses, and rice husk mixing with the pesticide Cymbush is applied.</li> </ul>	Cut worm
-Do-	Fula rog	<ul style="list-style-type: none"> <li>- Leaves turned into small sized and curled.</li> <li>- The plant bears too much branches and turned into dense bushy structure.</li> <li>- Plants bear few flowers but get no fruits. If fruits are produced, it is deformed.</li> <li>- This disease generally starts from the fruiting stage.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals are not used.</li> <li>- Uprooting the infested plant.</li> </ul>	Little leaf of brinjal
-Do-	Gura shukna rog/ Saipti rog/ Gura mora rog	<ul style="list-style-type: none"> <li>- The basal portion of the plant is dried and become narrower.</li> <li>- Roots of the plant are also rotted.</li> <li>- Sometimes black spots are found. The stem is cracked and glutinous substances are extracted.</li> <li>- The plant turned into pale coloured and finally died.</li> <li>- Sometimes fruits are also rotted.</li> <li>- This disease appeared as a serious problem for 3-4 years.</li> <li>- Generally matured plants are affected.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of 'Tute' (CuSO<sub>4</sub>) and Lime.</li> </ul>	Unidentified , may be foot rot.
-Do-	Dul mora rog/ Kalo poch a rog/ Aga mora rog	<ul style="list-style-type: none"> <li>- The branches of the plant bears black lesson in one side.</li> <li>- Infested branches are dried and the disease gradually enlarged backwardly and finally died.</li> <li>- Severe infected plant bears no leaf.</li> <li>- Considerable damage is observed from the last 4-5 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant.</li> <li>- Application of Dithane M, Indofil, Bavistin, Tafgor, Karate, Vegimax</li> </ul>	Die back
-Do-	Guti rog	<ul style="list-style-type: none"> <li>- The roots of the plant bear knot like structure.</li> <li>- Most of the roots are damaged.</li> <li>- The plant cannot uptake fertilizers.</li> <li>- The plant turned into yellowish colour and bears only few flowers or fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant</li> </ul>	Root knot of brinjal

Crop	Local name	Description of the problem	Management practices*	Identification
		<ul style="list-style-type: none"> <li>- Within few days the infected plant may wilted or die.</li> <li>- It is generally found in matured plants.</li> <li>- From the last 4-5 years it becomes serious pest of brinjal.</li> </ul>		
-Do-	Saifly rog	<ul style="list-style-type: none"> <li>- Initially the basal stem of the plant bears brown to blackish lesions.</li> <li>- The infested part is died within few days and the whole plant may die.</li> <li>- Sometimes the branches of the plant and the fruits also bear the symptom.</li> <li>- The infested bark may crack and secreted glutinous substances.</li> <li>- It is generally found in matured plants and causes considerable damage for the last 3-4 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Dithane M-45, with glutinous substance.</li> <li>- Application of Rovral.</li> </ul>	May be stem rot
Onion	Aga mora/ Aga sukna rog	<ul style="list-style-type: none"> <li>- It starts from the seedling stage and remains up to harvesting.</li> <li>- Initially the top portion is died and then gradually enlarged downwardly.</li> <li>- During rainy season, its infestation is high.</li> <li>- It is the most damaging disease of onion and considerable damage is noticed from the last 8-10 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Rovral, Antracol etc.</li> </ul>	Purple blotch of onion
-Do-	Gura pocha	<ul style="list-style-type: none"> <li>- Roots as well as the immature bulbs are rotted.</li> <li>- The infested plant can be uprooted easily.</li> <li>- The plant turned into yellowish coloured and wilted.</li> <li>- Rain water favours the disease.</li> <li>- It is mostly found in the summer season (summer variety).</li> </ul>	-Do-	Stem rot of onion
Betel vine	Khauni	<ul style="list-style-type: none"> <li>- The stem that comes to contact with the newly applied soil is generally infested.</li> <li>- The basal stem turned into whitish or blackish coloured, soft, sticky and rotten symptom appeared with unpleasant odour.</li> <li>- After the rainy season, the disease turned into severe condition.</li> <li>- If oil cake and fertilizers are applied in worm weather and dumpy soil condition, the</li> </ul>	<ul style="list-style-type: none"> <li>- Application of pesticides such as Tilt, Bavistin, etc.</li> <li>- Application of sandy soil.</li> <li>- Application of Knowin, Cupravit, Vesivax, Agrovax etc.</li> </ul>	Foot rot of betel vine

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

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Turmeric	Pocha rog	<ul style="list-style-type: none"> <li>- Leaves are rotted. Initially the top portion of the leaf is dried and gradually enlarged downwardly.</li> <li>- This disease may be caused by soil problems or nutrient deficiency.</li> <li>- The infestation starts from one month after transplanting and remain up to harvesting.</li> <li>- During rainy season, its infestation is high.</li> <li>- This disease may be caused by a small kirra (worm) known as 'mazra poka'.</li> <li>- Severe damage starts from the last 10-12 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Marshal, Regent, Kuraterr, Furadan, Basudin, etc.</li> <li>- Application of ash.</li> </ul>	Leaf blight of turmeric
-Do-	Pocha kana/ Halud pocha rog	<ul style="list-style-type: none"> <li>- Initially the tip portion of the young rhizome is rotted.</li> <li>- The upper portion (plant) remains good but the lower portion is rotted.</li> <li>- In case of serious infestation, the whole rhizome may rot and 70 - 80% yield is damaged by this disease.</li> <li>- In some cases, leaves are also rotted.</li> <li>- Severe damage starts from the last 2-3 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Karate, Cymbush but gives no results</li> </ul>	Rhizome rot of turmeric
Banana	Dauda rog/ Dugpura rog/ Solma rog	<ul style="list-style-type: none"> <li>- The young leaves as well as the young fruits bear scar like blackish spots.</li> <li>- It may be caused by one kind of black, small, hard insect that remains in the leaf blade.</li> <li>- It is generally found in the old garden.</li> <li>- Infested fruits take more time to ripe and lower market value.</li> </ul>	Application of chemicals such as Biesteren, Basudin, Brifur etc. mixing with fertilizers.	Banana leaf and fruit beetle.
-Do-	Chera laga	<ul style="list-style-type: none"> <li>- This pest eats the central stem. As a result the central leaf turned into yellowish colour.</li> <li>- This pest also eats the roots and the whole plant may die within a few days.</li> <li>- Sometimes the stem may crack.</li> <li>- It is generally found in the old bunch of banana.</li> </ul>	- Do -	May be banana stem weevil

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Bottle gourd, Sweet gourd,	Machi poka/ Bhomra poka	<ul style="list-style-type: none"> <li>- It is yellowish coloured small fly insect, which have a sting behind the body.</li> <li>- With the help of the sting, it bore the young fruits.</li> <li>- The infested fruits turned into yellowish coloured and finally died.</li> <li>- If the fruit can grow large, the shape is deformed.</li> <li>- If pesticides are applied, it flies away from the plant for a short time and cannot be eliminated.</li> <li>- It is the most damaging pest of white gourd.</li> </ul>	Application of chemicals such as Sevin, Dursban, Fenfen, Fifanon, Tafgor etc.	Cucurbit fruit fly
Chilli	Kukra laga/ Thupa dhora/ Virus rog.	<ul style="list-style-type: none"> <li>- The leaves of chilli is curled and turned into yellowish colour.</li> <li>- The plant turned into a bush like structure.</li> <li>- The plant cannot bear flowers or fruits.</li> <li>- Warm weather favours the disease, and summer varieties suffer seriously.</li> <li>- Within a few days of disease attack, the whole field may be affected.</li> <li>- From the last 4-5 years, it becomes a destructive disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant.</li> <li>- Application of ash.</li> <li>- Application of zinc fertilizers and Agro grow (Vitamin).</li> </ul>	Leaf curl of chilli
Bitter gourd	Leda poka	<ul style="list-style-type: none"> <li>- It bore the bitter gourd and eats inside the fruit.</li> <li>- Within a few days, the fruit turned into yellowish coloured and finally rotten.</li> <li>- Whitish worm like insects are found inside the fruit.</li> <li>- Hot and cloudy weather favours the infestation of this insect.</li> <li>- In case of severe infestation 50% of the fruits are damaged.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Cymbush, Fifanon, Decis etc.</li> <li>- Application of ash.</li> </ul>	Dipteran larva
Yard long bean/ Teasle gourd	Holde poka/ Khatale poka	<ul style="list-style-type: none"> <li>- It is yellowish coloured round insect, which have soft spines.</li> <li>- It eats the young leaves remaining net like structure.</li> <li>- It also eats the tender shoots and young fruits.</li> <li>- It remains itself at the lower surface of the leaf.</li> <li>- Growth of the plant is reduced and cannot bear much fruits.</li> <li>- Hot weather favours the</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Malathion, Dursban, Decis etc.</li> <li>- Application of ash.</li> </ul>	Grub of Epilachna beetle

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>infestation.</p> <ul style="list-style-type: none"> <li>- It is identified as a serious pest from the last 6-7 years.</li> <li>- Infestation starts from one month after transplanting and remain all over the season.</li> </ul>		
Papaya	Fula rog/ Virus rog	<ul style="list-style-type: none"> <li>- Initially the young leaves turned into yellowish coloured and curled.</li> <li>- Gradually all the leaves are curled.</li> <li>- Growth of the plant is reduced.</li> <li>- Length of the stalk of leaves is reduced.</li> <li>- The plant cannot bear flowers or fruits.</li> <li>- If a plant is affected in a garden by this disease, it is spread rapidly to another plants.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant</li> <li>- Application of water.</li> </ul>	Leaf curl virus
Sweet gourd	Fola rog/ virus	<ul style="list-style-type: none"> <li>- The leaves turned into yellowish coloured and the ribs of the leaf becomes whitish.</li> <li>- Sometimes the leaves are also curled.</li> <li>- The plant can not bears fruits or flowers.</li> <li>- If the plant bears fruits, it becomes sprinkled and with in a few days it is spoiled.</li> <li>- This disease generally affects the plant in summer season.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of ash.</li> <li>- Uprooting the infested plant.</li> </ul>	Virus
Red amaranth/ Indian Spinach	Lal machi/ Sunduri machi/ Ura poka	<ul style="list-style-type: none"> <li>- It is red coloured fly insect.</li> <li>- It eats the leaves making round holes.</li> <li>- As the plant bears leaves, its infestation starts.</li> <li>- The plant cannot grow large and reduce the market value.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Malathion, Fifanon etc.</li> <li>- Application of ash.</li> </ul>	Red pumpkin beetle.
Coconut	Mazra poka/ Kirra poka	<ul style="list-style-type: none"> <li>- It is whitish worm like large pest that bore the soft part of the top portion and eat inside it.</li> <li>- The central portion is destroyed. As a result the central leaf is died and within a few days the whole plant may die.</li> <li>- It also eats the young leaves.</li> <li>- The infestation is available all the year round.</li> </ul>	Control measures are not adopted.	Grub of Rhinoceros beetle

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Pomegranate	Dalimer kirra/ Lal kirra poka/ Mazra poka	<ul style="list-style-type: none"> <li>- Its infestation starts from the flowering stage.</li> <li>- It bore the flowers and the young fruits making circular hole</li> <li>- Inside the fruit, worm like red insects are available.</li> <li>- The infested part turned into blackish coloured and within few days it is dropped.</li> <li>- The internal portion of the fruit turned into blackish colour.</li> <li>- It can damage up to 80-90% fruits in case of severe infestation.</li> <li>- Hot weather favours the infestation.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Malathion, Fifanon, Cymbush etc.</li> <li>- Wrapping the young fruits.</li> </ul>	Pomegranate fruit borer.
Mango	Tata poka	<ul style="list-style-type: none"> <li>- It bore the stem and eats the inner portion of the stem.</li> <li>- Saw dust like substance is found on infested plant parts.</li> <li>- Sometime the infested plant part bears glutinous substances.</li> <li>- The damaged plant part is broken when wind blows.</li> <li>- Hot weather may favour the infestation.</li> </ul>	Control measures are not adopted.	Mango stem borer
-Do-	Kukra dhora	<ul style="list-style-type: none"> <li>- The tip portion of the branches turned into bushy structure.</li> <li>- Size of the leaves is very much reduced and makes a bunch or clusters.</li> <li>- The affected portion cannot bear flowers.</li> <li>- Generally the young plants are affected (3-10 years old plants).</li> <li>- From the last 2-3 years, it is identified as a major problem.</li> </ul>	Control measures are not adopted.	May be nutritional deficiency
Mustard	Jaua poka	<ul style="list-style-type: none"> <li>- It is brown to blackish coloured insect that suck the juice from the tender shoots, young leaves, flowers and fruits.</li> <li>- Growth of the plant is stopped.</li> <li>- Same insect attacks the yard long bean and bean.</li> <li>- The infested pod is deformed.</li> <li>- Cold weather favours the infestation of this pest.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Cymbush, Fifanon, Fenfen, Malathion etc.</li> <li>- Application of ash mixing with kerosene oil.</li> <li>- Application of the extract of tobacco leaf.</li> </ul>	Mustard aphid

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identificati on</b>
Red amaranth	Ghora poka	<ul style="list-style-type: none"> <li>- It is greenish coloured, soft-bodied pest that eat the leaves.</li> <li>- It lives inside the folded leaves.</li> <li>- If pesticides are not applied, this pest can damage the field with in few days.</li> <li>- Its infestation is comparatively low in the rainy season.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Fenfen, Cymbush etc.</li> </ul>	Caterpillar of red amaranth
Wheat	Lal berum/ Gas lal houa	<ul style="list-style-type: none"> <li>- Initially the plant turned into reddish coloured.</li> <li>- The plant cannot grow large and unable to uptake fertilizer.</li> <li>- Roots are damaged and with in few days the plant may die.</li> <li>- Sometimes few areas of the field bear smaller pale or red coloured plant, which can be easily distinguished from a distance.</li> <li>- From the last 5-6 years, this problem causes serious damages.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Tilt, Bavistin etc,</li> </ul>	Foot rot of wheat
Betel nut	Fol jhora	<ul style="list-style-type: none"> <li>- Immature fruits are dropped.</li> <li>- The spike let of bud is turned into blackish coloured or reddish colour and then dropped.</li> <li>- About half of the fruits are dropped.</li> <li>- Sometimes the immature fruits are also cracked.</li> </ul>	<ul style="list-style-type: none"> <li>- Control measures are not adopted</li> <li>- Sometimes fertilizers are applied.</li> </ul>	Bud rot of Betel nut.
Lentil	Sukna rog	<ul style="list-style-type: none"> <li>- Initially the plant turned into reddish coloured.</li> <li>- The plant cannot grow large and unable to uptake fertilizers.</li> <li>- Roots are damaged and with in few days the plant may die.</li> <li>- Excess fog favours the disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Bavistin, Tilt etc.</li> </ul>	Foot rot of lentil
Spinach	Pocha kana/ Gura pocha	<ul style="list-style-type: none"> <li>- Initially the basal portion of the plant become soft, water soaked lesion is appeared and finally rotted.</li> <li>- The whole plant is rotted within few days.</li> <li>- The roots are also rotted.</li> <li>- Wet condition favours the disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Dithane, Ridomil etc.</li> </ul>	Foot rot
Pointed gourd	Holde poka	<ul style="list-style-type: none"> <li>- It is yellowish coloured soft spiny insect that eat the green portions of the leaf.</li> <li>- It infests the plant from the seedling stage but maximum in vegetative stage.</li> <li>- It remains itself at the lower surface of the leaf. For this reason it is difficult to control the pest by chemicals.</li> <li>- Growth of the plant is reduced and the plant bears very few fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals such as Fenfen, Malathion, Cymbush etc. are used.</li> <li>- Application of ash.</li> </ul>	Epilachna beetle

**Table 9: Farmer's concept about the major plant health problems in Norsingdi District**

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Cauliflower	Ful mela rog/ Ful futa rog	<ul style="list-style-type: none"> <li>- The affected card contains loosed bindings.</li> <li>- The colour of the card turned into brown to purple colour.</li> <li>- Sometimes the top portion of the card is rotted and it gradually enlarged downwardly.</li> <li>- Sometimes the root region is also rotted.</li> <li>- These symptoms are appeared at the early stage of the card and the card cannot grow large and the plants can bear early flower.</li> <li>- This disease is appeared from the last 10-15 years.</li> <li>- Hot weather and late transplanting favours the disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Dithane M-45, Indofil, Tafgor etc.</li> <li>- Uprooting the infected plant.</li> </ul>	Buttoning/ Richeness of Cauliflower
Cabbage/ Cauliflower	Kirra poka/ Holud kirra/ Badami kirra	<ul style="list-style-type: none"> <li>- It is 1-1.5 inches long, brown coloured worm which eat inside the folded leaves.</li> <li>- Cabbage cannot grow large.</li> <li>- Infestation starts from the early stage of the plant but maximum at maturity stage.</li> <li>- From the last 5-6 years, it caused severe damage.</li> </ul>	Application of Diazinon, Milfen, Fenfen etc.	Larvae of cabbage butterfly
Country bean, Yard long bean	Pachi poka/ Echi poka/ Jab poka	<ul style="list-style-type: none"> <li>- It is small insect that sucks juice from the young shoots and fruits.</li> <li>- Thousands of these insects attack the plant at a time.</li> <li>- Growth of the plant is hampered and the flowers are shaded.</li> <li>- Severely infested plants bear only few fruits, which are deformed.</li> <li>- It is generally found in winter crops such as yard long bean and country bean. But from the last 2-3 years it also found in summer crops.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Malathion, Fenfen, Tafgor, Dursban, Cymbush etc.</li> <li>- Application of ash.</li> </ul>	Bean aphid.

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

Crop	Local name	Description of the problem	Management practices*	Identification
-Do-	Mazra poka/ Sada poka/ Machi poka/ Simer kirra	<ul style="list-style-type: none"> <li>- It bore the fruit and eats the internal portion.</li> <li>- It is dark, brownish coloured worm like insect.</li> <li>- It is just like the worm of country bean.</li> <li>- It is only available at the fruiting stage.</li> <li>- In case of severe infestation it can damage up to 50% of the fruits.</li> <li>- During the last 4-5 years it becomes difficult to control by chemicals.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as "Indian bish" Fenfen, Milfen, Basathrin, Tafgor, Ralothrin, Fentox, Karate etc.</li> <li>- Application of the pesticide 'Fenfen' mixing with crushed naphthalene.</li> </ul>	Bean pod borer
Country bean	Kando pocha/ Pocharog/ Pata pocha/ Cancer	<ul style="list-style-type: none"> <li>- Initially the leaf bears brown to reddish brown spots and gradually the leaf is rotted.</li> <li>- When fresh leaves come to contact with the infected leaf, the disease rapidly spread.</li> <li>- Gradually the vine is contaminated</li> <li>- Finally the whole plant is rotted and died.</li> <li>- Fruits are also rotted. Young fruits are highly affected.</li> <li>- Severe damage is appeared from the last 4-5 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Removing the infested plant parts.</li> <li>- Application of Dithane M-45, Indofil, Corolux, Fentox, Milfen, Bavistin, Planofix etc.</li> <li>- Application of 'Sevlon'</li> </ul>	May be anthracnose of bean
-Do-	Murga poka	<ul style="list-style-type: none"> <li>- It is round, yellow to red coloured insect.</li> <li>- It eats the leaves remaining net like structure.</li> <li>- Its attack starts from the early stage of the plant.</li> <li>- It also damages Bitter gourd, Teasle gourd etc.</li> <li>- Dry weather favours the attack of this pest.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Fenfen, Milfen, Basathrin, Cymbush, Dursban, Decis etc.</li> <li>- Application of ash.</li> </ul>	Epilachna beetle
-Do-	Jhora rog/ Sim jhora/ Pochalaga	<ul style="list-style-type: none"> <li>- Generally the young fruits are damaged in a large scale.</li> <li>- Whitish powder like substance covered the inflorescence and the young fruits.</li> <li>- With in a few days of disease attack, flowers and fruits are dropped.</li> <li>- In case of severe damage, the plant cannot bear any flowers or pods.</li> <li>- From the last 4-5 years it becomes a serious problem in Country bean cultivation.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of pesticides such as Dithane M-45, Thiovit, Cupravit etc.</li> <li>- Considerable results are not obtained from pesticide application.</li> </ul>	May be anthracnose of bean

Crop	Local name	Description of the problem	Management practices*	Identification
Bottle gourd	Morrok rog	<ul style="list-style-type: none"> <li>- The disease is available from the flowering stage.</li> <li>- The main root is rotted and the roots contain knot like structure.</li> <li>- Initially the top portion of the plant is died and gradually the whole plant is died.</li> <li>- If this disease infests a field, two-third of the crops are destroyed.</li> <li>- It caused serious damage for the last 4-5 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Bavistin, Tilt, Knowin, Dithane M-45 etc.</li> </ul>	Unidentified, may be root knot
-Do-	Gas mora/ Mora laga/Doga mora/ Sukna rog	<ul style="list-style-type: none"> <li>- Initially the leaves bear brown to blackish spots on the leaves.</li> <li>- Gradually the spots grow large and the whole leaf may rot.</li> <li>- Rot symptoms are generally found on the young leaves and vines.</li> <li>- In case of severe damage, the whole plant may die.</li> </ul>	<ul style="list-style-type: none"> <li>Application of Bavistin, Thiovit etc.</li> </ul>	May be anthracnose of cucurbit
-Do-	Kando pocha	<ul style="list-style-type: none"> <li>- The vine is cracked and glutinous substances are secreted.</li> <li>- Within a few days the infected portion turned into blackish coloured and become narrower.</li> <li>- The infected plant part is turned into yellowish coloured and finally died.</li> <li>- Initially the top portion is died and then hanged down. The foot region is rotted.</li> </ul>	<ul style="list-style-type: none"> <li>- Do -</li> </ul>	May be foot rot.
Chilli	Pipri laga/ Pukra laga/ Fula rog/ Virus rog	<ul style="list-style-type: none"> <li>- The leaves of chilli is curled and turned into yellowish colour</li> <li>- The plant bears much branches making a bush like structure.</li> <li>- The plant cannot bear flowers or fruits.</li> <li>- Worm weather favours the disease, and summer varieties suffer seriously.</li> <li>- Within a few days the whole field may affected.</li> <li>- From the last 4-5 years, it becomes a destructive disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant.</li> <li>- Application of ash.</li> </ul>	Leaf curl of chilli
Cabbage	Gura pocha	<ul style="list-style-type: none"> <li>- The dry symptom found at ½" lower from soil surface to ½" upper from soil surface.</li> <li>- The skin of basal portion is dried.</li> <li>- The plant is wilted during daytime and turned to fresh at night.</li> <li>- It is generally found from the seedling stage.</li> <li>- It is the most damaging disease of the seedlings of cabbage and cauliflower.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Bavistin, Dithane M-45.</li> <li>- Removing excess water from field.</li> <li>- Application of water.</li> </ul>	Foot rot

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Potato	Morok rog/ Pata sukna rog	<ul style="list-style-type: none"> <li>- Initially few plants of the field are affected and the tender leaves of the affected plant are rotted.</li> <li>- Rapidly this disease is spread and within 2-3 days the whole field is destroyed.</li> <li>- Unpleasant odour comes out from the seriously affected fields.</li> <li>- The foot region and the roots are also rotted.</li> <li>- Deep fog favours the disease.</li> <li>- From the last 4-5 years, it has become quite impossible to grow the crop without pesticides.</li> </ul>	Application of Dithane M-45, Ridomil, Indofil etc.	Late blight of potato
-Do-	Kaita poka/ Leda poka	<ul style="list-style-type: none"> <li>- It is soft-bodied insect that remains itself under the soil surface.</li> <li>- It cuts the seedlings slightly upper from the soil surface.</li> <li>- It comes out from soil at morning and at down.</li> <li>- It can be found the soil near the cut plant.</li> <li>- It also cuts the seedlings of other winter crops.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of water.</li> <li>- Application of pesticides such as Tafgor, Basudin, Dursban, Furadan, Cymbush etc.</li> <li>- Wrapping the seedling by polythene.</li> </ul>	Cutworm
Tomato	Gura pocha	<ul style="list-style-type: none"> <li>- The skin of basal portion is dried.</li> <li>- The dry symptom found at ½" lower from soil surface to ½" upper from soil surface.</li> <li>- The plant is wilted during daytime and turned to fresh at night.</li> <li>- It is generally found from the seedling stage.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Bavistin, Dithane M-45.</li> <li>- Removing of excess water from field.</li> <li>- Application of water</li> </ul>	Foot rot.
-Do-	Gas fola/ Kukra rog	<ul style="list-style-type: none"> <li>- The leaves of chilli is curled and turned into yellowish colour.</li> <li>- The plant bears much branches making a bush like structure.</li> <li>- The plant cannot bear flowers or fruits.</li> <li>- Warm weather favours the disease.</li> <li>- From the last 4-5 years, it becomes a destructive disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Bavistin, Indofil etc.</li> <li>- Uprooting the infested plant.</li> <li>- Application of ash.</li> </ul>	Leaf curl of chilli
Bottle gourd/ Sweet gourd	Pakra laga/ Virus laga	<ul style="list-style-type: none"> <li>- The leaves turned into yellowish colour and curled.</li> <li>- The vines of the leaf turned into whitish coloured.</li> <li>- Growth of the plant is reduced and the plant cannot bear so much fruits and flowers.</li> <li>- The fruits are small in size and deformed.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant.</li> <li>- Application of Bavistin, Dithane M-45 etc.</li> <li>- Application of Malathion.</li> </ul>	Leaf curl of cucurbits

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Sweet gourd	Pocha laga	<ul style="list-style-type: none"> <li>- The immature fruits cannot grow large and turned into yellowish colour.</li> <li>- The infected fruit is wrinkled and finally dried.</li> <li>- Generally this problem is found when the plant bears only few fruits.</li> </ul>	Control measures are not adopted	May be pollination problem
Cucumber/ Teasel gourd	Pata morano poka	<ul style="list-style-type: none"> <li>- It is green coloured long insect that fold the leaves.</li> <li>- It eats the young tender shoots and leaves and hides itself inside the folded leaves.</li> <li>- It also bore the young fruits.</li> <li>- After one month of transplanting, its infestation started and remains entire crop season.</li> </ul>	Application of Dursban, Decis, Cymbush etc.	Pumpkin caterpillar
Cucumber/ Bitter gourd	Pipri laga/ Pakra laga	<ul style="list-style-type: none"> <li>- Leaves are curled and turned into yellow coloured.</li> <li>- Growth of the plant is reduced</li> <li>- The plant cannot bear much flowers or fruits.</li> <li>- If the plant bears fruits, it is curled and the skin of the fruits becomes smooth.</li> <li>- Finally the vines are dried.</li> <li>- It becomes a major problem from the last 4-5 years.</li> </ul>	Application of Cupravit, Thiovit, Macuprax, Homai etc. Considerable results are not obtained	Leaf curl of cucurbit
Bottle gourd/ Sweet gourd/ Bitter gourd	Bolla poka/ Machi poka/ Bhomra poka	<ul style="list-style-type: none"> <li>- It is yellowed coloured fly insect that more the young fruits.</li> <li>- Glutinous substance is secreted from the infested plant part.</li> <li>- The infested fruit turned into yellowish colour and then rotted.</li> <li>- The shape of the fruit is deformed.</li> <li>- During the last 5-6 years, it makes unable to grow the crop without using pesticides.</li> </ul>	Application of chemicals such as Fenfen Dursban, Sevin, Cymbush, Fifanon, Tafgor etc.	Cucurbit fruit fly
Wheat	Mora laga	<ul style="list-style-type: none"> <li>- Initially the plant turned into reddish colour.</li> <li>- The plant cannot grow large and unable to uptake fertilizers.</li> <li>- Roots are damaged and with in few days the plant may die.</li> <li>- Sometimes few areas of the field bear small sized, pale or red coloured plant that can be easily distinguished from a distance.</li> <li>- From the last 4-5 years, this problem causes serious damages.</li> </ul>	- Application of Thiovit, Cupravit, Tilt, Bavistin etc.	Foot rot of wheat
Banana	Pata mora	<ul style="list-style-type: none"> <li>- Initially the leaves bear yellowish spots.</li> <li>- Gradually the spots grow large and within few days the leaf may dry.</li> </ul>	- Application of Bavistin, Knowin, Dithane M-45, Topsin	Sigatoga of banana

Crop	Local name	Description of the problem	Management practices*	Identification
		<ul style="list-style-type: none"> <li>- Severely infected plant bears only dried leaves and the midrib of the leaf is broken down.</li> <li>- Infected plant cannot grow large.</li> <li>- Fruits cannot grow large and can be ripen few days earlier.</li> <li>- From the last 6-7 years, it is appeared as a serious problem in banana cultivation.</li> </ul>	etc.	
Brinjal	Mazra Poka/ Beguner kirra	<ul style="list-style-type: none"> <li>- It is the most destructive pest of brinjal.</li> <li>- Its infestation starts from soon after transplanting and remains the entire crop season.</li> <li>- It bore the tender shoot resulting the wilting symptom.</li> <li>- Without frequent application of pesticides, it is quite impossible to control.</li> <li>- If chemicals are not applied, it can damage up to 80-100% of fruits.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Cymbush, Marshal, 'Indian bish', Fenfen, Ripcord, Dursban, Basathrin, Fentox etc.</li> <li>- Application of neem extract mixing with Cymbush.</li> <li>- Cutting and removing the infested plant part.</li> </ul>	Brinjal short and fruit borer.
-Do-	Muri laga/ Cancer	<ul style="list-style-type: none"> <li>- The branches of the plant bears black lesson in one side.</li> <li>- Infested branches are dried and the disease gradually enlarged backwardly and finally the whole plant is died.</li> <li>- Severe infected plant bears no leaf.</li> <li>- Considerable damage is observed from the last 5-6 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Uprooting the infested plant.</li> <li>- Application of Dithane M-45, Indofil, Bavistin, Tafgor, Karate, Vegimax etc.</li> </ul>	Die back of brinjal
	Pocha laga	<ul style="list-style-type: none"> <li>- Initially the basal stem of the plant bears brown to blackish lessons.</li> <li>- The infested part is died and within few days the whole plant may die.</li> <li>- Sometimes the branches of the plant and the fruits also bear the rot symptom.</li> <li>- The infested bark may crack and secreted glutinous substances.</li> <li>- It is generally found in matured plants and causes considerable damage for the last 4-5 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Dithane M-45, Tilt, Thiovit, Champion etc.</li> </ul>	May be stem rot

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Lemon	Guri pocha/ Gura fata rog	<ul style="list-style-type: none"> <li>- Initially the basal portion of the plant bears brown lesion.</li> <li>- Gradually the lesion is enlarged.</li> <li>- The bark of the infected area is cracked and glutinous substance is secreted.</li> <li>- Leaves turned into yellowish colour and dropped.</li> <li>- The plant cannot bear flowers or fruits and finally died.</li> </ul>	Application of Tilt, Bavistin etc.	Gummosis of lemon
-Do-	Salma rog	<ul style="list-style-type: none"> <li>- The outer surface of the fruit bears scar like structure.</li> <li>- The leaves also bear the same symptom.</li> <li>- The young fruits cannot grow large and sometimes fruits are deformed.</li> <li>- Infection of this disease highly reduces the market value of the fruit.</li> </ul>	- Control Measures are not adopted.	Scab of lemon
-Do-	Leda poka	<ul style="list-style-type: none"> <li>- It is soft, greenish coloured long pest that eat the tender young leaves.</li> <li>- It eats the entire leaves remaining the mid ribs.</li> <li>- It lives inside the folded leaves.</li> </ul>	- Application of Milfen, Fenfen, Basathrin etc.	Larva of lemon butterfly
Guava	Leda poka	<ul style="list-style-type: none"> <li>- It is soft, long, greenish coloured pest that eats the leaves.</li> <li>- It starts eating the leaves from the margin and eats the entire leaves remaining the mid ribs.</li> <li>- If the plant bears fresh young leaves, its infestation is high.</li> </ul>	- Application of Fenfen, Milfen etc.	Caterpillar of guava
-Do-	Makorr-sha	<ul style="list-style-type: none"> <li>- It is one kind of spider that produces webs on the flowers and eats the inner portion of the flowers.</li> <li>- Gradually the flower turned into blackish colour and finally died.</li> <li>- The web structure is also found at the lower portion of the fruit and becomes rotted.</li> <li>- Infested portion bears white small pest.</li> </ul>	- Control Measures are not adopted	Mite of guava

**Table 10: Farmer's concept about the major plant health problems in Moulvibazar district**

Crop	Local name	Description of the problem	Management practices*	Identification
Potato	Kukri bemar/ Kukra rog	<ul style="list-style-type: none"> <li>- Leaves are curled and growth of the plant is reduced.</li> <li>- Tubers cannot grow large and in most cases, the plant can be only pea nut shaped tuber.</li> <li>- As the plants bear few leaves, the infestation of this disease is appeared and remains up to maturity.</li> <li>- The infestation starts from the last 10-15 years but maximum infestation is observed from the last 5-6 years.</li> <li>- The contaminated tuber may cause this disease.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Dithane M-45, Ridomil etc. but gives no results</li> </ul>	Virus
-Do-	Bicha poka	<ul style="list-style-type: none"> <li>- It is very small green to brown coloured insect.</li> <li>- The infestation starts from the young stage of the plant.</li> <li>- The worm produces web like structure and lays eggs inside the nest (the worm is responsible to lay eggs).</li> <li>- It eats leaves making net like structure and the entire leaf may eaten.</li> <li>- It has been observed from the last 4-5 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticides are not applied.</li> </ul>	Unidentified caterpillar of potato
-Do-	Morki bemar/ Pocha morok/ Pocha rog/ Cancer	<ul style="list-style-type: none"> <li>- Initially few plants of the field are affected and the tender leaves of the affected plant are rotted.</li> <li>- Rapidly this disease is spread and within 2-3 days the whole field is destroyed.</li> <li>- Unpleasant odour comes out from the seriously affected fields.</li> <li>- The foot region and the roots are also rotted.</li> <li>- Deep fog favours the</li> </ul>	Application of Dithane M-45, Indofil, Mancozeb, Ridomil, Milfen etc.	Late blight of potato

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

Crop	Local name	Description of the problem	Management practices*	Identification
		<p>disease.</p> <ul style="list-style-type: none"> <li>- From the last 4-5 years, it has become quite impossible to grow the crop without pesticides.</li> </ul>		
Cauliflower	Gura pocha/ Gura sukna	<ul style="list-style-type: none"> <li>- The basal portion of the plant is rotted</li> <li>- The symptom gradually expended towards the top portion</li> <li>- The disease is found from the seedling stage but more in matured plant</li> <li>- Sometimes roots are also rotted</li> </ul>	<ul style="list-style-type: none"> <li>- Pesticides are not used</li> </ul>	May be foot rot
Tomato, Potato, Chilli, Brinjal	Katui poka/ Leda poka/ Kala poka	<ul style="list-style-type: none"> <li>- It is soft-bodied insect that remains itself under the soil surface.</li> <li>- It cuts the seedlings slightly upper from the soil surface.</li> <li>- It comes out from soil at morning and evening.</li> <li>- It can be found in the soil near the cut plant.</li> <li>- It also cuts the seedlings of other winter crops.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of water.</li> <li>- Application of pesticides such as Tafgor, Basudin etc.</li> <li>- Wrapping the seedling by polythene.</li> </ul>	Cutworm
Country bean	Idla poka/ Lauri poka/ Jab poka	<ul style="list-style-type: none"> <li>- It is small, soft-bodied insect that suck juice from the tender shoots, leaves and young fruits.</li> <li>- Growth of the plant is reduced and the infested plants become pale coloured and curled.</li> <li>- It is identified as the most damaging pest for the last 5-6 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Malathion, Fifanon etc.</li> <li>- Application of ash mixing with crushed naphthalene.</li> </ul>	Bean aphid
-Do-	Kirra poka/ Simer kirra	<ul style="list-style-type: none"> <li>- It bore the fruit and eats the internal portion.</li> <li>- It is brownish coloured worm like pest.</li> <li>- It is just like the worm of country bean.</li> <li>- It is only available at the fruiting stage.</li> <li>- In case of severe infestation it can damage up to 50% of the fruits.</li> <li>- From the last 4-5 years it becomes difficult to control.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of chemicals such as Fenfen, Basathrin, Tafgor, Ralothrin, Fentox etc.</li> </ul>	Bean pod borer

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Red amaranth	Sada rog	<ul style="list-style-type: none"> <li>- The lower surface of the leaf bears numerous small white spots.</li> <li>- Leaves turned into pale coloured.</li> <li>- The plant cannot grow large.</li> <li>- From the last 3-4 years it is appeared as a major problem.</li> <li>- It greatly reduces the market value.</li> </ul>	Control measures are not adopted	White rust of red amaranth
Tomato	Jhur mora/ Gura pocha	<ul style="list-style-type: none"> <li>- Initially the basal portion of the plant become soft, water soaked lesion is appeared and finally rotted.</li> <li>- The whole plant is rotted within few days.</li> <li>- The roots are also rotted.</li> <li>- Wet condition favours the disease.</li> </ul>	Application of chemicals such as Dithane M-45, Ridomil etc.	Foot rot
-Do-	Kukra rog	<ul style="list-style-type: none"> <li>- Leaves are curled and the growth of the plant is reduced</li> <li>- The plant can not bear flowers or fruits</li> <li>- If the plant bears fruits, it can not grow large</li> <li>- It may be caused by nutrient deficiency or bed wind contamination</li> <li>- Since the beginning of tomato cultivation, the infestation of this disease is observed</li> <li>- Generally matured plants are affected.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals are not used</li> <li>- Sometimes ashes are used</li> </ul>	Leaf curl of tomato
Brinjal	Kirra poka/ Mazra poka	<ul style="list-style-type: none"> <li>- It bore the fruit as well as the tender shoots and eats the internal portion.</li> <li>- Infestation starts from the seedling stage and remains all the year round.</li> <li>- The infested shoots are wilted at sunny days.</li> <li>- It is the most damaging insect of brinjal.</li> </ul>	<ul style="list-style-type: none"> <li>-Application of chemicals such as Tafgor, Malathion, Cymbush, Dursban etc.</li> <li>-Cutting and removing the infested plant parts.</li> </ul>	Brinjal shoot and fruit borer

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

<b>Crop</b>	<b>Local name</b>	<b>Description of the problem</b>	<b>Management practices*</b>	<b>Identification</b>
Pomegranate	Morok rog	<ul style="list-style-type: none"> <li>- Initially the skin of the young fruits bears black lesion.</li> <li>- Gradually the lesion grows large and finally the whole fruit is rotted.</li> <li>- This disease also damages the matured fruits.</li> <li>- The inner portion of the fruit turned into black coloured.</li> <li>- The fruit is cracked before ripening.</li> <li>- The leaves bear black spots and shaded.</li> </ul>	<ul style="list-style-type: none"> <li>- Control measures are not adopted</li> </ul>	Fruit rot of pomegranate
Sweet gourd	Kori mora	<ul style="list-style-type: none"> <li>- Initially the immature fruits turned into yellow coloured and gradually the fruit is shriveled.</li> <li>- With in few days, the fruit is spoiled</li> <li>- It may be caused due to nutritional deficiency</li> <li>- Considerable damage is observed from the last 5-7 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Application of Malathion, Dimethion, Agrimethion etc.</li> </ul>	Pollination problem
Cabbage, Lai shak	Leda poka	<ul style="list-style-type: none"> <li>- It is greenish coloured pest</li> <li>- It remains itself at the lower portion of the leaf and eat the leaves</li> <li>- In case of serious infestation, it can eat the entire leaves remaining the stalk</li> <li>- The damaged leaves seems to be cut by scissors</li> <li>- Severe damage is observed from the last 4-5 years</li> </ul>	<ul style="list-style-type: none"> <li>- Application of pesticides such as Tafgor, Sobicron etc.</li> </ul>	Larva of cabbage butterfly
French bean	Gura pocha	<ul style="list-style-type: none"> <li>- The basal portion of the plant bears reddish coloured spots</li> <li>- Growth of the plant is stopped.</li> <li>- In case of severe infestation, the foot region is rotted (2-4" of the basal portion may rot) and with in a few days the plant may die.</li> <li>- Severe damage has been observed from the last 2-3 years.</li> </ul>	<ul style="list-style-type: none"> <li>- Chemicals are not used</li> </ul>	May be the infestation of the pulse beetle

#### **IV. Use of pesticides for pest management**

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

To know the actual situation about the use of pesticides, farmers were asked to inform the trade name of pesticide, rate of application, frequency of pesticide spraying and their effectiveness. Farmers of three districts frequently used some insecticides such as Basudin, Furadan, Curaterr, Diazinon, Biesterin, Phaddy, Malathion, Dursban, Basathrin, Decis, Fenfen, Fyfanon, Tafgor, Fenitox, Fastac, Ripcord, Cymbush, Marshal, Schincyper, Karate, Aktara, Marshal, Sevin, Kartap, etc. to protect their crops and fruits from a variety of insects. In some cases, farmers used some unlabelled and unauthorized pesticides. In most cases, farmers used pesticides on the basis of recommendations from their local pesticide dealers. Farmers used some fungicides such as Tilt, Dithane M-45, Ridomil, Rovral, Indofil, Bavistin, Antracol, Topsin, Folicur, Thiovit, Cupravit, Ronovit, Knowin, Champion, etc. to protect their crops from diseases. In general, farmers are found more interested to use pesticide to protect insects in comparison to diseases.

In Natore district, farmers frequently apply insecticides to control bean aphid, bean pod borer, brinjal shoot and fruit borer, cabbage butterfly, sugarcane stem borer, leaf folder of cucurbits, cucurbit fruit fly, cutworm, banana leaf and fruit beetle etc. Farmers frequently used some fungicides to control purple blotch of onion or garlic, late blight of potato, foot rot of vegetables, foot/ stem rot of betel vine etc. In some cases, farmers applied pesticides almost everyday to control few destructive pests. Farmers use pesticides up to 40-50 times to control bean pod borer. To control brinjal shoot and fruit borer, it was found to apply pesticides up to 180-200 times in a crop season.

In Narsingdi district, farmers used excess amount of pesticides to control bean pod borer, bean aphid, brinjal shoot and fruit borer, cucurbit fruit fly, cabbage butterfly etc. Farmers generally applied pesticides at least 1-3 times in a week in all most all kinds of vegetables and it may rise up to 6-7 times in a week on the basis of pest severity. Farmers used pesticides almost everyday to control bean pod borer. Fungicides are frequently used to control late blight of potato, foot rot of vegetables, die back or wilt of cucurbits and brinjal.

In Moulvibazar district, farmers frequently applied pesticides to control cutworm, bean pod borer, cabbage butterfly, brinjal shoot and fruit borer, bean aphid, late blight of potato, foot rot of vegetables etc.

Some of the unauthorized and unlabelled pesticides are found to be used to control few major pests. The 'Indian oil'/ 'Indian bish' (Comes from India whose chemical name is Kripcord) became very popular for the last 1-2 years to control some of the destructive pests in Natore and Narsingdi district.

In Winter crop season, farmers of all districts frequently applied excess amount of pesticides to control some insects and diseases such as, bean pod borer, bean aphid, brinjal shoot and fruit borer, cucurbit fruit fly, cutworm, late blight of potato, foot rot of vegetables, die back or wilt of cucurbits and brinjal, leaf curl of chilli etc.

Use of pesticides to control some of the major pests in three districts is explained in the following Table 11,12 and 13:

**Table 11: Use of pesticides for pest management in Natore district**

<b>Crop</b>	<b>Pest</b>	<b>Commercial name of the chemicals</b>	<b>Application technique</b>	<b>Effectiveness</b>
Rice	Earthworm (chera)	- 'Indian oil' (Comes from India whose chemical name is Kripcord) - Furadan, Basudin etc.	- After 15-30 days of transplanting, application of this chemical starts and sprayed for 1-2 times @ 1 Bottle/ Bigha - These are used for 1-2 times @ 12- 16 Kg/Acre	- Good result is obtained  - Satisfactory results are not obtained
Countr y bean	Aphid	- Cymbush, Fyfanon, Fenfen, Malathion	- When the infestation starts, these are used for 3-7 times @ 15-25 ml/10 L water at 15 days interval.	Although these pesticides can eliminate the pest for 2-3 days, these cannot protect the repeated infestation.
-Do-	Bean pod borer	Fenfen, Milfen, Basathrin, Tafgor, Relothrin, Fentox, Karate, 'Indian oil'	- These are applied from fruiting stage for 2-3 times in a week @ 2-4 cork/ 10 L water. - In a crop season about 25-50 sprays are made.	Frequent application can give results.
Caulifl ower	Cabbage butterfly	Fenfen, Milfen, Diazinon, Dursban, Sevin, Cymbush, Fifanon, Tafgor.	- These are sprayed for 1-3 times in a week @ 2-3 cork / 10 L water. - In a crop-growing season about 10-15 sprays are made.	- The pest cannot be controlled effectively. After 1-2 days of application, the pest attacks again.
Potato	Late blight of potato	Dithane M-45 Indofil, Ridomil	- These are applied for 3-4 times in a crop season at 10-15 days interval @ 40-50 g/ 15 Lt water. - When the field bears few infected plants, spraying is started	These chemicals can reduce the rapid damage
Bottle gourd/ Sweet gourd	Cucurbit fruit fly	Fenfen, Dursban, Sevin, Cymbush, Fenfen, Fifanon, Tafgor.	- These are sprayed for 1-3 times in a week @ 2-3 cork / 10 L water. - In a crop-growing season about 15-20 sprays are made.	- It cannot be controlled effectively. After 1-2 days of application, the pest attack again. - Comparatively Tafgor gives better result.

<b>Crop</b>	<b>Pest</b>	<b>Commercial name of the chemicals</b>	<b>Application technique</b>	<b>Effectiveness</b>
Brinjal	Brinjal shoot and fruit borer	- Ripcord, Cymbush, Ekalux, Fenfen, 'Indian oil' (Comes from India), Marshal, Kartap, Suntap, Rider etc.	These chemicals are used for 10-20 days in a moth @ 10-20 ml/ 10 L water for 3-4 times in a year. On an average, these chemicals are applied for 50-70 times in a crop season but in some case it may raise up to 180-200 times. During rainy season, pesticides are applied almost every day.	It is quite impossible to grow brinjal without frequent pesticide application.  Pesticide application can stop the infestation of this pest only for 1-2 days
-Do-	Die back	Dithane M-45, Indofil, Bavistin, Tafgor, Karate, Vegimax	- As the infestation starts, these are used for 1-2 times in a week @ 50g/ 2-3 Gallon of water. - Spraying is done for 5 to 7 times.	These cannot show results in case of severe infestation.
Onion	Purple blotch of onion	Rovral, Antracol	As the infestation starts, these chemicals are applied for 2-6 times @ 30 g / 10 L of water at 15-20 days interval.	Desirable results are found
Betel vine	Foot rot/ Stem rot	Tilt, Knowin, Cupravit, Cymbush	Application starts at the beginning of season and remains up to Winter @ 10 ml/ 10 L of water.	In case of severe infestation, these cannot give good results.
-Do-	Leaf rot	Knowin, Cupravit, Vesivax, Agrovax.	Application of these chemicals for 2-3 times and 100 g/ 10 L of water.	Satisfactory results are not found.
Chilli	Leaf curl	Zinc, Agro grow (vitamin)	These are applied for 1-2 times @ 5-10 ml/ 10 L of water.	These chemicals give no results.
Sugarcane	Sugarcane stem borer	Brifur, Curaterr (from sugar mill) Furadan	After rain, these are applied for 1-2 a times @ 16 kg/ Acre as the infestation starts.	Effective results are not found.
Bitter gourd	Lepidopteran larvae/ Fruit fly	Cymbush, Fifanon, Decis	Soon after flowering stage, it is applied for 10-15 times in a season at 10-15 days interval @ 10 ml/ 10 L of water.	Effective results are found.

**Table 12: Use of pesticides for pest management in Norsingdi district**

<b>Crop</b>	<b>Pest</b>	<b>Commercial name of the chemicals</b>	<b>Application technique</b>	<b>Effectiveness</b>
Country bean, Yard long bean	Bean pod borer	Fenfen, Milfen, Basathrin, Tafgor, Relothrin, Fentox, Karate, 'Indian bish'	<ul style="list-style-type: none"> <li>- These are applied from fruiting stage for 2-3 times in a week @ 2-4 cork/ 10 L water.</li> <li>- In a crop season about 15-45 sprays are made.</li> </ul>	Frequent application can give results.
Country bean	Aphid	Malathion, Fenfen, Tafgor, Dursban, Cymbush	<ul style="list-style-type: none"> <li>- As the infestation starts, these are applied for 1-2 times in a week @ 3-4 cork/ 10 ml water.</li> <li>- In a crop season, spraying is done for about 10-15 times.</li> </ul>	These chemicals can temporally control the pest.
-Do-	Anthraco nose	Dithane M-45, Indofil, Corolux, Fentox, Milfen, Bavistin, Planofix	<ul style="list-style-type: none"> <li>- As the infestation starts, these are applied for 2-3 times in a week @ 50g/ 10 ml water.</li> <li>- In a crop season, spraying is done for about 20-30 times.</li> </ul>	These chemicals are effective, but when a plant is affected, these can not eradicate the disease
Bottle gourd/ Sweet gourd	Cucurbit fruit fly	Fenfen Dursban, Sevin, Cymbush, Fifanon, Tafgor	<ul style="list-style-type: none"> <li>- These are sprayed for 1-3 times in a week @ 2-3 cork / 10 L water.</li> <li>- In a crop-growing season, about 15-20 sprays are made.</li> </ul>	<ul style="list-style-type: none"> <li>- This pest cannot be controlled effectively. After 1-2 days of application, the pest attack again.</li> <li>- Comparatively Tafgor gives better result.</li> </ul>
Cauliflower	Cabbage butterfly	Fenfen, Milfen, Diazinon, Dursban, Sevin, Cymbush, Fifanon, Tafgor	<ul style="list-style-type: none"> <li>- These are sprayed for 1-3 times in a week @ 2-3 cork / 10 L water.</li> <li>- In a crop-growing season about 10-20 sprays are made.</li> </ul>	<ul style="list-style-type: none"> <li>- The pest cannot be controlled effectively. After 1-2 days of application, the pest attack again.</li> </ul>
-Do-	Buttoning/ Richeness	Dithane M-45, Indofil, Tafgor	<ul style="list-style-type: none"> <li>- These are applied before the flowering stage for 1-2 times in a week @ 25-50g / 10 L water.</li> <li>- In a crop season about 8-10 sprays are made.</li> </ul>	Effective results are not obtained

<b>Crop</b>	<b>Pest</b>	<b>Commercial name of the chemicals</b>	<b>Application technique</b>	<b>Effectiveness</b>
Brinjal	Brinjal shoot and fruit borer	'Indian bish' Ripcord, Dursban, Fenfen, Fentox, Fifanon, Basathrin, Milfen, Cymbush	- These are used for 3-7 times in a week @ 10-20 ml/ 10 L of water. - In rainy season, spraying is made almost every day. In a crop season, pesticides are sprayed for about 50-70 times.	No chemicals are found so much effective against this pest.
-Do-	Die back	Dithane M-45, Indofil, Bavistin, Tafgor, Karate, Vegimax	- As the infestation starts, these are used for 1-2 times in a week @ 50g/ 2-3 Gallon of water. - Spraying is done for 5 to 7 times	These cannot show results in case of severe infestation.
Bottle gourd	Wilt/ Die back	Bavistin, Dithane M- 45, Tilt, Indofil	- As the infestation starts, these are used for 1-2 times in a week @ 2-2.50 spoon/ 10 L water. - Although spraying is done for 5 to 6 times, it cannot show results in case of severe infestation.	Application of chemicals cannot give good results.
Cauliflower / Cabbage	Foot rot	Dithane M-45, Bavistin	These are applied for 1-3 times at seedling stage @ 1.5-2.5 spoon/ 10 L of water.	Considerable results are not found.
Chilli	Leaf curl	Bavistin, Indofil	As the infestation starts, these are used for 1-2 times @ 2-3 spoon/ 10 L of water.	Effective results are not obtained
Potato	Late blight of potato	Dithane M-45 Indofil, Ridomil	- These are applied for 3-4 times in a crop season at 10-15 days interval @ 40-50 g/ 15 L of water. - When the field bears few infected plants, spraying is started.	These chemicals can reduce the rapid damage
-Do-	Cutworm	Tafgor, Basudin, Dursban, Furadan, Cymbush	These are applied for 2-3 times at 5-7 days interval during the seedling stage @ 2-3 Cork/ 10 L of water.	Considerable results are not found
Bitter gourd, Cucumber	Leaf curl	Cupravit, Thiovit, Macuprax, Homai	As the infestation starts, these are used for 1-2 times in a week @ 2-3 spoon/ 10 L of water.	Effective results are not found

**Table 13: Use of pesticides for pest management in Moulvibazar district**

<b>Crop</b>	<b>Pest</b>	<b>Commercial name of the chemicals</b>	<b>Application technique</b>	<b>Effectiveness</b>
Potato	Late blight of potato	Dithane, Mencojob, Milfen, Indofil	- These are applied for 3-4 times in a crop season at 10-15 days interval @ 40-50 g/ 15 L of water. - When the field bears few infected plants, spraying is started	These chemicals can reduce the rapid damage
Country bean	Bean aphid	Malathion, Fenfen, Relothion, Tafgor, Sobicron	- As the infestation starts, these are applied for 1-2 times in a week @ 3-4 cork/ 10 L of water. - In a crop season, spraying is done for about 8-10 times.	These chemicals can give effective results
-Do-	Bean pod borer	Agromethion, Karate, Fenfen, Basathrin, Tafgor, Ralothrin,	- These are applied from fruiting stage for 1-3 times in a week @ 2-3 cork/ 10 L of water. - In a crop season about 15-20 sprays are made.	Frequent application can give results.
Tomato	Foot rot	Ridomil, Dithane M-45, Champion	When the infestation starts, these are used for 3-7 times @ 15-20 ml/10 L water at 7-10 days interval	Considerable results are not found.
Potato, Tomato, Brinjal, Chilli	Cutworm	Agromethion, Relothion, Dursban, Karate, Tafgor	- These are sprayed for 3-5 times at 5-7 days interval @ 2-3 cork / 10 L water. - Spraying is started as soon as the seedling established	Considerable results are not found.
Brinjal	Brinjal shoot and fruit borer	Karate, Tafgor, Malathion, Agromethion, Relothion, Cymbush, Dursban	- These are applied for 1-3 times in a week @ 10-20 ml/ 10 L water. - After 1-2 month of transplanting, spraying is started and continued the entire season. - In a season, spraying is made, for about 40-50 times.	The pest cannot be fully controlled by chemicals.
Cabbage , Lai shak	Larva of cabbage butterfly	Tafgor, Sobicron, Dursban	- These are applied for 1-2 times in a week @ 10-20 ml/ 10 L water. - In a season, spraying is made, for about 5-7 times.	Considerable results are not found.

## V. Background of pesticide application in three districts

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

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

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

### **Natore**

- ✓ Use of pesticides starts from 20-30 years ago, and frequent application starts from the last 8-10 years.
- ✓ Farmers are unable to grow some crops (e.g. brinjal, country bean) without frequent application of chemicals.
- ✓ To control the brinjal shoot and fruit borer, the 'Indian oil' (comes from India whose chemical name is 'Kripcord') is frequently used as it can protect the pest for 3-4 days.
- ✓ Few farmers produce brinjal only for selling in the market, not for their own consumption.
- ✓ Considerable farmers were unable to diagnose the problem and used broad-spectrum pesticides.
- ✓ Farmers identified birds, frogs and spiders as the beneficial for their crops.
- ✓ Farmers mentioned the excess pest attack, frog and fish extinction and human body disorder as the result of excess application of pesticides.

### **Narsingdi**

- ✓ Use of pesticides starts from 25-30 years ago and frequent application starts from the last 10-15 years.
- ✓ About one third of the farmer's income by selling the vegetables is spending against buying pesticides.

- ✓ Increasing pesticide application resulting increasing infestation of pest. Farmers claimed the low quality pesticides for this situation.
- ✓ Most of the farmers used pesticides in their vegetable fields at least 2-3 times in a week.
- ✓ In some cases, they used pesticides everyday in the same field to protect the crops from destructive pest (e.g. Bean pod borer, Brinjal shoot and fruit borer).
- ✓ Some farmers frequently used pesticides for selling their vegetable where they routinely grow few vegetables for their own consumption.
- ✓ The unauthorized 'Indian bish' become popular from the last 1-2 years as it can be used to protect the pest of majority vegetables.
- ✓ Few farmers identified the spider, frogs, 'Dail poka' (lady bird beetle), birds as the beneficial agent for crop protection.
- ✓ Physical sufferings, extinction of birds, severe pest attack etc. problems were mentioned as the results of excess application of pesticides.

### **Moulvibazar**

- ✓ Use of pesticides starts from 15-20 years ago and frequent application of pesticides starts from the last 5-6 years.
- ✓ Most of the farmers have no idea about the pest and their management.
- ✓ Farmers are interested to grow crops by using proper pesticides.
- ✓ Farmers identified the excessive pest attack as the natural calamity.
- ✓ Only birds and frogs are identified as the beneficial agents for crop production.
- ✓ Farmer's identified the extinction of fishes, physical sufferings as the results of excess application of pesticides.

## **VI. Farmers innovative knowledge on pest management**

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

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

From the survey in three different crop-growing seasons, it was found that few farmers of three districts successfully controlled a variety of major pests. To know the effective, alternative way of pests control action, farmers were asked about their adaptive innovative methods for pest management. Most of the innovative methods were found economical, readily available and helpful to conserve biodiversity. It will also be helpful to suggest the farmers of another region where it is difficult to control the pest by suitable way.

In Winter crop season, about 18 methods were identified from the survey in three districts. Among them, 14 methods in Natore district, 2 methods in Narsingdi district and 2 methods in Moulvibazar district were identified where 5-6 methods showed considerable results against bean aphid, bean pod borer, foot rot of brinjal, purple blotch of onion or garlic etc.

Some of the innovative methods those are repeatedly identified in the survey of two crop seasons are not described thoroughly in this report (Please see the reports of Summer-I and Summer-II crop season).

From the survey in three different crop seasons, it was found that most of the innovative methods were found to be used by the affluent farmers as they are able to take risk by innovating and applying this methods in their field for crop protection.

Some of the innovative methods identified in three districts are described in the following Table 14:

**Table 14: Farmers innovative knowledge on pest management in three districts**

<b>Crop</b>	<b>Pest</b>	<b>Description of the method</b>	<b>Effectiveness</b>	<b>Cost</b>	<b>Source</b>
Carrot, Radish	Reddening of the plant	Sohaga (500g), Karpur (500g), Boric powder (500g), 10 Kg Gypsum and 10Kg of Potash are mixed properly and applied in one Bigha of land during the final land preparation. After 15-20 days of seed sowing, this mixture is again applied mixing properly with soil.	Effective results are obtained	100 Tk / Bigha	Md. Badshah Mian, East Haguria, Natore Sadar
White gourd	Cucurbit Fruit fly	Wrapping the young fruits by a loosed polythene paper making small punch. Immature fruits are wrapped for 20-30 days.	Effective but time consuming	Negligible	Mrs. Rahima Khatun, East Haguria, Natore Sadar
Wheat	Rat	'Soas gura' (an irritable substance found in the local market) is applied on the way of their movement. When a rat comes to contact with that substance, it feels anxiety. The other rats can feel the setback and they run off from the field.	Effective result is obtained	Negligible	Md. Abdus Samad, Agran, Boraigram
-Do-	-Do-	Large sized crab is inserted into the burrow system of the rat. After inserting the crab, the burrow opening is enveloped with the soil.	Rats are eliminated from the field but difficult to collect the large sized crabs.	Negligible	Md. Saiful Islam, Agran, Boraigram
Brinjal	Foot rot/ Stem rot	<ul style="list-style-type: none"> <li>- 100 g Dithane M- 45 and 50 g 'Aqua wint' (one kind of glue collected from the poultry dealer) is mixed properly in 1- 1.5 L water.</li> <li>- A rough cloth is used to apply the solution on the infected plant part by a layer. Within few hours, the solution becomes dry and persistent and cannot be removed by water.</li> <li>- It is used for 2-3 times when the infestation starts or before the infestation.</li> <li>- This method is used when the basal portion is dried and broken by cracking.</li> </ul>	60-70% disease infestation can be controlled	50 Taka / Bigha	Md. Farid Ahmed, Agran, Boraigram

<b>Crop</b>	<b>Pest</b>	<b>Description of the method</b>	<b>Effectiveness</b>	<b>Cost</b>	<b>Source</b>
Rice	Earth worm (Chera)	- Application of crushed naphthalene mixing with urea fertilizer. It is only done when urea fertilizer is applied in the field.	Reasonably effective	20-25 Tk/ Bigha	Md. Suruj Ali, Adhgram, Boraigram
Brinjal	Brinjal shoot and fruit borer, Epilachna beetle	- Application of 'Gul' (powdered tobacco leaf), crust dry chilli and neem leaf extract mixing with water. - Spraying is done for 1-2 times in a week.	It can protect the infestation for 2-4 days	25-30 Tk/ Bigha	Md. Rezaul Karim, Pasbaria, Boraigram
-Do-	-Do-	- Application of leaf extract of clustered apple mixing with water for 1-2 days in a week.	It is found to have the ability to protect the pest for 2-3 days.	Negligible	Md. Sidu Kabiraj, Mazpara, Natore Sadar
Mango	Mango hopper, Mango defoliator	- Application of crushed naphthalene mixing with water - Spraying is done for 1-2 days in a week.	Moderately effective	15-20 Tk/ Plant	Md. Nuru Mian, Joari, Boraigram
Country Bean, Yard long Bean	Aphid & other leaf insects	-Ash mixing with kerosene oil is applied to the foliage part of the plant at early morning when the plant parts bear moisture. -One basket ash is mixed with 100 ml kerosene oil and applied 3-4 times at 5-6 days interval.	The pest can be effectively controlled	10-15 Bigha	Mrs. Rabia Begum, Tegachi, Natore Sadar
Country bean	Bean pod borer	- 'Gul' (dust tobacco leaf) mixing with water is sprayed on the infested plant. - 4-5 packed 'Gul' is mixed with 10 L water and sprayed for 1-3 times.	Effective	5-7 Taka/ Bigha	Md. Ali Hossain, Dighapotia, Natore Sadar.
Tomato	Tomato aphid	Application of tobacco leaf extract dipping into water for 24 hours. 100-150 g tobacco leaf (Ala pata) is needed for one Bigha of land	It gives good results	10-120Tk/ Bigha	Md Saiful Islam, Ahmedpur Boraigram
Country bean	Bean pod borer	- 'Gul' (dust tobacco leaf) mixing with water is sprayed on the infested plant. - 4-5 packets of 'Gul' mixing with 10 L water and sprayed for 1-3 times.	Effective	5-7 Taka/ Bigha	Md. Ali Hossain, Dighapotia, Natore Sadar.

<b>Crop</b>	<b>Pest</b>	<b>Description of the method</b>	<b>Effectiveness</b>	<b>Cost</b>	<b>Source</b>
Garlic, Onion	Purple blotch disease	<ul style="list-style-type: none"> <li>- 1 kg 'Tute' (Copper sulphate) and 1 kg 'Fitkari' is mixed with 4 drum of water (1 drum= 10 L water) and sprayed for 1 Bigha of land.</li> <li>- Spraying is done for 1-2 times as soon as the disease symptom appeared.</li> </ul>	Very effective to control this disease	145 Tk/ Bigha (Tute=80T k/ Kg, Fitkari = 65 Tk/ Kg)	Md. Nasir Uddin, Vaturia, Natore Sadar.
Country bean	Bean aphid, Bean pod borer	<ul style="list-style-type: none"> <li>- Crushed naphthalene and powdered soap ('wheel powder') are mixed with water and applied in the field at 3-4days intervals.</li> <li>- 1-2 packets of medium sized nepthalene and 1-2 packets of powder soap are mixed in 10 L water</li> </ul>	Like as quality pesticides, effective results are obtained	15-18 Tk/ Spray	Md. Abul Hossain, Bakhornagar , Raipura
Lemon	Foot rot, Gummosis	<ul style="list-style-type: none"> <li>- Application of lime mixing with water.</li> <li>- The mixture is applied for 1-2 days in a week.</li> <li>- 150-200 g lime is mixed with 10 L of water.</li> <li>- The limewater is applied before the disease infestation.</li> </ul>	If limewater is applied before the disease infestation, the plant is not generally affected by this disease.	8 - 10Tk / Spray	Md. Rahmat Ullah, Palpara, Shibpur
Vegetables	Cutworm	<ul style="list-style-type: none"> <li>- Putting sticks inside the vegetables field to make an opportunity to sit down the owl.</li> <li>- With the help of straw, the tip portion of the stick is prepared into round structure so that the owl can sit down easily</li> </ul>	Moderately effective	Negligible	Md. Habibur Rahman, Akberpur, Moulvibazar Sadar
All fruits	Fruit borer	<ul style="list-style-type: none"> <li>- Application of tobacco leaf extract dipping into water for 24 hours.</li> <li>- 100 g tobacco leaf (Ala pata) is needed for one Bigha of land.</li> </ul>	It can be used in fruits where it is difficult to use pesticides.	10-12 Tk / Bigha	Md. Rashed Mian, Akbarpur, Moulvibazar Sadar

## Lessons Learned

- ✓ Most of the innovative methods were found to be used by the affluent farmers as they are able to take risk by innovating and applying these methods in their field for crop protection.
- ✓ In most cases, farmers used fungicides to control viral diseases and gave their opinion that this disease is spread by contaminated soil.
- ✓ Farmers identified intensive cultivation of crops and vegetables, frequent application of pesticides and the extinction of frogs as the main causes for increasing rate of pest attack.
- ✓ Farmers are more interested to know about the effective innovative methods, as these are cost effective, readily available and effective in situations where it has become difficult to achieve control with pesticides.
- ✓ In Winter crop season, farmers frequently used pesticides to protect some vegetables like country bean and brinjal. In a crop growing season, farmers sprayed pesticides for about 40-60 times to protect the country bean and 60-80 times to protect brinjal. In some cases, application of pesticides in a brinjal field may raise up to 180-200 times whereas few farmers sprayed pesticides almost every day to protect their vegetables from pest.
- ✓ Most of the farmers claimed that it is not cost effective to use pesticides for major pest management at present time. About one third of their crop revenue is spent on buying pesticides and using in the crop field.
- ✓ The unauthorized pesticide 'Indian oil'/'Indian bish' (comes from India whose chemical name is 'Kripcord') becomes popular in Natore and Norsingdi district for the last 1-3 years to control the destructive pests (e.g. Bean pod borer, Brinjal shoot and fruit borer).
- ✓ Few farmers were found to apply the pesticides frequently in their vegetables only for selling their products in market at a high rate where they grown few vegetables without using pesticides for their own consumption.
- ✓ In Winter crop season, farmers of three districts identified more diseases in comparison to the survey in Summer-I and Summer-II crop season.
- ✓ Most of the farmers are depended upon the local pesticide dealers for pest management where they advise to apply high doses of their selected pesticides with the aim of selling their chemicals.
- ✓ Farmers used the local name of the plant health problems on the basis of nature of damages, symptoms and major pest characters where some local names bear no specific meaning.

- ✓ Farmers, who produce vegetables for commercial purpose, give more emphasis to use chemicals, instead of other methods, as it is easier and instant result can be obtained.
- ✓ In comparison to insects, farmers have little concept about disease and their management, the symptoms of disease infection and the symptoms of nutritional deficiency. Some insects, which are not visible, identified as diseases.
- ✓ Only few trained farmers have concept about the beneficial insects. Maximum farmers believed that any kind of insect present in the crop field is harmful.
- ✓ Farmers were found less interested to use chemicals to protect against diseases and were more inclined to protect against insect pests. Even farmers used broad-spectrum insecticides when they failed to control some diseases.
- ✓ Some pesticides banned by the government that contains high toxicity and residual effects are available in the market.
- ✓ It was found that farmers sprayed pesticides in their vegetable fields prior to harvesting or selling if the pest attack observed.
- ✓ Some of the farmer's innovative methods to protect pest infestation give considerable results. Most of the innovative methods are used in the specific areas.
- ✓ Some of the effective innovative methods were the modification of some indigenous methods or the association of common chemicals with some traditional techniques.
- ✓ Female farmers expressed more interest about fruit problems and the crops grown in the homestead.
- ✓ Few farmers were not interested to explain their effective innovative methods in a group discussion, as they believed that it's a secret technique for better crop production.
- ✓ In most of the cases, farmers are dependent to the local pesticide dealers to take suggestion for crop protection
- ✓ Farmers expressed their much interest to receive training on pest management and they want to know the appropriate recommendation of pesticide use.

## Conclusion

The Participatory survey was undertaken to know the consensus opinion of the farmers about the plant health problems. Necessary information related to plant health problems was collected in a participatory manner. After completion of the survey in Summer-I and Summer-II crop season, AAS/CABI Bioscience conducted the survey in Winter crop season at 17 villages in Natore, Narsingdi and Moulvibazar districts. In the survey, farmers were asked to express their opinion on existing plant health problems, status of the pest infestation, pest identifying characters, nature of damage or symptoms, favourable conditions of pest attack, period of pest severity and the existing pest management practices. Farmers of the survey area were inclined to apply some unauthorized highly toxic pesticides as few insects have already gained greater resistance against chemicals. Some vegetables were found to spray pesticides almost everyday to control their infestation. Few farmers were found to spray pesticides frequently only for selling their vegetables in the market and uninterested to consume themselves. Due to application of pesticides excessively or using the wrong chemicals, about one third of the farmer's vegetable crops revenue is spent on buying pesticides.

Besides the frequent pesticide application, few farmers were found to successfully control some major pests through the used of some innovative methods. In the survey of Winter crop season, a total of 18 innovative methods were identified in three districts where about 5-6 methods were found to be highly effective to control the pest. Some innovative methods were found to be cost effective, readily available and very effective against the pest where it has become difficult to achieve control by pesticides.

The survey in three different crop-growing seasons (Summer-I, Summer-II and Winter) has already completed. This report summarizes the information of the survey undertaken in the Winter crop-growing season. The final summery paper compiling the necessary information of the survey in three different crop growing season could be act as a generalized conclusion about the overall plant health situation in the survey areas.

## Recommendations

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

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

Date	Venue	Village	Upazila	District	Number of participating farmers			Group Coordinator
					Male	Female	Total	
10-12-04	Ahmedpur	Hazrat's Home	Boraigram	Natore	26	-	26	Hazrat Ali
12-12-04	East Haguria	Badshah's Home	Natore Sadar	Natore	5	16	21	Sujan Mian
13-12-04	Tegachi	Kabir's Home	Natore Sadar	Natore	8	15	23	Rugina Begum
14-12-04	Joari	Joari High school	Boraigram	Natore	22	-	22	Md. Saiful Islam
15-12-04	Buridaha	Kajoli's Home	Natore Sadar	Natore	7	18	25	Kajoli Begum
16-12-04	Madanhut	Mustafa's Home	Natore Sadar	Natore	12	13	25	Husneara Begum
17-12-04	Agran	Agran High School	Boraigram	Natore	28	-	28	Md. Abdus Samad
18-12-04	Adhgram	Adhgram High School	Boraigram	Natore	25	-	25	Md. Shahid
19-12-04	Pasbaria	Pasbaria High School	Boraigram	Natore	24	-	24	Md. Rashid Mian
19-12-04	Mazpara	NEDA Training Room	Natore Sadar	Natore	16	7	23	Md. Sujan Mian
21-12-04	Charmorjal	Morjal High School	Raipura	Norsingdi	27	-	27	Abul Hasnat(BS)
22-12-04	Bajnabo	Bajnabo Bazar	Shibpur	Norsingdi	29	-	29	Md. Tofazzal Hossain (BS)
23-12-04	Bakhornagar	Bakhornagar Bazar	Raipura	Norsingdi	24	-	24	Anwer Hossain (BS)
24-12-04	Palpara	Samsul Haque's Home	Shibpur	Norsingdi	27	-	27	Md. Burug Afrad (BS)
25-12-04	Isobpur	Isobpur Puja Mondap	Srimangal	Moulvibazar	23	-	23	Sri Mihir Deb
26-12-04	Akbarpur	Usman's Home	Moulvibazar Sadar	Moulvibazar	21	-	21	Sri Rakesh Debnath
31-12-04	Morjal	Morjal High School	Raipura	Norsingdi	39	9	48	Narayan Chandra Sarker

## Annex-II

# Agricultural Advisory Society (AAS)

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

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

## Schedule of FGD (Sample)

**Season:** Winter 2004

**Number of Participants:** 20-40 farmers

**Conducted by:** Agricultural Advisory Society (AAS)

**Funded by:** CABI Bioscience, UK

**Venue:**

**Date:**

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