Local Knowledge of Plant Health in Bangladesh

The meanings of names farmers use for pests and diseases and how they control them.

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FOREWORD

When Mrs Paula Kelly (née Nash), who leads our Bangladesh programme, and Dr Jeffery Bentley first visited Bangladesh in 2003 there was an enthusiastic response to starting plant health clinics. The Rural Development Academy in Bogra began running clinics in 2004, then the Agriculture Advisory Society and Shushilan in 2005. Now there are 25 clinics giving regular (weekly) advice and technical support to local farmers who previously relied on agrochemical shops or simply had no one to ask.

During their first visit, Paula and Jeff gave a short training course on local knowledge of plant disease names (ethnopathology) and this led to the current study. Similar reports on ethnopathology have been published by the GPC for Bolivia and Uganda.

Why study ethnopathology? It reveals useful things about the experiences and understanding of farmers and extension workers. Local knowledge can have practical benefits, one of the main reasons for commissioning this study. Knowing what local names of plant health problems signify helps plant doctors diagnose them and suggest suitable advice.

Local names and descriptions are a major source of information for plant doctors, particularly because of the difficulty in sending samples to laboratories for analysis. Scientific knowledge about viruses and phytoplasmas, difficult to observe causes of diseases, is indispensable and we want to see more samples sent to labs for analysis. But local knowledge can fill awkward gaps in symptom development, for example, that are difficult to study in the laboratory.

As far as we are aware, this is the first ethnopathology study in Bangladesh. It contains much new information and I hope it stimulates further studies, to include other crops and regions. I also hope that scientists will see the benefits of understanding local names and use this new knowledge in their own research. Local and scientific knowledge provides the best understanding of plant health problems and how to solve them.

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The survey

AAS (Agricultural Advisory Society) surveyed farmer knowledge of plant health problems on behalf of the Global Plant Clinic. During three successive cropping seasons; Summer-I (Kharif-I), Summer-II (Kharif-II) and Winter (Rabi), 2004, using a novel method at 35 villages in 6 upazilas of Natore (Boraigram and Sadar), Norsingdi (Raipura and Shibpur) and Moulvibazar (Srimangal and Sadar). AAS surveyed 1591 farmers, including 334 women. Farmers' assessments of the status of insect, disease and soil problems were recorded (on a scale of 0 to 5).

Farmers were divided into small groups to collect samples of plant health problems from nearby fields. In focused group discussions (FGD), farmers described local names, identifying characteristics, damage or symptoms, favourable conditions and management practices. Farmers identified about 130 crops in the three districts (49, 30 and 51 crops during 2004 Summer-I, Summer-II and Winter crop seasons respectively). More crops were identified in Natore district (85) followed by Norsingdi district (54) and Moulvibazar district (49). Farmers identified 214 plant health problems (97 insect and 117 disease problems).

The seasonality of pests and diseases

During 2004 Summer-I (*Karif* I), insect pests were more common, including the cucurbit fruit fly, brinjal shoot and fruit borer, rice stem borer, sugarcane stem borer, pumpkin caterpillar and epilachna beetle; diseases were also more common during Summer I, including bud rot in coconut, nutritional deficiency of coconut, clove separation of garlic, leaf curl of teasel gourd, virus of cucurbit and anthracnose of mango. During the Summer-II (*Karif* II) insect pests included rice stem borer, hispa, rice gall midge, cucurbit fruit fly, bean aphid, and brinjal (eggplant) shoot and fruit borer. Common diseases were dieback of brinjal, sheath blight of rice, foot rot of brinjal, leaf blight of turmeric, leaf curl of chilli and root knot of brinjal.

During the 2004 Winter (*Rabi*) season, problems included bean aphid, brinjal shoot and fruit borer, bean pod borer, cucurbit fruit fly, potato cutworm and mustard aphid; (ii) the frequency of some damaging diseases such as leaf curl of chilli, anthracnose of bean, stem rot of brinjal, riceyness of cauliflower, foot rot of wheat, leaf curl of brinjal, die back of brinjal, foot rot of tomato and foot root of col.

How farmers name pests and diseases

Farmers often used more than one local name for each plant health problem and some of local names label various problems. Most local names had a translatable or literal meaning. Many of the names are short phrases (usually two words) that describe the shape, colour, behaviour or damage caused by the insect pest or the disease. Some local names were unique to specific places, but names of insects were common to all survey areas. Most of the disease names simply describe symptoms. Farmers of three districts named or described 165 plant problems, using some 287 local names.

Pest and disease damage

Natore district

CROP	INVERTEBRATE PEST
rice	stem borer
sugarcane	stem borer
pointed gourd and cucumber	lepidopteran larvae
mango	stem borer and hopper
jackfruit	stem borer
country bean	bean aphid and bean pod borer
cabbage and cauliflower	larva of cabbage butterfly
brinjal (eggplant)	brinjal shoot and fruit borer
bitter gourd, bottle gourd and sweet gourd	cucurbit fruit fly
banana	banana leaf and fruit beetle
teasel gourd	epilachna beetle
pomegranate	pomegranate fruit borer
rice	earthworm

Norsingdi district

Crop	*Invertebrate pest*
rice	hispa, case worm
cucumber and brinjal	red mite
gourds	epilachna beetle
banana	leaf and fruit beetle
cabbage & cauliflower	cabbage butterfly and cutworm
brinjal	brinjal shoot and fruit borer
country bean *yard long bean*	aphid and pod borer
bitter gourd *sweet gourd* *bottle gourd*	cucurbit fruit fly
potato	cutworm
lemon	lemon butterfly

Moulvibazar district

Crop	*Invertebrate pest*
potato and chilli	cutworm
country bean	bean pod borer
yard long bean	aphid
cabbage	cabbage butterfly
brinjal	brinjal shoot and fruit borer
rice	hispa, and stem borer
taro	hairy caterpillars
country bean	aphid

Diseases

Natore:

- Purple blotch of onion and garlic
- Foot rot of vegetables
- Leaf curl of chilli, tomato, cucurbit and papaya
- Dieback and wilt of brinjal
- Rhizome rot of turmeric
- Foot rot of wheat, bud rot of coconut and betel nut.

Norsingdi:

- Anthracnose of bean
- Wilt, leaf curl and anthracnose of cucurbits
- Leaf curl of chilli
- Foot rot of vegetables
- Late blight of potato
- Sigatoka of banana
- Gummosis and scab of lemon
- Dieback and wilt of brinjal.

Moulvibazar:

- 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.

How farmers use pesticides

AAS asked farmers to give the trade name of pesticides applied, doses and frequency of application. Farmers commented on the effectiveness of the chemicals. Common ones include Basudin, Furadan, Curaterr, Diazinon, Biesterin, Phaddy, Malathion, Dursban, Basathrin, Decis, Fenfen, Fyfanon, Tafgor, Fenitox, Fastac, Ripcord, Cymbush, Marshal, Schincyper, Karate, Aktara, Sevin, Kartap. In most cases, farmers used these chemicals on the basis of the recommendation of pesticide dealers.

Farmers were more interested in using chemicals to kill insects than to treat diseases. Chemicals such as Tilt, Dithane M-45, Ridomil, Rovral, Indofil, Bavistin, Antracol, Topsin, Folicur, Thiovit, Cupravit, Ronovit, Knowin and Champion were used to manage disease. Farmers often used insecticides for diseases when they did not properly diagnose the problem.

Farmers used common as well as some unauthorized pesticides, making frequent use of 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 made 40-50 pesticide applications to protect a single bean crop from bean pod borer. To protect the brinjal shoot and fruit borer, farmers used the pesticides almost everyday and in some cases, 150-200 times in a single crop season. Farmers of Norsingdi district applied pesticides at least 1-3 times in a week on vegetable crops. Some farmers in Natore and Norsingdi district spray high amounts of chemicals to their market crops, but avoid spraying the part they intend to eat at home.

Indiscriminate use of pesticides at high concentrations and frequent intervals was exceedingly common in all three survey areas. Farmers were inclined to apply unauthorized, highly toxic pesticides, since some insects have already gained resistance to the authorized and safer chemicals. Due to excessive application of pesticides, often the wrong ones, as much as one third of some farmer's vegetable crop revenue is spent on pesticides. Farmers link pesticide abuse

with the extinction of fish, frogs and birds, and human health problems.

Farmer innovations for pest and disease control

The survey found about 35 innovations. Of about 20 innovations in Natore district, farmers said that five or six of them were useful for control of adult moth of rice, jute, fruit flies, cutworm, rats, and aphids. In Norsingdi, of 15 innovations, three or four gave good results for red mite, cucurbit fruit fly, banana leaf and fruit beetle, and aphids. In Moulvibazar of about 10 innovations, two or three helped control rice hispa, cutworm and rice stem borer.

Most farmers rely on local pesticide dealers for crop protection recommendations, leading to high doses of pesticides (see Davidson et al. 2001, for a similar case in Pakistan). Farmers asked for training on pest management and for pesticide use. Farmers expressed an interest in growing crops with safe and effective pesticides or even without pesticide use.

LOCAL KNOWLEDGE IN ACTION: The plant doctor and visiting scientist Jim Waller listen carefully, keen to make best use of what the farmer says.

Introduction

Agriculture accounts for about one third of Bangladesh's gross domestic product and more than 30% of export earnings. Nearly two thirds of the country's population works in agriculture, especially rice. About 80% of the 140 million Bangladeshis depend on agriculture for their subsistence. Bangladesh now deems itself to be self-sufficient in food grain production. This is a significant accomplishment as food security has long been a major part of national policy.

The major crops are rice, wheat, pulses, jute, oilseed, vegetables, potatoes, fruits, sugarcane, spices and cotton. While pest losses vary from 10 to 25% of harvest (depending on the crop, year etc.) Bangladesh is lagging behind in the development of efficient, eco-friendly, plant health management. About 22,000 tons of pesticides are used every year in Bangladesh.

About 75% of Bangladesh's farmland is in rice and the other 25% is planted in over 50 crops, including high value vegetables, fruits, spices which have become much more common since 1985, in response to market demand. But these high value crops are now threatened by rising production costs. Pest and disease losses are increasing for rice and other crops.

Farmers are increasingly dependent on the frequent use of highly toxic pesticides. Farmers are concerned about pesticide adulteration by wholesalers and retailers, while using pesticides based on advice from local dealers, leading to pesticide abuse. DAE (Department of Agricultural Extension) monitoring of pesticide use is minimum at the field level. Agricultural research institutes have no role in monitoring. The agro-chemical industry has done little or nothing to police itself.

Most farmers want to protect their crop with chemicals, partly due to motivation by DAE, BADC (Bangladesh Agricultural Development Corporation,) agricultural research institutes and pesticide companies since the 1960s. The current low-level of plant protection safety may lead to greater human health risks to consumers and sprayers. Current pesticide use is top-down and gives little consideration to farmers' roles and perceptions. To understand plant health problems, Agricultural Advisory Society (AAS) with the support of the Global Plant Clinic surveyed 30, 12 and 17 villages during Summer-I, Summer-II and Winter seasons respectively in six upazilas in Natore, Norsingdi and Moulvibazar districts.

Objectives

To know more about the local knowledge of plant health problems.

Identify insect pests, diseases and soil problems.

Assess the level of infestation of pests and diseases and farmers' concepts of plant health problems.

Understand pest management practices used by farmers, including reasons for pesticide abuse.

Document farmers' innovations for pest management.

Location and Participants

The survey was conducted in three seasons i.e. Summer-I (Kharif-I), Summer-II (Kharif-II) and Winter (Rabi) from 13 March 2004 to 31 December 2004, at 35 villages in six upazilas of Natore (Boraigram and Sadar upazilas), Norsingdi (Raipura and Shibpur upazilas) and Moulvibazar (Srimangal and Sadar upazilas) districts, and included 1,591 farmers (1,257 males and 334 females). See Table 1.

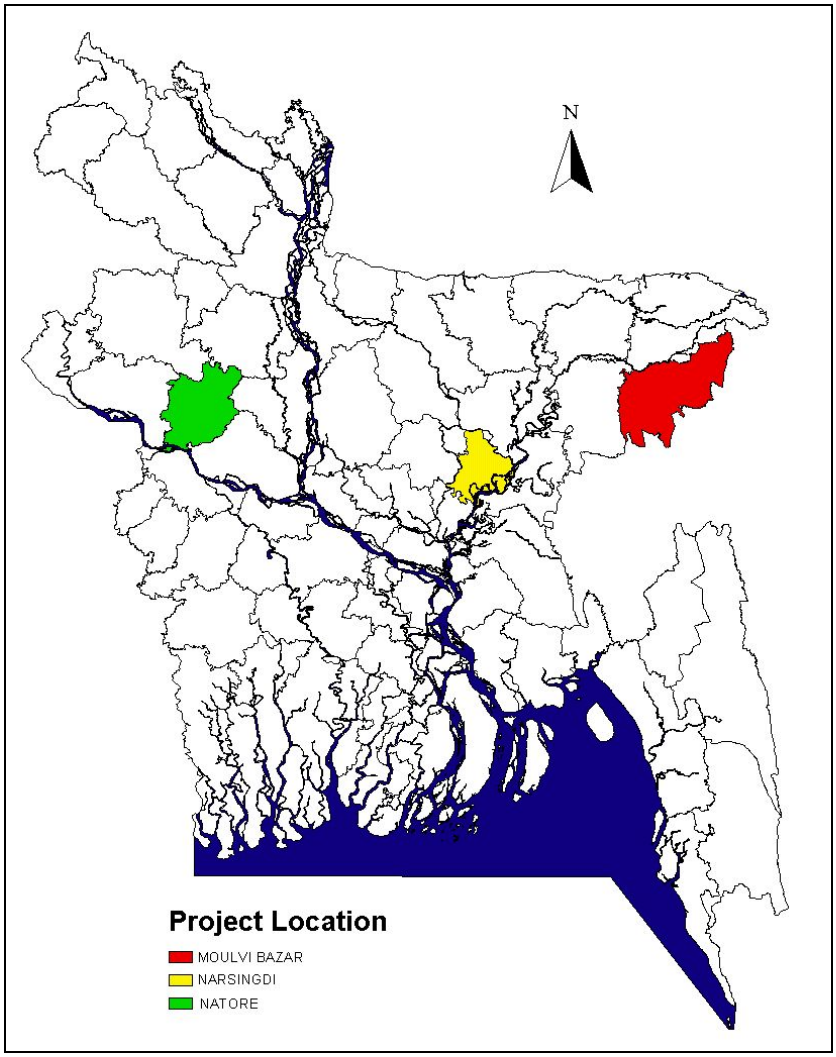
Table 1: Participants and survey sites during three seasons

DISTRICT	UPAZILA	NUMBER OF VILLAGES			NUMBER OF FARMERS SURVEYED								
		SUM-I	SUM-II	WIN	2004 SUMMER-I			2004 SUMMER-II			2004 WINTER		
					M	F	TOTAL	M	F	TOTAL	M	F	TOTAL
Natore	Boraigram	10	4	5	238	16	254	102	-	102	125	-	125
	Sadar	8	4	5	61	179	240	78	43	121	48	69	117
Norsingdi	Raipura	4	1	3	85	4	89	24	-	24	90	9	99
	Shibpur	2	1	2	70	-	70	21	-	21	56	-	56
Moulvibazar	Srimangal	4	1	1	96	14	110	35	-	35	23	-	23
	Sadar	2	1	1	57	-	57	27	-	27	21	-	21
Total	**6**	**30**	**12**	**17**	**607**	**213**	**820**	**287**	**43**	**330**	**363**	**78**	**441**

Sum-I = 2004 Summer -I, Sum-II = 2004 Summer-II, Win = 2004 Winter, M = Male, F = Female

Method

A.K.M. Murshedur Rahman, entomologist, AAS, was the principal surveyor. Mr. Harun-Ar-Rashid, executive director, AAS, supervised the study. Bentley and Nash gave training on the study of local knowledge, and edited the manuscript. Eric Boa advised on layout and printing.



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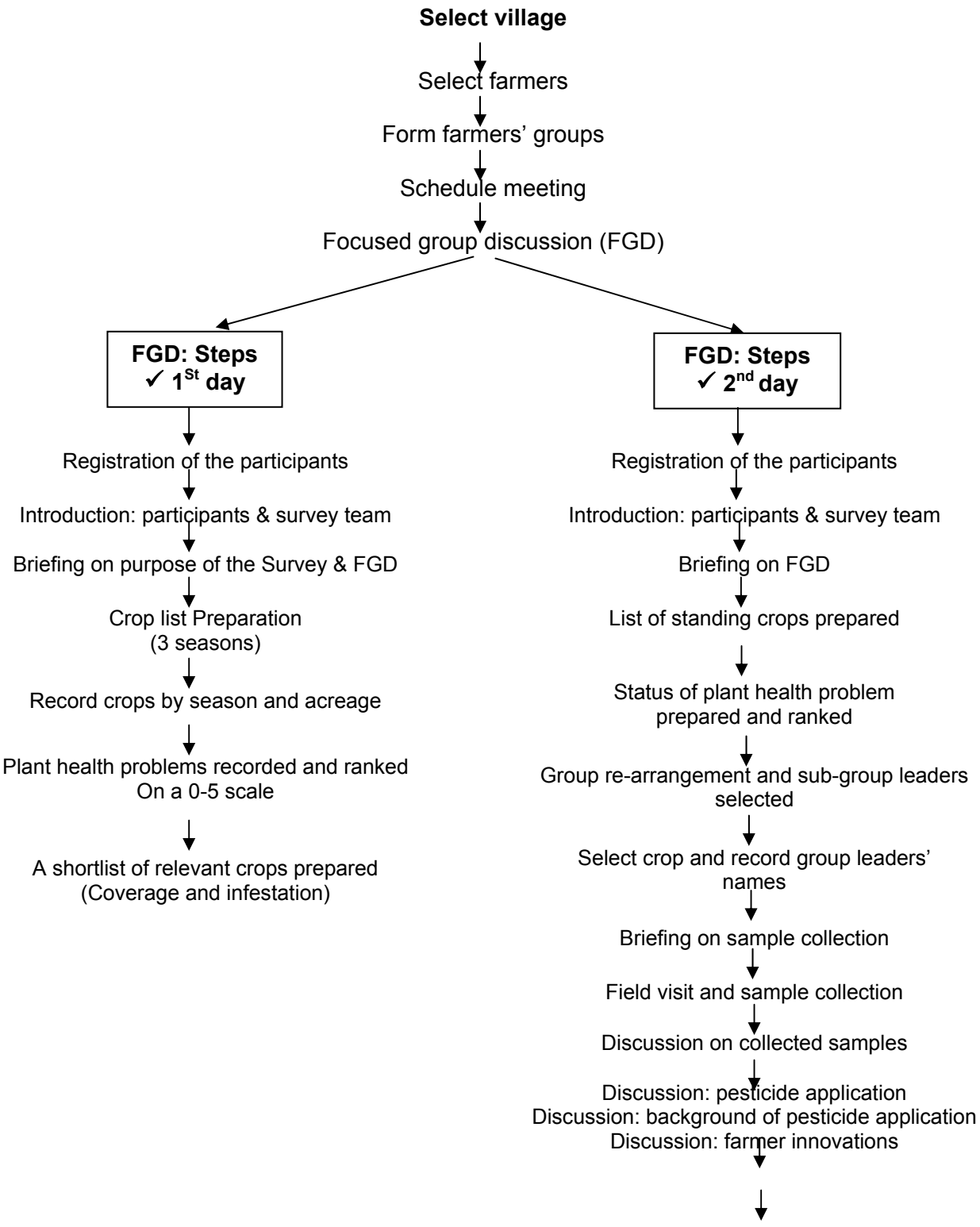
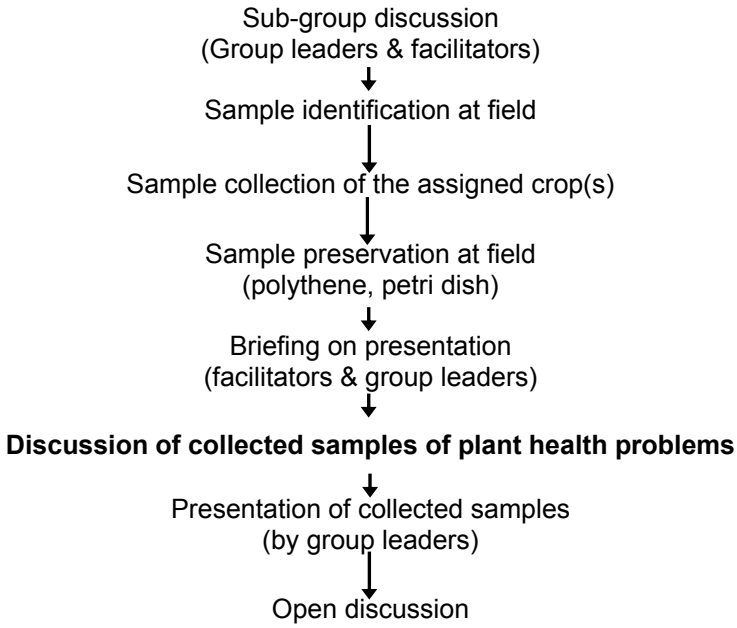
Survey method



Field Visit and Sample Collection: Steps



During discussion, farmers' statements about the following topics were recorded:

- ✓ Local name of the plant health problems
- ✓ Description of the pest and disease
- ✓ Damage or symptoms
- ✓ 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
- ✓ Severity of infestation or approximate status of crop damage.

Discussion of pesticides included the following areas:

- ✓ Commercial name of the applied pesticide
- ✓ Time of application (on the basis of crop stage, time of infestation etc.)
- ✓ Dosage
- ✓ Frequency of application
- ✓ Effectiveness

Discussion of the history of pesticides included:

- ✓ When farmers started to use pesticides
- ✓ Start of large-scale use
- ✓ After using pesticide, the condition or infestation level of the pest
- ✓ Whether or not pesticides are beneficial
- ✓ Harmfulness.

Discussion of farmer innovations was aimed at understanding modification of traditional methods or the effective use of low-level chemicals with other methods. Farmers were asked to discuss:

- ✓ Innovations they are aware of
- ✓ Local name of the method
- ✓ Who started the method and when
- ✓ Description of the method
  - Equipment and materials
  - Application technique
  - Time of application
  - Rate and frequency of application
- ✓ Effectiveness
- ✓ Cost and benefit

Findings

Status of plant health problems

At the first day of focussed group discussion (FGD) in each village, farmers were asked to discuss the crops by acreage for each season, and the status of insect, disease and soil problems. AAS wrote summaries of their responses on a large flip chart, to make a short list of plant health problems.

The second day, farmers were asked their opinion about plant health problems of field crops, homestead crops, fruit trees and orchards. And these were also written on a flipchart. See Table 2.

Table 2: Number of crops surveyed

Season	Number of crops identified		
	Natore	Norsingdi	Moulvibazar
2004 Summer-I	27	21	20
2004 Summer-II	23	11	11
2004 Winter	35	22	18

Farmers said that the following crops were highly vulnerable to pest and disease attack:

Summer-1:	**Summer-II:**	**Winter:**
Rice	rice	country bean
Brinjal	brinjal	brinjal
lady's finger (okra)	chilli	Chilli
Cucumber	country bean	Potato
teasel gourd,	bottle gourd	Cabbage
white gourd	white gourd	Cauliflower
Coconut	turmeric	bottle gourd
Jackfruit	banana	sweet gourd
Pomegranate	coconut	Banana
banana		Coconut

Farmers in each districted listed between 55 and 85 problems. Insects were mentioned slightly more frequently in Summer I, but diseases were more common than insects in the other two seasons.

Table 3: Number of plant health problems mentioned by farmers

Season	Identified plant health problems[a]		
	Insects	Diseases[b]	Total
2004 Summer-I	39	35	74
2004 Summer-II	24	31	55
2004 Winter	34	51	85

[a] Duplication of several plant health problems under each category
[b] Including few soil and physiological orders

Plant health problems frequently mentioned by farmers

Summer-I (30 villages):	Summer-II (12 villages):	Winter (17 villages):
cucurbit fruit fly	rice stem borer	bean aphid
brinjal shoot and fruit borer	Hispa	brinjal shoot and fruit borer
rice stem borer	rice gall midge	bean pod borer
sugarcane stem borer	cucurbit fruit fly	cucurbit fruit fly
pumpkin caterpillar	bean aphid	potato cutworm
epilachna beetle	brinjal shoot and fruit borer	and mustard aphid
bud rot of coconut	die back of brinjal	leaf curl of chilli
nutritional deficiency of coconut	sheath blight of rice	anthracnose of bean
Clove separation of garlic	foot rot of brinjal	stem rot of brinjal
leaf curl of teasel gourd	leaf blight of turmeric	riceyness of cauliflower
virus of cucurbit	leaf curl of chilli	foot rot of wheat,
anthracnose of mango	root knot of brinjal	leaf curl of brinjal
		die back of brinjal
		foot rot of tomato
		foot root of col

Local names of the plant health problems

Many plant health problems have more than one local name, even within the same community. Most names reflect appearance, behaviour or damage of the pest. Most of the names are short phrases that make common sense to the farmers. Only a few names are unanalysable (cannot be broken down into smaller parts with meanings). Farmers of three districts identified 165 plant health problems, with 287 names. See Table 4.

Table 4: Number of local names for plant health problems given by farmers

Season	Natore		Norsingdi		Moulvibazar		Total [a]	
	PHP	LN	PHP	LN	PHP	LN	PHP	LN
2004 Summer-I	40	80	18	30	20	32	45	85
2004 Summer-II	39	66	14	20	14	21	55	90
2004 Winter	55	90	32	64	18	32	65	112

[a] The total is less than the sum of the numbers in the rows, because many of problems and names are repeated in each district. For example "stem borer" appearing in all three districts is one problem, not three.

PHP = Plant health problems; LN = Local name

Some of the disease names are quite general, even vague, e.g. *pochon rog* (rot disease); *gora pocha rog* (base rot disease), *mora rog* (die disease) and *jhora rog* (dropping disease). The names seem slippery, in that a label may refer to various organisms which are not overly similar.

Compared to other folk names in other places (see Bentley and Rodríguez 2001), the Bengali names have many binomials, although the second word often seems semantically empty. For example *pocha rog*, (rot disease), or *menda poka* (aphid insect). Other languages occasionally do this (cf. American English 'hound dog', where the word 'dog' carries little new information), but the Bangladeshi terms frequently have a partially redundant second word.

This body of data seems odd in some other ways as well. Why are there five words for aphid? Why does *leda poka* refer to aphids and to various other creatures as well.

There are some words which make interesting distinctions, e.g. *kira* means worm as in insect larvae, while earthworms are called *chera*. Folk English does not make such a distinction, although Latin American Spanish does (*gusano* and *lombriz*).

Many crops have pests with similar or identical names, e.g. many crops have a stem borer, or *majra poka*. Farmers recognise that they are different (that is, they know that each crop has its own kind of *majra poka*).

Disease names are symptom names (E. Boa, pers. com.), and insect names are names for specific, visible creatures. So that, for example, the fruit and leaf beetle in banana may be called a *poka* (insect), but its damage will be called *rog* (disease).

The Bangladeshi names show that smallholders borrow concepts from English, from modern human health (septic, virus, cancer) and applying them creatively to their plant health problems, suggesting that people make analogies between their own health and that of their crops. For more information on local names, see Annex A.

Farmer knowledge of plant health problems

In the survey, farmers collected insects and diseased plants from nearby fields. Then farmers took turns describing samples to their neighbours and to AAS in a kind of show-and-tell. Having samples in their hands made discussions realistic and concrete. AAS wrote summaries of what farmers said, on a flipchart that the whole audience could see. For more information on farmer knowledge, see Annex B.

Use of pesticides for pest management

Farmers use pesticides when the infestation of insects or diseases is high. Pesticides not only kill pests, but also beneficial insects, besides damaging human health. At present about 22,000 tons of pesticides are used every year in Bangladesh. Dealers promote authorized as well as some unauthorized pesticides.

Common insecticides include

> Basudin, Furadan, Curaterr, Diazinon, Biesterin, Phaddy, Malathion, Dursban, Basathrin, Admair, Duraban, Decis, Fenfen, Fyfanon, Tafgor, Fenitox, Fastac, Ripcord, Cymbush, Marshal, Sunfuran, Schincyper, Karate, Aktara, Sevin, Kartap.

Some farmers used unlabelled and unauthorized pesticides. Most farmers used pesticides recommended by local pesticide dealers. Farmers showed more interest in insecticides than in fungicides. Popular fungicides include:

> Tilt, Dithane M-45, Ridomil, Rovral, Indofil, Bavistin, Antracol, Topsin, Folicur, Thiovit, Cupravit, Ronovit, Knowin, Champion.

In Natore district, farmers frequently apply insecticides to control:

> rice stem borer, country bean aphid, bean pod borer, brinjal shoot and fruit borer, Okra shoot and fruit borer, cabbage butterfly, sugarcane stem borer, leaf folder of cucurbits, epilachna beetle, cucurbit fruit fly, red pumpkin beetle, cutworm, banana leaf and fruit beetle.

They frequently use fungicides to control:

> purple blotch of onion or garlic, late blight of potato, foot rot of vegetables, foot/stem rot of betel vine, sheath blight of rice etc.

In some cases, farmers applied pesticides almost everyday to control certain insects. Farmers use insecticides some 40-50 times for bean pod borer. To control brinjal shoot and fruit borer, people apply pesticides up to 180-200 times in a cropping season.

In Norsingdi district, farmers used excessive pesticides to control bean pod borer, bean aphid, brinjal shoot and fruit borer, cucurbit fruit fly and cabbage butterfly, often spraying at least 1-3 times in a week in almost all vegetables and sometimes 6-7 times a week. Farmers used pesticides almost every day 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 rice hispa, rice case worm, 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 used for a few major pests. Since 2002 in Norsingdi and Natore districts, the unauthorized 'Indian *bish'* or Indian oil, (imported from India under the trade name Kripcord) has become popular against bean pod borer and brinjal shoot and fruit borer.

The history of pesticide use is summarized separately for three districts in Table 5.

Table 5: Pesticide use in three districts

NATORE DISTRICT	NORSINGDI DISTRICT	MOULVIBAZAR DISTRICT
Pesticide use started in the 1970s and 80s, with frequent spraying only after 1995 or 1997.	Pesticide use started in the 1970s and 80s, with frequent spraying only after 1990 or 1995.	Pesticide use started in the early1980s and 1990s, with frequent application since the late 1990s.
About one third of farmers' gross receipts from selling vegetables are spent on pesticides.	About one third of farmers' gross receipts from selling vegetables are spent on pesticides.	About one third of farmers' gross receipts from selling vegetables are spent on pesticides.
To control the brinjal shoot and fruit borer, Indian oil is frequently used as it can protect the pest for 3-4 days.	Indian oil became popular about 2003 since it can be used to protect most vegetables.	Farmers are interested in growing crops by using proper pesticides.
Some farmers produce brinjal only for sale, but will not eat it.	Some farmers frequently sprayed the vegetables they intended to sell, but not those they would eat at home.	Farmers identified excessive pest attack as a natural calamity.
Farmers listed birds, frogs and spiders as beneficial.	A few trained farmers identified spiders, frogs, ladybird beetles as beneficial, but showed little interest in conserving them.	Farmers only listed birds and frogs as beneficial.
Many farmers were unable to diagnose problems and so they use broad-spectrum pesticides.	Farmers identified excessive pest attack, extinction of fish, birds and frog and increased human health problems as results of pesticides.	Since the early 2000s, farmers have been unable to control rice hispa and rice case worm with chemicals. They blame this failure on poor quality pesticides.
Farmers are unable to grow some crops (e.g. brinjal, sugarcane, country bean) without frequent application of chemicals.	Some farmers complained of physical suffering caused by handling and spraying pesticides.	Farmers blamed the extinction of fish, and human health problems on pesticides.
Farmers identified excessive pest attack, extinction of fish, birds and frog and increased human health problems as results of pesticides.	Increasing pesticide spraying led to greater pest attacks. Farmers blamed this on the low quality of the pesticides.	Farmers identified about 10 innovations; 2-3 gave good results.
Only a few farmers, who have received training, know about beneficial insects.	Most farmers sprayed their vegetables at least 2-3 times a week.	
Increasing pesticide spraying led to greater pest attacks, e.g. until the late 190s bean aphid could be controlled with ash. But now it is impossible to grow beans without pesticide.	Some used pesticides every day (e.g. for bean pod borer, brinjal shoot and fruit borer).	
To grow sugarcane they used some unauthorized pesticides from India (e.g. heptachlor for termites in sugarcane).	Farmers identified about 15 pest control innovations. 3-4 gave good results.	
Most farmers sprayed their vegetable plots at least 2-3 times a week.	Farmers are dependent on pesticides to grow crops.	
Some used pesticides every day (e.g. for bean pod borer, brinjal shoot and fruit borer).	All of the farmers realized the bad effects of chemicals, but have no alternative techniques.	
Farmers identified about 20 pest control innovations, about 5-6 of which gave good results.		

For more information of pesticide use, see Annex C.

Farmers' pest control innovations

Farmers reported use some traditional crop protection method (e.g. application of ash, cow dung, neem extract). By the 1990s farmers became interested in pesticides, because they gave instant results, and were easy to apply. Due to frequent application of pesticides with excessive doses, some pests have already gained high resistance against pesticides. So now, farmers often fail to control some serious pests with chemicals. Yet farmers have to spend much money on chemicals.

When farmers failed to protect their crops with traditional methods or chemically, they seek alternatives by experimenting on their own. Some of these innovations blend traditional and chemical control. Although few farmers were able to successfully control a wide variety of major pests, most of the innovative methods were affordable, readily available and less harmful to non-target organisms.

Farmers identified 69 plant health innovations (82, counting duplications). See Table 6.

Table 6: Number of local innovations mentioned by farmers

Season	Number of Innovative Method							
	Natore		Norsingdi		Moulvibazar		Total	
	Total	Effective	Total	Effective	Total	Effective	with duplicate innovations	without dupl. innovations
2004 Summer-I[a]	20	5-6	15	3-4	10	2-3	45	35
2004 Summer-II[a]	15	5-6	3	1	1	1	19	16
2004 Winter[a]	14	3-4	2	1	2	1	18	14
Total	49	-	20	-	13	-	82	65

[a] There is some duplication of innovations in districts during the same season.

Innovations which gave good results, Summer I

NATORE: SUMMER I	NORSINGDI: SUMMER I	MOULVIBAZAR: SUMMER I
controlling adult moth of rice, jute, fruit flies, cutworm, rats, aphids	reducing attack of red mite, cucurbit fruit fly, banana leaf and fruit beetle, aphids	control of rice hispa, cutworm, rice stem borer etc.
NATORE: SUMMER II	NORSINGDI: SUMMER II	MOULVIBAZAR: SUMMER II
control of rice stem borer, rice hispa, bean aphid, bean pod borer, cutworm, pomegranate fruit borer		
NATORE: WINTER	NORSINGDI: WINTER	MOULVIBAZAR: WINTER
control of bean aphid, bean pod borer, foot rot of brinjal, purple blotch of onion and garlic		

Most of the innovations were used by wealthier farmers who could afford the risks of innovation (Cancian 1972). Some of the innovations are described in Annex D.

Discussion

Local names of insect pests tend to be based on the form, colour, habit, damage etc. of the creature, while folk names for diseases are actually symptom names.

About 35 farmer innovations were identified, about 10-13 of which are reported by farmers as being highly effective. Farmer innovations tend to be low cost and based on locally-available materials. Neighbouring farmers are interested in the innovations, if they give good results. And some of them do. Some of these were modifications of some earlier methods or the association of chemicals with traditional techniques. Most of the innovations were used by the elite farmers who are more able to take risks.

Farmers frequently used pesticides to protect some vegetables like country bean and brinjal. In a single season, farmers sprayed pesticides about 40-60 times for country bean and 60-80 times for brinjal. A few farmers sprayed pesticides 200 times, almost every day.

Farmers identified intensive, frequent use of pesticides and the extinction of frogs, fish and birds as the main causes for increasing pest attack. Most farmers claimed that it is no longer cost-effective to use pesticides. About one third of their gross receipts from vegetables are spent on pesticides. A few farmers who apply pesticides on market vegetables avoid spraying the ones they will eat at home.

Most farmers depend on pesticide dealers for pest management advice. Many farmers use fungicides for all diseases (many of which are not fungal). Farmers believe that many diseases come from contaminated soil.

Farmers understand disease less than insects. Damage caused by un-observed insects may be labelled as a disease. Only few trained farmers know about beneficial insects. Few farmers identified spiders, ladybird beetle, frogs, bees etc. as beneficial, but expressed no interest in preserving them. Most farmers believe that all insects in the field are harmful.

Farmers were more interested in using chemical control of insects than of diseases. Some farmers tried to use insecticides to control some diseases. Some highly toxic pesticides with residual effects, which are banned by the government, are available in the market. If farmers notice insect pests in vegetables, they spray insecticide, even if the field is about to be harvested.

Female farmers expressed more interest in fruit problems and crops grown in the homestead. Farmers expressed their interest in receiving training on pest management and requested recommendations for pesticide use.

There are some magico-religious practices intended to protect diseases (e.g. to protect coconuts from bud dropping and from having waterless fruit, water blessed by a religious specialist is sprayed. A cow bone may be hung to protect against the folk disease generally known as ‘evil eye’. A broken clay pot with some simple designs painted on it is placed in the field to protect vegetables from evil eye.

Recommendations

More emphasis should be given to those insect pests that have acquired high levels of pesticide resistance so that control measures can be developed without using frequent application of pesticides.

The survey gathered farmer's knowledge on plant health problems and their management. This can be incorporated into plant protection measures to produce healthy crops for national and international consumers.

Bangladeshi farmers are in a serious pesticide crisis, which is a danger to their livelihoods, their health, and the health of consumers. Pesticides are failing to protect crops. Bangladesh urgently needs appropriate technology for pest control.

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SHURI POKA LOOKS LIKE LEDA POKA: LOCAL NAMES HELP DIAGNOSIS

A woman farmer brings a large piece of sugarcane to the plant clinic, and says that a hole appears in the stem, the top dries and the canes break down. She tells me this is caused by *Shuri poka* (this means take the inside road). It attacks straight away when the crop is young. 'All the time I spray,' she explains. 'The plants don't survive unless I spray'. I ask the woman what the *Shuri poka* looks like, and she says that it looks the same as the *Leda poka*. It is small sized, white, with a head that is red. Jami tells us that this is the pink-headed stemborer although we still need to see the insect to confirm our diagnosis.

[As told to Paula Kelly with assistance of Zakaria Aka, RDA]

Annex A: Local names of plant health problems

Table A1: Local names of plant health problems in Natore district (Summer I)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
rice (dhan)	majra poka majkaÚa poka	centre insect (named for its habit of eating a gallery in the centre of the main stem of the plant) stem cutting insect	rice stem borer
	chhaÚka poka	jumping insect	grass hopper
	chera	earthworm	earthworm
	gora pocha rog	base rot disease	sheath blight
	bhairash	loanword from English 'virus'	yellowing, stunted growth
garlic (roshun)	jab poka menda poka	'jab' and 'menda' are both unanalysable and mean 'aphid.' *Menda* is a word which farmers use, but *jab* is originally from entomologists	aphid
	pata mora rog	leaf die disease	unidentified
	shikor pocha rog	root rotting disease	root rot
	gora phula jaowa	base swelling	unidentified
cucumber (shosha, khira)	phol chhidrokari poka bolta poka pholer poka	fruit boring insect wasp insect (standard Bengali ''bolta'). I.e. it is colored yellow, like a wasp fruit insect	cucurbit fruit fly
	achha poka bichha poka	*Achha* and *bichha* are both unalaysable and refer to various hairy caterpillers	caterpillar
	gora pocha rog	base rot disease	may be foot rot
onion (pĩyaj)	aga mora rog	tip die disease	unidentified
bean (anaj, shim) **yard long bean** (borboÚi)	majra poka leda poka	centre insect soft insect (see below)	bean pod borer
	jab poka	aphid	aphid
	pata dag rog	leaf spot disease	bean rust
sugarcane (kushor, akh)	majra poka shada kira	centre insect white worm	sugarcane stem borer
	kalo pata rog bhairash	black leaf disease 'virus'	unidentified
eggplant or brinjal (begun)	beguner kira majra poka phol chhidrokari begun poka	eggplant worm centre insect fruit borer eggplant insect	eggplant shoot & fruit borer
black cumin (kalo jira)	leda poka	leda means "soft, like fresh dung." The word is obscure, and was probably introduced by extension agents.	gram pod borer
mango (am)	pata poka chhoÚka poka	leaf insect hopping insect	mango hopper
	ÚaÚa poka	drill insect (as in a carpenter's drill)	mango stem borer
	mora laga rog jaowa dhora	starts to die disease starts losing	die back
	jhora rog	dropping disease	anthracnose

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
coconut (narkel)	kira poka	worm insect	grub of rhinoceros beetle
	jhora rog shukna rog pani shukna rog	dropping disease drying disease water drying disease	nutritiet deficiency or coconut bud rot
jackfruit (kãÚhal)	bhomor poka bhor poka birbira rog	boring insect boring insect slow disease	jackfruit fruit borer
	jhora laga rog phol pocha laga muchi jhora	starts dropping disease fruit rot bud dropping	rhizopus rot of jackfruit
sweet gourd (mishÚi kumṛa)	holud machhi bolta poka	yellow fly wasp insect	cucurbit fruit fly
bitter gourd (korola)	leda poka bolta poka	soft insect wasp insect	cucurbit fruit fly
bottle gourd (lau)	shundori poka lal poka ura poka	beautiful insect red insect flying insect	red pumpkin beetle
melon (bãgi)	ghora poka	horse insect (i.e. an inchworm that rears up like a horse)	pumpkin caterpillar
	kukra rog	curling disease	virus
chilli (morich)	kaÚui poka leda poka	cutting insect cow dung like soft insect	cutworm
	ui poka and roi poka	meanings obscure	termite
	thanga poka	long-legged insect	field cricket
	pata kukrano rog bhairash rog	leaf curling disease 'virus' disease	leaf curl
teasle gourd (kakrul)	shobuj poka ghora poka	green insect horse insect	pumpkin caterpillar
ribbed gourd (toroi, jhĩga)	kãÚhali poka boshonto poka dal poka holud poka	jackfruit (coloured) insect spring insect (or perhaps 'pox insect' since 'boshonto' means both 'spring' and 'pox') lentil (dal) insect yellow insect	grub of epilachna beetle
mung bean (mug kalai)	bichha poka chhëga poka achha poka	unanalysable names for various hairy caterpillars, especially with urticating hairs.	hairy caterpillar
pomegranate (Ãalim)	leda poka phol chhidrokari poka pholer kira	soft insect fruit boring insect fruit worm	pomegranate fruit borer
white gourd (chal kumṛa)	gora pocha rog	base rot disease	possibly the attack of the grub of red pumpkin beetle
lemon (lebu)	chamra phatha rog	bark cracking disease	gummosis of lemon
pointed gourd (poÚol)	ura poka	flying insect	cucurbit fruit fly
	majra poka	centre insect	pumpkin caterpillar
groundnut (badam)	leda poka	soft insect	cutworm
	ura poka	flying insect	field cricket
	mora rog	die disease	may be foot rot
okra (lady's finger) (Ãhæṛosh)	chhidrokari poka leda poka ghora poka	borer insect soft insect horse insect	okra shoot and fruit borer

Table A2: Local names of plant health problems in Norsingdi district (Summer I)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
eggplant (begun)	majra poka chhoÚkano poka kira poka phol chhidrokari poka	centre insect hopping insect worm insect fruit boring insect	eggplant shoot and fruit borer
	shaid mora	side (recent loan word from English) die; i.e. one side of the plant dies	die back
teasle gourd (kakrul)	shobuj lomba kira ghora poka phol chhidrokari kira pholer kira	green long worm horse insect fruit boring insect insect larvae of fruits	pumpkin caterpillar
	pipra laga pata kukrano rog	becomes curled leaf curling disease	unidentified
	holud poka boshonto poka kãÚhali poka	yellow insect spring insect jackfruit (coloured) insect	grub of epilachna beetle
cucumber (shosha)	gora poka lal poka hajhari poka	base insect red insect thousands of insects	red mite
	pata moje jaowa kukra rog	damaging of leaves curling disease	unidentified
okra (Ãhæṛosh)	chhidrokari poka Ãhæṛosher poka	borer insect okra insect	okra shoot and fruit borer
bitter gourd (korola)	chhidrokari poka	borer insect	cucurbit fruit fly
white gourd (chal kumṛa)	boshonto poka	spring (yellow) coloured insect	grub of epilachna beetle.
banana (kola)	kaÚh poka	wood insect (named for its hard outer wings)	banana leaf and fruit beetle
snake gourd (koira, chichĩga)	gora chhidrokari poka	base boring insect	unidentified
yard long bean (borboÚi)	jab poka pachhi poka	aphid wrapping insect	aphid
lemon (lebu)	majra poka pata morano poka	centre insect leaf folded insect	larvae of lemon butterfly
chilli (morich)	shobuj lomba kira	green long worm	may be pumpkin caterpillar
jackfruit (kãÚhal)	kænsher	loan word from English “cancer”, so called because there is no cure for the disease and it leads to death	possibly the attack of jackfruit stem borer

Table A3: Local names of plant health problems in Moulvibazar district (Summer I)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
rice (Aus) (dhan)	lohari poka	iron insect (i.e. as hard as iron)	rice hispa
	manjara poka majra poka	centre insect centre insect	rice stem borer
white gourd (chal kumṛa)	bolta poka machhi poka khude machhi	wasp insect house fly insect small house fly	cucurbit fruit fly
cucumber (shosha)	leda poka	soft insect	pumpkin caterpillar
teasle gourd (kakrul)	koli shuke jaowa rog kori jhora	bud drying becomes disease young fruit dropping	possibly a pollination problem
	chhoÚo bichha poka chhãga poka	small hairy insect hairy insect	grub of epilachna beetle
sweet gourd (mishÚi kumṛa)	kori jhora	bud dropping	possibly a pollination problem
taro (mukhi kuchu)	bichha poka	hairy insect	unidentified caterpillar
	gachh lal howa	plant becoming red	may be nutrient deficiency
okra (Ãhæṛosh)	phuti poka majra poka	moth insect centre insect	okra shoot and fruit borer
eggplant (begun)	majra poka beguner kira	centre insect eggplant worm	eggplant shoot and fruit borer
betel vine (pan) (leaf chewed with betel nut)	gora pocha	base rot	foot rot of betel vine
	kando pocha	stem rot	stem rot of betel vine
yard long bean (ramesh, borboÚi)	lawri poka leda poka	'lawri' is a kind of wild fruit which grows very close to and hides its stem. soft insect	bean aphid (many soft insects are called leda poka)
	gora pocha pochon rog	base rot rot disease	foot rot of vegetables
coconut (narkel)	bojragun aga more jaowa	thunder storm top die	may be bud rot
	isai khaowa	evil drinking (i.e. some evil entity drank the water from the coconut)	may be nutrient deficiency
jackfruit (kãÚhal)	karul poka korati poka	hole making insect saw like insect	jackfruit stem borer
carambola (kamrãga)	jhora rog	dropping disease	unknown
pomegranate (Ãalim)	Ãalimer kira	pomegranate worm	pomegranate fruit borer
betel nut (shupari)	jhora rog	dropping disease	bud rot of betel nut
mango (am)	korati poka	saw insect	mango stem borer
banana (kola)	gila dhora	gullet becoming (i.e. swelling like the gullet of a hen)	bunchy top of banana

Table A4: Local names of plant health problems in Natore district (Summer II)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
rice (dhan)	majra poka	centre insect	rice stem borer
	shobuj poka pata kata poka	green insect leaf cutting insect	rice case worm
	pamri poka	unanalysable name	rice hispa
	phuti poka	moth insect	adult moth of rice stem borer
	ghugri poka	*ghugri* (onomotopoeic) insect	mole cricket
	chekur	type of weed with a hollow stem	rice gall midge
	khol pocha gora pocha pocha rog	sheath rot base rot rot disease	sheath blight of rice
	pata pocha	leaf rot	sheath rot of rice
eggplant (begun)	majra poka beguner poka	centre insect eggplant insect	eggplant fruit and shoot borer
	holud poka	yellow insect	epilachna beetle
	leda poka	soft insect	cutworm
	phula rog bhairash rog	bushy disease (lit. 'swelling' disease, because the plant canopy swells). 'virus' disease	eggplant little leaf
	gora shukna rog sephÚi rog gora mora rog	base dry disease 'septic' disease base die disease	foot rot
	dul mora rog kalo pocha rog aga mora rog	branch die disease black rot disease tip die disease	die back of eggplant
	guÚi rog	knot	root knot
	sephÚi rog	'septic' disease (loanword from English; when the plant gets sick, it never gets better).	possibly stem rot
onion (pīyaj)	aga mora aga shukna rog	tip die tip dry disease	unidentified
	gora pocha rog	base rot disease	stem rot
betel vine (pan)	khaoni	being eaten	foot rot
	shukna khaoni	eaten until it turned dry	stem rot
	tela rog	spot disease	leaf spot
	sholma rog	scar disease	possibly virus
turmeric (holud)	pocha rog	rot disease	leaf blight
banana (kola)	dauda rog dag pora rog salam rog	scar disease spotted disease meaning unclear	banana leaf and fruit beetle
	chera laga	has earthworms	grub of banana weevil
groundnut (badam)	gora pocha	base rot	foot rot
white gourd (chal kumṛa)	machhi poka bhomra poka	fly insect bumble bee insect (i.e. insect that burrows into the gourd the way the bumble bee digs a gallery in dry wood)	cucurbit fruit fly

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
chilli (morich)	kukra laga thupa dhora bhairash rog	being curled turning bunchy virus disease	leaf curl of chili
bitter gourd (korola)	leda poka	soft insect	fruit fly
teasle gourd (kakrul) **bitter gourd** (korola)	pata morano poka ghora poka	leaf folder insect horse insect	leaf folding caterpillar
yard long bean (borboÚi), **teasle gourd** (kakrul)	holud poka kãÚhali poka	yellow insect jackfruit (coloured) insect	grub of epilachna beelte
papaya (pepe)	phula rog bhairash rog	bushy disease 'virus' disease	papaya virus
country bean (shim)	jaowa poka	gradual insect	bean aphid
sweet gourd (mishÚi kumṛa)	phula rog bhairash rog kukra rog	bushy disease 'virus' disease curl disease	leaves turn yellow, then white and begin to curl. Plant stops growing and does not bear fruit
red amaranth (lal shak)	lal machhi shundori machhi ura poka	red fly beautiful fly flying insect	red pumpkin beetle
wood apple (bel)	phol chhidrokari poka pholer shada poka majra poka	fruit boring insect white fruit insect centre insect	wood apple fruit borer
coconut (narkel)	majra poka kira poka	centre insect worm insect	grub of rhinoceros beetle
hog plum (amra)	pata khaowa poka	leaf eating insect	hog plum caterpillar
pomegranate (Ãalim)	Ãalim kira lal kira poka majra poka	pomegranate worm red worm insect stem borer	pomegranate fruit borer
sugarcane (kushor)	majra poka gora pocha kushorer mora rog	centre insect base disease sugarcane die disease	red rot of sugarcane, secondary to stem borer

Table A5: Local names of plant health problems in Norsingdi district (Summer II)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
bottle gourd (lau)	kando pocha	stem rot	possibly foot rot
	pakra laga	being curled	cucurbit virus
	pocha laga	being rotted	cucurbit foot rot
	morok rog	dieing disease	possibly root knot
cabbage (bãdhakopi)	gora pocha	foot rot	foot rot
cauliflower (phulkopi) **cabbage** (bãdhakopi)	kaÚui poka leda poka	cutting insect soft insect	cutworm
sweet gourd (mishÚi kumṛa)	bhairash laga pakra rog	getting 'virus' curl disease	cucurbit virus
yard long bean (borboÚi)	kira poka majra poka	worm insect centre insect	bean pod borer
country bean (shim)	pachhi poka	wrapping insect (because the stem is covered in insects)	aphid
cucumber (shosha) **teasle gourd** (kakrul)	pata morano poka shobuj kira	leaf folder insect green worm	pumpkin caterpillar
rice (dhan)	majra poka	centre insect	rice stem borer
	ichhi poka	named for the sound they make	rice hispa
banana (kola)	dauda poka	scar insect	banana leaf and fruit beetle

Table A6: Local names of plant health problems in Moulvibazar district (Summer II)

Crop	Local name	Gloss of local name	Common name
rice (dhan)	chhat rog	empty disease	bakanae of rice
	kaÚra poka	cutting insect	rice case worm
	chungi chhora loÚi chhora	becoming a flute becoming like a taro sucker	bakanae of rice
	lohari poka	iron insect	rice hispa
	majra poka manjara poka	centre insect stem cutting insect	stem borer
	bau laga	bad wind	leaf blight of rice (bakanae is also known as bau laga by some Bangladeshi communities), Nash pers. coms
	gori pocha, pata pocha	base rot, leaf rot	sheath blight
lemon (lebu)	dauda rog	scar diseae	lemon scab
	patar kalo bemar	black disease of leaf	possibly anthracnose or melanose
country bean (shim)	idla poka lawri poka	meaning unclear see above	bean aphid
eggplant (begun)	beguner kira majra poka	eggplant worm centre insect	eggplant fruit and shoot borer
yard long bean (borboÚi)	bau laga	bad wind	bean rust
tomato (ÚomeÚo)	jhar mora gora pocha	plant clump dies foot rot	foot rot
coconut (narkel) **betel nut** (shupari)	jhora rog	dropping disease	bud rot of coconut
chilli (morich)	ghugri poka	*ghugri* (onomotopoeic) insect	mole cricket

Table A7: Local names of plant health problems in Natore district (Winter)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
rice (dhan)	chera	earthworm	earthworm
eggplant (begun)	majra poka beguner kira Ãoga chhidrokari machhi poka	centre insect eggplant insect shoot boring fly insect	eggplant shoot and fruit borer
	leda poka	soft insect	cutworm
	phula rog bhairash rog kukra rog	bushy disease 'virus' disease curl disease	little leaf of eggplant
	gora shukna rog sephÚi rog gora mora rog	foot dry disease 'septic' 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 eggplant
	guÚi rog	knot disease	root knot of eggplant
	sephÚi rog	'septic' disease	may be stem rot
	chhoÚo lal poka chhoÚo sada poka	small red insect small white insect	aphid
onion (pĩyaj)	aga mora aga shukna rog	tip die tip dry disease	unidentified
	gora pocha rog	base rot disease	stem rot of onion
	menda poka	aphid	jassid
	ghugri poka	ghugri (onomotopoeic) insect	mole cricket
	pata kukrano rog	leaf curl disease	virus
betel vine (pan)	sholma rog	scar disease	virus of betel vine
	khaoni	being eaten	foot rot
	shukna khaoni	eaten until it turned dry	stem rot
	tela laga	spot disease	leaf spot
turmeric (holud)	pata pocha pocha rog	leaf rot rot disease	leaf blight
bottle gourd (lau)	machhi poka bhomra poka	fly insect bee insect	cucurbit fruit fly
	jala mora guÚi pocha	immature fruit die (jala means immature plants, seedlings and young fruits) young fruit rot (guÚi means young fruit)	may be pollination problem
chilli (morich)	kukra laga thupa dhora	being curled becoming bunchy (thupa means bushy, abnormal)	leaf curl of chilli
	leda poka	soft insect	cutworm
bitter gourd (korola)	leda poka	soft insect	fruit fly
teasle gourd (kakrul) **bitter gourd** (korola)	pata morano poka ghora poka	leaf folding insect horse insect	pumpkin caterpillar, leaf folder

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
yard long bean (borboÚi) **teasle gourd** (kakrul)	holud poka kãÚhali poka	yellow insect jackfruit (coloured) insect	grub of epilachna beetle
papaya (pepe)	kukra matha phula rog bhairash rog	curled head bushy (swollen) disease 'virus' disease	virus of papaya
country bean (shim)	jaowa poka ichhi poka jab poka menda poka	gradually destroying insect meaning unclear aphid aphid	bean aphid
	majra poka lal kira leda poka	centre insect red worm soft insect	bean pod borer
	pata mora rog	leaf die disease	bean leaf miner
sweet gourd (mishÚi kumṛa)	phula rog bhairash rog kukra rog	bushy disease 'virus' disease curl disease	cucurbit virus
red amaranth (lal shak)	lal machhi shundori machhi ura poka	red fly beautiful fly flying insect	red pumpkin beetle
coconut (narkel)	phol jhora rog phol phata rog	fruit dropping disease fruit cracking disease	bud rot of coconut
	pani shukna rog	water drying disease	possible nutrient deficiency
pomegranate (Ãalim)	Ãalimer kira lal kira poka majra poka	pomegranate worm red worm insect centre 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 (ÚomeÚo)	bhairash dhora	'virus' attack	virus
	hoshi poka	meaning unclear	aphid
	gora shukna gora pocha pochon rog	base dry base rot rot disease	foot rot
	phol jhora rog	fruit dropping disease	fruit rot
jackfruit (kãÚhal)	muchi jhora	bud dropping	fruit rot
	kando khaowa poka	stem feeding insect	jackfruit stem borer
garlic (roshun)	matha lal howa	head reddening	purple blotch of garlic
	ghugri poka	ghugri (onomotopoeic) insect	mole cricket
spinach (palong shak)	pocha kana gora pocha	rot blind (sense unclear) base rot	foot rot
pointed gourd (poÚol)	holud poka	yellow insect	grub of epilachna beetle
mustard (shorisha)	jaowa poka	gradually destroying insect	mustard aphid
lentil (dal, moshur)	gora pocha	base rot	foot rot

Table A8: Local names of plant health problems in Norsingdi district (Winter)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
country bean (shim)	pachhi poka ichhi poka menda poka jab poka	wrapping insect unclear aphid aphid	bean aphid
	majra poka shimer kira machhi poka shada kira	centre insect bean worm fly insect white worm	bean pod borer
	kando pocha pocha rog pata pocha kænsher	stem rot rot disease leaf rot “cancer”	anthracnose of bean
	jhora rog shim jhora	shedding disease pod dropping	possibly bean anthracnose
	murga poka	cockral (rooster) insect	epilachna beetle
potato (alu)	morok rog pata mora rog gora shukna rog	dieing disease leaf die disease base dry disease	late blight of potato
bitter gourd (korola)	pipri laga	being curled	leaf curl of cucurbit
cucumber (shosha)	pakra laga	being curled	virus of cucurbit
guava (peyara)	leda poka	soft insect	guava fruit borer
	makorsha	spider	mite of guava
bottle gourd (lau)	gachh mora mora laga Ãoga mora shukna rog	plant die dieing tender shoot die dry disease	may be root knot
chilli (morich)	pipri laga pukra laga phula rog bhairash rog	being curled forming curled bushy disease virus disease	leaf curl of chilli
tomato (ÚomeÚo)	pukra laga	forming curled	leaf curl of tomato
	gora pocha	base rot	foot rot of tomato
eggplant (begun)	majra poka beguner kira Ãoga chhidrokari	centre insect eggplant insect tender shoot boring	eggplant shoot and fruit borer
	dul mora rog aga mora rog kænsher	branch die disease tip die disease ‘cancer’	die back of eggplant
cauliflower (phulkopi)	phul mela rog phul phota rog	flower opening disease flower blooming disease	buttoning of cauliflower
cauliflower (phulkopi) **cabbage** (bãdhakopi)	badami kira kira poka holud kira	brown worm worm insect yellow worm	larva of cabbage butterfly
	kaÚui poka leda poka	cutting insect soft insect	cutworm
sweet gourd (mishÚi kumṛa)	bhairash laga pukra rog	getting ‘virus’ curl disease	virus of cucurbits

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
yard long bean (borboÚi)	pachhi poka ichhi poka	wrapping insect unanalyzable	aphids
cucumber (shosha) **teasle gourd** (kakrul)	pata morano poka shobuj kira	leaf folder insect green worm	pumpkin caterpillar
	pipri laga	being curled	leaf curl of cucurbit
bottle gourd (lau) **sweet gourd** (mishÚi kumṛa)	bolta poka machhi 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)	gora pocha gora phata rog	base rot base cracking disease	gummosis of lemon
	sholma rog	scar disease	scab of lemon

Table A9: Local names of plant health problems in Moulvibazar district (Winter)

CROP	LOCAL NAME	GLOSS OF LOCAL NAME	COMMON NAME
potato (alu)	kukri bemar kukra rog	curling disorder curling disease	leaf curl of potato
	pocha rog pocha morok morki bemar	rot disease rot death disease for dieing	late blight of potato
	bichha poka	hairy insect	caterpillar of potato
country bean (shim) **yard long bean** (romesh)	idla poka lawri poka jab poka	unclear 'lawri' is a wild fruit that grows very close to the stem, hiding the stem	bean aphid
	kira poka shimer kira	worm insect worm of bean	bean pod borer
	bichha poka	hairy insect	caterpillar of bean
eggplant (begun)	beguner kira majra poka	eggplant worm centre insect	eggplant shoot and fruit borer
eggplant (begun), **chilli** (morich), **tomato** (ÚomeÚo), **potato** (alu)	kaÚui poka kalo poka	cutting insect black insect	cutworm
tomato (ÚomeÚo)	jhar mora gora pocha	clump, hill dies base rot	foot rot of tomato
	kukra rog	curling disease	unknown
red amaranth (lal shak)	shada rog	white disease	white rust
chilli (morich)	gora pocha jhar mora	base rot hill, clump dies	foot rot
sweet gourd (mishÚi kumṛa)	kuri jhora	immature flower dropping	possible pollination problem
cabbage (bãdhakopi)	leda poka	soft insect	larva of cabbage butterfly
french bean (phorash)	gora pocha	foot rot	possibly attack of pulse beetle
pomegranate (Ãalim)	morok rog	dieing disease	fruit rot
cauliflower (phulkopi)	gora pocha gora shukna	base rot base dry	foot rot

Annex B: Local knowledge of plant health problems

Table B1: Insect knowledge and management in Natore (Summer I)

CROP	LOCAL NAME OF INSECT AND FARMERS' DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
banana	**KATH POKA ● DAUDA ROG** - Small blackish, hard-bodied insect - Eats the green part of the leaves - Also attacks the inflorescence and sucks the sap of young fruits - Spreads the scar disease (dauda rog), which reduces the fruit size and market value - Young leaves turn yellow - During the daytime, it hides inside the midrib of the leaf	BANANA SCARING BEETLE (Banana leaf and fruit beetle). Coleoptera family Chrysomelidae. *Colaspis hypochlora* **MP:** Pesticide such as Malathion, Sumithion etc are applied but do not give good results. Application of ash.
beans: yard long bean, country bean, (see also cowpea)	**JAB POKA ● MENDA POKA** - Small, brown, soft-bodied insect - Insect does not move but sucks the juice from the young vine, leaf and fruits - The plant cannot grow large and the pods are shed - The most damaging insect of the yard long bean	APHID. Hemiptera, Superfamily Aphidoidea. Preferred scientific name Aphididae. *Aphis* spp. **MP:** Application of ash. Application of soap water. Hand scraping. Application of pesticides such as Malathion, Dursban etc
chilli	**THANGA POKA** - Large legged reddish insect that lives in soil - Bore holes in the soil - Cuts the plant and the root - Generally attacks the young plant stage - Cannot tolerate water	FIELD CRICKET. Orthoptera, family Gryllidae. Field crickets are not a big problem in chilli. Farmers may confuse symptoms with mite or thrip damage (D. Sarker, pers. com.) **MP:** Application of excess water for 1-3 hours. Sometimes granular pesticides such as Basudin are applied, but results are poor
chilli	**KAÙUI POKA ● LEDA POKA** - Dark coloured, soft-bodied insect, ½ to 1 inch long - Always remains under the soil - Cuts the basal portion of the plant - Infestation is worst during sunset and sunrise - Also cuts the seedlings of brinjal, cabbage and cauliflower - Infestation is high when the soil is soft and dry	CUTWORM. Lepidoptera larvae of the family Noctuidae **MP:** Application of excess water. Application of Cymbush mixed with molasses and khoi (fried rice) **.** Hand pick the insect, found hidden under the cut plant. Sawdust, gur (raw material of sugarcane) and Cymbush is mixed and applied, and gives a good result. Application of crushed ripe chillies mixed with water
chilli, (see also sugarcane)	**UI POKA ● ROI POKA** - Lives in soil - Soft-bodied but cannot be easily controlled with insecticide - Cuts the roots and lifts the soil near to the stem, and takes sap from the root - Plant growth is poor and is incapable of bearing fruits	TERMITE. **MP:** Apply water by flooding with irrigation water, but results are poor. Put a stick close to the stem. Termites eat the stick instead of the plant . Sometimes Heptachlor is applied, which gives good results
coconut	**CARA POKA** - White coloured insect about 3 inches long - Bores the tender part of the stem and eats the inside with a saw-like cutting action - Sometimes it eats the soft leaves by cutting the edges - Within a few days the plant become weak and finally dies	POSSIBLY RHINOCEROS BEETLE GRUB. Coleopteran, family Scarabaeidae*Oryctes* spp. **MP:** Generally control measures are not taken. Sometimes kerosene oil is applied with a rope
cowpea (see also beans)	**JAB POKA ● MENDA POKA** - Small, brown, soft-bodied insect - Insect does not move but sucks the juice from the young vine, leaf and fruits - The plant cannot grow large and the pods are shed - The most damaging insect of the yard long bean	APHID. Hemiptera, Superfamily Aphidoidea. Preferred scientific name Aphididae. Aphis spp. **MP:** Application of ash. Application of soap water. Hand scraping. Application of pesticides such as Malathion, Dursban etc

CROP	LOCAL NAME OF INSECT AND FARMERS' DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
cucumber (small variety khira)	**ACCHA POKA** - Green coloured small hairy insect - Initially hundreds of insect are present on the underside of leaf - Eats the green leaf and the young fruit - Leaves become a white colour, plant cannot grow large - Became serious 3-4 years ago - Also found in teasel gourd and bitter gourd	UNIDENTIFIED. Farmers describe the larva of the epilachna beetle *Epilachna* spp. (D. Sarker, pers. com.) **MP:** Generally control measures are not adopted. Insecticides such as Malathion, Cymbush etc are sometimes sprayed
cucumber, sweet gourd	**MACHHI POKA ● HOLUD MACHHI ● PHOL CHHIDROKARI POKA** - Small wasp-like yellowish or reddish coloured insect - Bores the fruit with its sting and the fruit becomes rotten - Fruit turns a yellowish colour and becomes rotten - Infested fruit becomes deformed if it grows large - When the fruit is bored into, a glutinous substance is secreted - Sometimes worms (larvae) are found inside the fruit - Also attacks white gourd, melon, sweet gourd, pointed gourd, bitter gourd etc	CUCURBIT FRUIT FLY. Diptera, family Tephritidae. *Bactrocera cucurbitae*. Farmers may be confusing several different species of insects which attack different crops (D. Sarker, pers. com.) **MP:** Application of ash. Remove infested fruit. Pesticides such as Malathion, Tafgor, Marshal etc at 10-15 ml per 10 L water are sprayed 2-3 times a week
eggplant	**BEGUNER KIRA ● MAJRA POKA ● PHOL CHHIDROKARI POKA** - Insect severely damages brinjal - Small brown coloured worm that eats tender plant shoots, plant then dies - Attacks the young fruits, which become rotten inside - Infestation is highest during the flowering and fruiting stage - The black spoiled part of the fruit is visible - The brinjal becomes curved - Infested part becomes wilted during sunny days	BRINJAL SHOOT AND FRUIT BORER. Lepidopteran larvae, family Pyralidae *Leucinodes orbonalis* **MP:** Cut out and remove the infested plant part. Insecticides such as Ripcord, Cymbush, Fenfen Malathion etc are sprayed at 10-15 ml per 10 L water for 2-3 day intervals. It cannot be controlled without frequent application of pesticide. During serious infestation, the field is sprayed up to 7 times a week. Application of ashes with kerosene oil. Two people take an end of a rope soaked in kerosene oil and drag the rope through the row of crops, administering the kerosene
groundnut	**URA POKA** - 1-inch long, lives under the soil, has wings and can fly - Produces sound at night - Bears very strong mouthparts - Brownish to dark reddish-brown colour - Eats the root and cuts the stem	UNIDENTIFIED INSECT. Farmers describe the mole cricket (J.Waller, pers.com.) **MP:** Generally control measures are not adopted . Insecticides such as Furadan, Basudin, Nogos, Indian oil etc are sprayed. When the plant grows large, it is difficult to apply chemicals because the leaves burn
jackfruit	**BHOMOR POKA ● BHOR POKA ● BIRBIRA ROG ● PHOL POCHA ROG** - Dark or reddish coloured insect that bores into young fruits - A brownish black sticky substance is secreted from the bore holes - The fruit becomes rotten and cannot grow large - Black lesions appear	JACKFRUIT FRUIT BORER. Lepidopteran larvae, family Pyralidae. *Glyphodes caesalis.* **MP:** Generally control measures are not taken
mango	**PATA POKA ● CHHOÙKA POKA** - Brownish coloured small insect - When the plant part is shaken, the insect moves by jumping - Attacks the inflorescence, leaf and other soft parts - It sucks the green part of the plant part which turns a pale colour	MANGO LEAFHOPPER. Superfamily Cicadelloidea, family Cicadellidae. *Idioscopus* spp. *I. clypealis*, *I. atkinsoni* and *I. niveosparsus* are common species in Bangladesh (D. Sarker, pers. com.). **MP:** Application of pesticides e.g. Cymbush 10 EC, 1-2 times in a season. Application of water to the small trees.

CROP	LOCAL NAME OF INSECT AND FARMERS' DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
mango	**ACHHA POKA ● BICHHA POKA** - Reddish coloured hairy insect 1-2 inches long - Eats the leaves - Insects attacks the plant in large numbers - In severe infestations, all the leaves are eaten and then other plants are attacked - It is generally seen when the plant bears new leaves	MANGO DEFOLIATOR. Lepidopteran, family Saturniidae. *Cricula trifenestrata* (D. Sarker, pers. com.). **MP:** Generally control measures are not taken. Straw or stubble is burnt to produce smoke and heat, resulting in the 'smoking out' of caterpillars. Sometimes, kerosene oil mixed with water is sprayed
okra	**LEDA POKA ● GHORA POKA** - Dark coloured small larvae which eats the tender parts of the plant - When the flower blooms, it enters, and eats the soft parts - Also bores into the fruit, which restricts growth. Sometimes the fruit becomes curved - The same insect bores brinjal - Infested parts wilt during sunny days - The main pest of okra (Ãhæṛosh)	LADY'S FINGER SHOOT AND FRUIT BORER. Lepidopteran larvae, family Noctuidae. *Earias* spp. *Earias vitella* is common in Bangladesh. Farmers may confuse *Earias* with other insects that bore brinjal (D. Sarker, pers. com.). **MP:** Hand picking of infested plant pest and fruits. Insecticides such as Sumithion, Basathrin, Dursban, Fenfen, Sunbelerat, Cymbush etc are sprayed 1-4 times in a week at 5-15 ml per10 L water
gourd: **pointed gourd,** **melon** **teasel gourd**	**MAJRA POKA ● GHORA POKA** **SHOBUJ POKA ● PATA MORANO POKA** - Soft-bodied green coloured larvae - Folds the leaf and eats from inside - Also eats tender shoots and young fruits - Attacks melon, teasel gourd etc - If the folded leaf is opened, a spider web-like structure is seen	UNIDENTIFIED INSECT that is now causing serious damage **MP:** Insecticides such as Regent, Cymbush, and Sumithion etc at 10-15 ml per 10 L water are sprayed for a 7-day interval, and continues over the entire fruiting period.
pomegranate	**LEDA POKA ● PHOL CHHIDROKARI POKA ● PHOLER KIRA** - Worm-like insect, which bores the fruit soon after the flowering stage - Infested part turn a black colour and within a few days drops off the plant - If the fruit grow large, the inner part turns black - Infestation is high during hot weather and can damage up to 90% of the fruits	POMEGRANATE FRUIT BORER. Lepidoptera, family Lycaenidae. *Virachola isocrates*, preferred name *Deudorix isocrates* is common in Bangladesh (D. Sarker, pers. com.). **MP:** Generally control measures are not taken. Sometimes the fruits are wrapped . In some case, insecticides such as Malathion are applied
rice	**CHERA** - Small worm-like, red coloured insect - Remains in the upper layer of the soil - Eats the young roots and the plant cannot grow well - The plant cannot uptake fertilizers and turns a reddish colour - Problem started 4-5 years ago - Appears only in Boro season (irrigated rice field)	PHYLUM ANNELLIDA (BRRI & BSMRAU). Species unknown. **MP:** Sun drying the field. If sun drying not possible, granular insecticides such as Basudin, Furadan etc are applied. 'Indian gas' (Chemical name Kripcord) or Cymbush group pesticides give good results. Apply the chemical, and after an hour, the pest comes out of the soil
rice	**MAJRA POKA** - Cuts the main stem of rice - Attacks from an early stage and remains up to harvesting - Main pest of the irrigated rice field and cuts the central part of the stem - Initially it enters the stem by the basal part - The central leaf is dried and can be easily pulled out - Also infests sugarcane, brinjal etc	RICE STEM BORER. Lepidopteran larvae, family Pyralidae. *Chilo* spp. **MP:** Put a stick in the field to attract birds. Use a hand net to remove the insect. Granular insecticides such as Basudin, Furadan, Carbofuran, Diazinon, Sunfuran etc are used at the rate of 1 kg per bigha[1], 1-3 times. After 15 days, the liquid chemical is sprayed 1-2 times. Sometimes molasses are used as a trap, which is put in a pot, supported on a bamboo stick. Crushed Naphthalene mixed with urea is used, and gives good results

[1] One third of an acre (1500 squared metres)

CROP	LOCAL NAME OF INSECT AND FARMERS' DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
sugarcane	**MAJRA POKA ● MAJKAÙA POKA** - It cuts the central part (maj) of the cane resulting in localised dying, then, the whole plant may die - It attacks at an early stage and remains until harvesting - If the cane is large, it attacks the soft part, and the plant dies - The stem turns red inside, and has an unpleasant odour - Farmers think that phuti poka (a small moth, not a noctuid) is the mother of majra poka - When a plant has been attacked by majra poka, the central leaf pulls out easily - During the rainy season, infestation is high	SUGARCANE STEM BORER. Lepidopteran larvae, family Pyralidae. *Chilo* spp. **MP:** Cut out the infested cane. Granular insecticides such as Furadan, Basudin etc are applied during land preparation after rain at the rate of 1-3kg per bigha. Heptachlor and other unauthorized chemicals are sprayed. Sometimes bleaching powder mixed with water is sprayed
sugarcane, (see also chilli)	**UI POKA ● ROI POKA** - Lives in soil - Soft-bodied but cannot be easily controlled with insecticide - Cuts the roots and lifts the soil near to the stem, and takes sap from the root - Plant growth is poor and is incapable of bearing fruits	TERMITE. **MP:** Apply water by flooding with irrigation water, but results are poor. Put a stick close to the stem. Termites eat the stick instead of the plant . Sometimes Heptachlor is applied, which gives good results.
sweet gourd, cucumber	**SHUNDURI POKA ● LAL POKA ● URA POKA** - Red coloured small insect - Eats the leaf, making round holes - Infested leaf become pale coloured and the plant cannot grow large	RED PUMPKIN BEETLE .Coleoptera, family Chrysomelidae. *Aulacophora foveicollis* **MP:** Application of ash.
teasel gourd, ribbed gourd	**KATHALI POKA ● DAL POKA ● BOSHONTO POKA HOLUD POKA** - Round, yellow and soft-bodied. Hairs over entire body - Eats the green part of the leaf and the tender part of the vine - Growth of the plant and fruit production is limited - Remains on the lower surface of the leaf, and difficult to control with chemicals	GRUB OF EPILACHNA BEETLE. Coleoptera, family Coccinellidae. *Epilachna* spp. **MP:** Insecticides such Malathion, Fyfanon, Indian oil etc are sprayed at 2-3 corks[2] per 10 L of water, 10-15 times depending on the infestation rate. Crushed Naphthalene with ashes are used

[2] One cork is equivalent to 5 ml

Table B2: Disease knowledge and management in Natore (Summer I)

CROP	LOCAL NAME(S) AND FARMERS' DESCRIPTION OF DISEASE	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
bean: mung bean	**BHAIRASH ROG ● PATA KUKRANO ROG** - The most damaging disease of this crop - The plant turns yellow - Leaves curl - The plant cannot bear fruits - Disease appears when the plant is matured	UNIDENTIFIED. Symptoms could be caused by nematode or virus damage (J. Bridge, pers. com.) Begomovirus mungbean yellow mosaic virus is common in Bangladesh. **MP:** Chemicals such as Malathion are applied but are not effective.
chilli	**BHAIRASH ROG ● PATA KUKRANO ROG** - Leaf is curled and turns yellow - Plant cannot bear flowers or fruits - Mosquito like insects sucks the juice	UNIDENTIFIED. Whiteflies are described which transmit leaf curl viruses (J.Waller, pers.com.) Symptoms could also be caused by thrip damage or mite damage. (D. Sarker, pers. com.). **MP:** Uproot plants
coconut	**JHORA ROG ● SHUKNA ROG ● PANI SHUKNA ROG** - Young fruit sheds soon after flowering - Young fruit are cracked and dropped after they dry - Sometimes coconut is visually fresh, but contains no water - Sometimes the coconut bears no kernel or is uneven	UNIDENTIFIED. **MP:** Control measures are not adopted. Sometimes bricks are attached with a rope to the inflorescence, so that it curves downward.
cucumber (small variety, khira)	**GORA POCHA ROG** - The base or root zone is rotted - Proceeds upwards from the base towards the top part of the plant - Yellowing of the plant occurs and ultimately the plant may die - It also appeared in other seedlings	UNIDENTIFIED. From the farmer description, the most likely cause is foot root caused by *Pythium* spp and *Phytopthora* spp. (M. R. Ali, pers. com.). **MP:** Generally control measures are not taken.
eggplant	**CHIPTA ROG ● CHITA DHORA** - Generally found in the matured plant - Leaves of the plant turn a yellow colour - The plant cannot bear fruits or flowers - Roots are knotted - Plants cannot uptake fertilizer - The stem near the root zone is cracked, then dries and finally the plant starts to die	UNIDENTIFIED. Knotting of roots is a symptom of the root knot nematode, (*Meloidogyne* spp.) although roots need to be examined for confirmation (J. Bridge, pers. com.). **MP:** Pesticides are used according to dealer's recommendations, but plants do not recover from the disease.
eggplant	**GACHH PHULA JAOWA ● BHAIRASH ROG** - The disease starts at the fruiting stage - The leaf is very small, thin and the plant is dense and has many branches - Few flowers are produced, which do not bear fruits	UNIDENTIFIED. Possibly little leaf of brinjal or another mycoplasma-like organism (MLO) (J.Waller, pers. com.) **MP:** Uproot the plants. Generally chemicals are not used.
garlic	**GORA PHULA JAOWA** - The cloves of the head of the garlic break apart instead of intact - Each clove sprouts a stem - Production decreases - Plant is a pale colour with yellow patches. - The problem has worsened in the last 4-5 years - A severe infestation can damage 5-10% of bulbs	UNIDENTIFIED. From the farmer description, the most likely cause is abiotic or physiological. (M. R. Ali, pers. com.). **MP:** Generally control measures are not taken, although sometimes MP fertilizer is used.
garlic, onion	**PATA MORA ● PATA PURA ● AGA MORA** - When the plant is one to two months old, the tip of the leaf becomes dried - The symptoms start at the tip and proceed to the base of the leaf - Leaf slowly turn a yellow colour - In some cases, the whole plant is dried. - The plant becomes dried 15 days to one month before harvest - The bulb is small in size	UNIDENTIFIED. Could be purple blotch of onion (*Alternaria porii* and *Stemphyllium* sp. (M. R. Ali, pers. com.). Symptoms similar to that caused by downy mildew (*Peronospora destructor*) or *Botrytis* (J.Waller, pers. com.) **MP:** Application of ashes. In some cases, Ridomil is sprayed but does not give good results.

CROP	LOCAL NAME(S) AND FARMERS' DESCRIPTION OF DISEASE	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
gourd: sweet gourd	**KÆNSHER ROG** - Leaves have uneven patches of green and yellow colours - Leaves are small and hard and sometimes wrinkled - Plant rarely bears fruits and flowers and the skin of the fruit is wrinkled	UNIDENTIFIED **MP:** Application of ash. Cut out the infested plant part
gourd: white gourd	**GORA POCHA** - Base of the plant initially rots, and becomes sticky - Rotten part gradually enlarges - Plant turns a yellowish colour and finally the whole plant dies	UNIDENTIFIED **MP:** Control measures are not taken
groundnut	**MORA LAGA** - Plant initially turns a reddish colour - Infected plant has fewer roots - Finally the whole plant dies - The symptoms appear at all growth stages - Sometimes termite-like insects are present at the root zone	UNIDENTIFIED. From the symptom description, it is most likely to be a *Sclerotium rolfsii*, *Rhizoctonia solani* complex (J.Waller, pers.com.) **MP:** Insecticide such as Malathion, Fenfen or fungicide Ridomil, Kumulas etc are sprayed
jackfruit	**JHORA LAGA ROG ● PHOL POCHA LAGA ● MACHHI JHORA** - Initially the bud-spikelet of the turns red, then the young fruit turns black and drops - A powder-like black substance covers the young infected fruit - Young fruits, 2-4 inches long, are affected, but mature or large fruits remain unaffected	RHIZOPUS ROT OF JACKFRUIT **MP:** No control measures are taken, apart from applying water to the base of the tree
mango	**JAOWA DHORA ● JHORA PATA** - Disease infection starts when the fruit is young and peanut sized - Spikelet turns a black to yellowish colour - Finally the young fruit drops from the tree	ANTHRACNOSE OF MANGO. Anthracnose usually affects young inflorescence (J.Waller, pers.com.) Powdery mildews attack when fruits are peanut sized (M.R. Ali, pers. com.). **MP:** Pesticides such as Sevin powder and Sunguard are mixed with water at 1 spoon per 10 L and sprayed twice, once at the flowing stage and another when the mango is peanut sized
rice	**GORA POCHA ROG** - Generally found during the tillering stage. - Spots occur on the basal part which becomes rotten - Plant turns a yellowish colour and dies - Generally occurs when there is water in the field - Generally found in Aman season but it also occurs in Boro rice (irrigated rice)	UNIDENTIFIED. From the farmer description, the most likely cause is sheath rot *Rhizoctonia* spp. (M. R. Ali, pers. com.) **MP:** Generally control measure are not taken
sugarcane	**KALO PATA ROG ● BHAIRASH DHORA ROG** - The tender leaf turns a black colour, which bears an ash-like substance - When this substance falls on another plant, it also becomes infested - Plant turns a yellowish colour, cannot grow properly, and bears few tillers - Generally found in hot weather and incidence is lower during the rainy season	UNIDENTIFIED. Smuts promote tillering so it is unlikely to be caused by this (J.Waller, pers.com.) **MP:** Cut out the infested plant part

Table B3: Insect knowledge and management in Norsingdi (Summer I)

CROP	LOCAL NAME: FARMERS DESCRIPTION	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
banana	**KAÙH POKA** - Dark coloured, hard bodied insect that sucks the sap from tender shoots, leaves and fruits - Hides inside the leaf blade during the day time and infests at night - Infestation is high during inflorescence - When the hard insects walks on young fruits, they produces scab-like disease - The skin of the fruit is slightly thickened and market value is reduced - The most damaging insect of banana - It attacked older trees 5-10 years ago, but now it infests new plants	BANANA SCARING BEETLE (Banana leaf and fruit beetle). Coleopteran Family: Chrysomelidae. *Colaspis hypochlora.* **MP:** Insecticide such as Malathion and Cymbush are sprayed 3-4 times in a week during the inflorescence stage, at 15 ml per 10 L water. Wrap inflorescence at a young stage
bean: **yard long bean**	**JAB POKA • PACHHI POKA** - Small, dark coloured, soft-bodied insect that covers the tender vine and young fruits - Sucks the sap from the soft parts of the plant. - Tender vines and young leaves curl - Fruit is curved and deformed - Also attacks beans	APHID. Hemiptera, Superfamily: Aphidoidea. Preferred scientific name Aphididae. *Aphis* spp. **MP:** Application of ash. Insecticides such as Malathion, Cymbush Marshal, Tafgar etc at 20 ml per 40 L water are sprayed. Application of crushed Naphthalene with ash gives good results
bitter gourd	**BOLTA POKA** - Small honeybee –like, active, flying insect - Bears a sting behind the body, which is used to puncture holes in young fruit - The infested fruit secretes a glutinous substance - Worms can be found inside infested fruit - The same insect infests sweet gourd, bottle gourd, white gourd, and cucumber	CUCURBIT FRUIT FLY. Diptera, Family Tephritidae. Possibly *Bactrocera cucurbitae* (D. Sarker, pers. com.) **MP:** Pesticide such as Malathion, Fyfanol, Dursban, Cymbush etc at 10-15 ml per10 L are sprayed for 1-3 days a week. It is sprayed up to 10-15 times in the cropping season
chilli (see also gourd)	**SHOBUJ LOMBA KIRA • GHORA POKA • PHOLER KIRA • PHOL CHHIDROKARI KIRA** - Green coloured, like the leaves - The insect folds itself into the leaf to hide and eats the young leaf and fruits. - Infestation is greatest when flowers start to turn to fruit	UNIDENTIFIED INSECT. Likely to be the pumpkin caterpillar *Diaphania indica* as this was found inside the folded leaf. **MP:** Hand picking during artificial pollination When infestation is high, liquid insecticides such as Ripcord, Cymbush, Fyfanol Dursban etc are sprayed
cucumber	**GORA POKA • LAL POKA • HAJHARI POKA** - Very small red insect - Thousands of insects can be found on the underside of one leaf - Sucks the sap of the leaf, which gradually turns yellow - The infested leaf shows pox like symptoms and gradually curls - Can severely destroy crops within 1-2 days and has become worse in the last 5-6 years - Also infests brinjal	RED MITE. Family: Tetranychidae spp. **MP:** Pesticides such as Aldefen Aktara, Asataf etc at 10-20 ml per 10 L water are sprayed 2-4 times a week. Plants are uprooted when infestations are high
eggplant	**MAJRA POKA • CHHOÙKANO POKA • KIRA POKA PHOL CHHIDROKARI POKA** - Insect generally infests when the plant is about a foot high - Initially it bores into the tender shoots, and drying symptoms occur - Infected plant part appears wilted during sunny periods - Present all the year round - Fruits are seriously affected, and without using pesticide it is impossible to grow the crop	BRINJAL FRUIT AND SHOOT BORER. Lepidopteran larvae, family Pyralidae. *Leucinodes orbonalis* **MP:** Pesticides such as Rhison, Dursban, Fenfen, Fyfanol, Indian oil, Melfen, Bavistin etc at 15-20 ml per 10 L are sprayed 2-5 times a week. During the rainy season, infestation is serious, and pesticides are sprayed up to 7 days in a week. Sometimes dried and crushed pepper is mixed with boiling water and salt, and applied

CROP	LOCAL NAME: FARMERS DESCRIPTION	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
gourd: teasel gourd, gourd: bitter gourd	**HOLUD POKA ● BOSHONTO POKA ● KATHALI POKA** - Yellowish coloured, round, soft-bodied insect, upper part of the body bears soft hairs - Lays eggs on the lower part of the leaf which becomes yellow - It cannot fly, but remains on the lower part of the leaf, where it eats - Also eats pointed gourd and bitter gourd leaves	GRUB OF EPILACHNA BEETLE. Coleoptera, family Coccinellidae. *Epilachna* spp. **MP:** Pesticide such as Syfanol, Malathion Dursban, Ripcord, Cymbush etc at 20-30 ml per 10 L water are sprayed for 2-3 times a week Excessive amounts of pesticides are required to control this insect as it is found on the underside of the leaf
gourd: teasel gourd, pointed gourd (see also chilli)	**SHOBUJ LOMBA KIRA ● GHORA POKA ● PHOLER KIRA PHOL CHHIDROKARI KIRA** - Green coloured, like the leaves - The insect folds itself into the leaf to hide and eats the young leaf and fruits. - Infestation is greatest when flowers start to turn to fruit	UNIDENTIFIED INSECT. Likely to be the pumpkin caterpillar *Diaphania indica* as this was found inside the folded leaf. **MP:** Hand picking during artificial pollination When infestation is high, liquid insecticides such as Ripcord, Cymbush, Fyfanol Dursban etc are sprayed
gourd: snake gourd	**GORA CHHIDROKARI POKA** - Insect bores the base of the vine and a sticky substance is secreted. The affected part gradually becomes dried and finally the whole plant may die - The insect lives in the soil	UNIDENTIFIED INSECT. Dithane M-45 is sprayed but is not effective
okra	**PHOL CHHIDROKARI POKA ● MAJRA POKA** - Slightly reddish coloured larvae - Generally infestation starts during the fruiting stage, it also bores the tender shoot - Infested fruit bears 1-3 insects - Infestation is high during drought conditions	LADY'S FINGER SHOOT AND FRUIT BORER. Lepidopteran larvae, family Noctuidae. *Earias* spp. *Earias vitella* is common in Bangladesh (D. Sarker, pers. com.). **MP:** Remove the infested part by hand picking. Insecticide such as Fenfen, Melfen, Bavistin etc are sprayed at 10 ml per 10 L water for 3-4 times in a week

Table B4: Disease knowledge and management in Norsingdi (Summer I)

CROP	LOCAL NAME: FARMERS DESCRIPTION	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
brinjal	**SHAID MORA** - The side branch dies first, then gradually the whole plant dies - The disease is spread by wind. Plants in the direction of the wind are affected	UNIDENTIFIED DIEBACK. **MP:** Fungicide such as Dithane M-45, Ridomil at 45 g per 10 L water for 1-2 times in a week and sprayed for 2-4 times in the crop season
gourd: teasel gourd	**PIPRA LAGA ● KUKRANO ROG** - Leaves are curled and very small in size and the plant stops growing - Infested part becomes hard and a cracking sound is heard when pressed - The skin of the fruit turns smooth - Up to 50 % of the crop can be damaged and in the severest case, the whole crop cannot bear fruit. The disease has become worse in the last 2-3 years - Without treatment the disease reduces within 15-20 days, but production is seriously decreased during this time - Sometimes infects chilli	UNIDENTIFIED **MP:** Fungicides are applied but do not give a good result
jackfruit	**KÆNSHER** - Round black spots appear on the bark of the plant - Sawdust like material is found near the small holes on the branches of the plant - At the later stage, the infected part dies and the tree cannot bear fruits - Sometimes the whole plant may die - The symptom appears mainly on the lower part of the plant	UNIDENTIFIED. Most likely an insect-fungal complex (M.R. Ali, pers. com) **MP:** Liquid pesticides are sprayed but gives no result

Table B5: **Insect knowledge and management in Moulvibazar (Summer I)**

CROP	LOCAL NAME: FARMERS DESCRIPTION	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
rice	**LOHARI POKA** - Small black insect, very hard-bodied (like iron) - It scraps the leaf, which becomes white and dried - Attacks after 15 days of transplanting - The field looks whitish like sunhemp - It remains in the field until flowering stage	RICE HISPA. Coleoptera, Family Chrysomelidae. *Dicladispa armigera.* **MP:** Use of hand nets. Apply kerosene oil with a rope. Insecticides such as Schincyper, Malathion, Quinalfos, Dimecron etc used at 150-200 ml per bigha for 3-5 times
rice	**MAJRA POKA ● MANJARA POKA** - Whitish coloured worm-like insect which initially attacks the lower part of the plant - Infestation starts immediately after transplanting and remains until harvesting - The infested central stem dies and can be easily pulled out	RICE STEM BORER. There are two listed in the Crop Protection Compendium, *Chilo suppressalis* and *Scirpophaga incertulas*. Both have whitish pale larvae. **MP:** Insecticides such as Furadan, Basudin, Diazinon, Marshal, etc are sprayed at 1-1.5 kg per bigha for 1-2 times. Application of crushed Naphthalene mixed with fertilizers
taro	**BICHHA POKA** - Greenish coloured, 1-1½ inch long hairy insect - During the daytime, it hides in cool places and attacks the leaf at night - It sucks sap from the leaf and also cuts the stem	UNIDENTIFIED INSECT. **MP:** Malathion at 10-15 ml per 10 L water is sprayed for 10 days intervals, but does not give a good result
yard long bean	**LAWRI POKA ● LEDA POKA** - Very small, blackish-brown insect that sucks juice from leaves, tender shoots and fruits - Infestation rate is very high during the flowering stage and infested parts curl - Black ants also attack at the same time - Infects bean	APHID. Hemiptera, Superfamily: Aphidoidea. Preferred scientific name Aphididae. *Aphis* spp. **MP:** Insecticides such as Malathion, Dursban, Fyfanol etc. are sprayed for 3 times in a week at 20-25 ml per 10 L water. Application of ashes. Sometimes liquid cow dung is also sprayed
okra	**PHUTI POKA ● MAJRA POKA** - Small soft insect found on the lower part of the leaf - Each leaf contains 50-60 insects - Sucks sap from the leaf which results in curling - If the plant is shaken, the insect 'flies' (hops) way	LEAFHOPPER. INDIAN COTTON JASSID OR GREEN JASSID. Hemiptera, Family: Cicadellidae. *Amrasca biguttula biguttula.* **MP:** Insecticides such as Malathion, Dursban, Curaterr, Cymbush, Karate at 10 ml per 10 L of water are sprayed 2-3 times in a week
okra	**MAJRA POKA** - It infests the tender part as well as fruit - Reddish brown larvae are found when the infested shoot is broken - Young fruits are curved and faeces is found - Also found in brinjal	LADY'S FINGER SHOOT AND FRUIT BORER. Lepidopteran larvae, family Noctuidae. *Earias* spp. *Earias vitella* is common in Bangladesh (D. Sarker, pers. com.) **MP:** Insecticides such as Malathion, Agromethion, Melfen at 10-15 ml per 10 L water are sprayed for 2-3 times a week
eggplant	**MAJRA POKA** - Bores into tender shoots which die within a few days - Fruit is seriously infested - It is the most damaging insect of brinjal - Wilt symptoms appeared during sunny days	BRINJAL FRUIT AND SHOOT BORER. Lepidopteran larvae, Family Pyralidae. *Leucinodes orbonalis* **MP:** Insecticide such as Cymbush, Marshal, Dursban, Fenfen, Regent, Curaterr etc at 15-20 ml per 10 L water are sprayed 2-4 times a week
cucumber	**LEDA POKA** - Green and slender, remains on the underside of the leaf - Eats the green part of the leaf leaving the veins as a net - Starts attacking when the leaves form	UNIDENTIFIED CATERPILLAR. **MP:** Hand picking. Liquid insecticides are used when the infestation is serious

CROP	LOCAL NAME: FARMERS DESCRIPTION	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
white gourd, bitter gourd	**BOLTA POKA ● MACHHI POKA ● KHUDE MACHHI** - Wasp-like yellowish insect, which has a sting behind the body - It bores into the young fruit and secretes juice - Fruits cannot grow large, and gradually turn yellow and finally rot. Any fruits reaching maturity are curved - It is a very damaging insect	CUCURBIT FRUIT FLY. Diptera, Family Tephritidae. *Bactrocera cucurbitae* (D. Sarker, pers. com.) **MP:** Insecticides such as Dursban, Tafgar, Fenfen, Schincyper etc are sprayed for 1-2 times a week
teasel gourd	**CHHÃGA POKA ● BICHHA POKA** - Light yellowish colour, hairy and round - Sucks the sap of the leaf - It remains on the underside of the leaf	GRUB OF EPILACHNA BEETLE. Coleopteran beetle, family Coccinellida. *Epilachna* spp. **MP:** Pesticide such as Regent, Dursban, Malathion, Betothin, and Schincyper at 10-15 ml per 10 L water are sprayed 1-2 times a week
mango	**KORATI POKA** - Bores the stem and eats the inside - Infested part secrete glutinous substances - Sawdust like substance is found on infested parts - Infested part is dried and breaks easily during high winds	MANGO STEM BORER. **MP:** Control measures are not adopted
jackfruit	**KARUL POKA ● KORATI POKA** - It bores into young jackfruits - Infested part becomes black and dry - Red coloured, 1 inch long larvae found inside fruit - Fruits become rotten when rainwater enters	JACKFRUIT FRUIT BORER. Lepidopteran larvae, Family Pyralidae. *Glyphodes caesalis* Control measures are not adopted
pomegranate	**DALIMER KIRA** - Reddish-brown larvae bore young fruits when the flower begins to bloom - As the fruit grows, the larvae get larger - The fruit inside becomes black - 80-90% young fruits are rotten and drop	POMEGRANATE FRUIT BORER OR GUAVA FRUIT BORER. Lepidoptera Family Lycaenidae. *Virachola isocrates*, preferred scientific name *Deudorix isocrates*, common in Bangladesh (D. Sarker, pers. com.) **MP:** Generally control measures are not adopted. Sometimes, Malathion, Agromethion etc are sprayed. Wrap the fruits

Table B6: **Disease knowledge and management in Moulvibazar (Summer I)**

CROP	LOCAL NAME: FARMERS DESCRIPTION	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
banana	**GILA DHORA** - The leaves are small, narrow and straight - The plant bears no fruit and is small	UNIDENTIFIED. **MP:** Control measures are not adopted
bean: **yard long bean**	**GORA POCHA • POCHON ROG** - Infestation begins when the plant has 3-4 leaves - Initially the foot region becomes rotten, then the rot spreads - The rotten area is sticky, and when the rot enlarges to about 2", the whole plant dies - The disease appears until the flowering stage	FOOT ROT OF VEGETABLE. Foot rots are caused by *Rhizoctonia* spp. and *Pythium* spp. (M.R. Ali, pers. com.). This may be a secondary symptom caused after insect attack (J.Waller, pers.coms.) **MP:** Pesticide such as Amphigram at 10 g per 10 L water is sprayed for 4 days intervals. Copper sulphate mixed with water is sprayed at the basal part
betel nut	**JHORA ROG** - Initially the bud spikelet turns blackish- red and the young bud drops - About half of the fruits are shed and the remaining fruit does not grow large	BUD ROT OF BETEL NUT. A positive identification is required **MP:** Control measures are not taken
betel vine	**GORA POCHA** - The most damaging disease of betel vine. - The disease is of two kinds, one is black and the other is white rot - Black rot- black spot appeared in leaves and finally the plant becomes rotten. Plant smells like smoke, and infestation is very rapid - White rot- the foot region of the plant become white and smells rotten, finally the plant dies. Infection is slow	UNIDENTIFIED. Young vine leaves are required so it is harvested over a 4-6-week duration. The older vine is placed on the floor and becomes susceptible to diseases. Mechanical damage leading to other causes is likely to be the main cause of the symptoms described (M.R. Ali, pers. com.) **MP:** Fungicides such as Dithane M-45, Ridomil, Sandomil etc at 2-5 g per 1 L water are sprayed for 7-15 days interval. Application of cow dung reduces white rot and increase black rot
betel vine	**KANDO POCHA** - The rot symptom starts when the vine is young and tender and gradually the whole plant is infected - During the rainy season this disease spreads rapidly	UNIDENTIFIED. Complex of disease and mechanical injury (see description above) (M.R. Ali, pers. com.) **MP:** Fungicides such as Ridomil, Dithane M-45 etc are applied.
carambola	**JHORA ROG** - Flowers are shed - If the plant bears fruit, it is often shed at early stage - Mature fruit are curved	UNIDENTIFIED. **MP:** Control measure is not adopted
coconut	**BOJRAGUN • AGA MORE JAOWA** - The most damaging disease of the coconut - Worm about 2 inches long, whitish with a black head - Cuts the central part of the stem and gradually the tender part dies - This insect eats the young leaves	UNIDENTIFIED.. Farmers described the rhinoceros beetle grub (M.R. Ali, pers. com.) **MP:** Control measure are not adopted, although sometimes bricks are hanged by ropes to the inflorescence
coconut	**ISAI KHAOWA** - The fruit bears little or no water, which has an unpleasant odour - The kernel of coconut is uneven - From the outside of the fruit, it is impossible to detect the disease - Sometimes young fruits are dropped with cracking	UNIDENTIFIED. **MP:** Cow dung or other fertilizers are used. Sometimes bricks are used

Table B7: Knowledge and management of plant health problems in Natore (Summer II)

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
amaranth, red (Indian spinach)	**LAL MACHHI ● SHUNDORI MACHHI● URA POKA** - Red coloured fly - Eats the leaves leaving round holes - Infestation starts when the plant starts to produce leaves - Plants cannot grow large and the market value is reduced	RED PUMPKIN BEETLE. Coleoptera, Family Chrysomelidae . *Aulacophora foveicollis.* **MP:** Application of Malathion, Fyfanon, etc. Apply ash
banana	**DAUDA ROG ● DAG PORA ROG ● SALAM ROG** - Scar-like black spots appear on young leaves and young fruits - Possibly caused by a small, black, hard bodied insect that live on the leaves - Generally found in established gardens - Infested fruits take time to ripen and market value is lower	BANANA SCARING BEETLE (Banana leaf and fruit beetle). Coleopteran Family: Chrysomelidae. *Colaspis hypochlora.* **MP:** Application of chemicals such as Biesterin, Basudin, Briffer etc. mixed with fertilizers
banana	**CHERA LAGA** - Pest eats the central stem and as a result the central leaf turns yellow - This pest also eats roots, and the whole plant may die within a few days - Sometimes the stem cracks - Generally found in mature bunches of bananas	Problem unidentified, possibly the banana stem weevil. **MP:** Application of chemicals such as Biesterin, Basudin, Briffer etc. mixed with fertilizers
bean	**JAOWA POKA** - Brown to black coloured insect sucks the sap from the tender shoots, young leaves and fruits - Fruit and plant growth stops - Same insect attacks the yard long bean - The infested fruit is curved and deformed - Cold weather favours the infestation of this pest	BEAN APHID. *Aphis craccivora* and *Aphis fabae* are found in Bangladesh. **MP:** Application of chemicals such as Cymbush, Fyfanon, Fenfen, Malathion etc. Application of ash mixed with kerosene oil. Application of the extract of tobacco leaf
bean: yard long bean (see also teasel gourd)	**HOLUD POKA ● KATALI POKA** - Round, yellow insect with soft spines - Eats the young leaves leaving the leaf skeleton, which looks like a net - Eats the tender shoots and young fruits - Can be found on the lower surface of the leaf - Plant growth is reduced and produces few fruits - Hot weather favours the infestation - Has been identified as a serious pest in the last 6-7 years - Infestation starts one month after transplanting and remains throughout the season	GRUB OF EPILACHNA BEETLE . Coleoptera Family: Coccinellidae **MP:** Application of Malathion, Dursban, Decis etc. Apply ash
betel vine	**KHAONI** - The stem that comes in contact with the newly applied soil is affected - The base of the stem turns a white or black colour, and becomes soft, sticky and rotten. Stems also gives off an unpleasant odour - Disease becomes severe after the rainy season - The infestation rapidly increases if oil cake and fertilizers are applied to warm and dumpy soils. Gas produced from the decomposition of oil cake may cause this disease - Soil surrounding the infested part become wet - Generally, gardens that are 10-20 years old are severely infested	FOOT ROT OF BETEL VINE. Mechanical damage can also be one of the main causes of the symptoms described due to the harvesting process. Oil cake changes the microbial state of the soil, and ph etc. Weak pathogens can then invade susceptible plant roots. Need to add oil cake to a different part of the field (where crop is not grown). Or add to a field before planting and sowing crop (M.D. Ali, pers. coms.). **MP:** Application of pesticide such as Tilt, Bavistin, etc. Apply sandy soil. Application of Knowin, Cupravit, Vesivax, Agrovax etc

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
betel vine	**SHUKNA KHAONI** - Rot symptoms are observed near the middle of the stem. - Dry rot symptoms appear in the stem and enlarge to 2-4 inches. - Disease favours fog and warm conditions - This disease may be caused by the contamination of stem with the infested blackish root zones - In severe infestations, the whole plant may die	STEM ROT OF BETEL VINE. There appears to be two problems being described. *Colletotrichum* spp. can affect vines **MP:** Application of Knowin, Cupravit, Tilt etc. Apply dry sandy soil
betel vine	**TELA LAGA** - Black to brown spots observed on the leaf - This disease is generally found all the year round, but is most severe during the rainy season - If oil cake is applied in wet soil or excessively dry soils, the disease rapidly attacks - Plants grown in shady places influence the disease infestation. - Excess fertilizer application or nutrient deficiency also favours the disease - Production maybe reduced to 50 % in cases of severe infestation	UNIDENTIFIED LEAF SPOT OF BETEL VINE **MP:** Uniform shedding of plant leaves . Small amounts of mustard oil cake and cow dung are applied
betel vine	**SALAM ROG** - Leaves become scabby and curved - Disease starts from the tip part and gradually spreads to the whole plant - The tip becomes narrow - Warm weather favours the disease - In severe infestations, the whole garden may be destroyed	UNIDENTIFIED. From the description, this is viral or mite damage (M.D. Ali, pers. com.) **MP:** Uproot the affected plant
chilli	**KUKRA LAGA ● THUPA DHORA ● BHAIRASH ROG** - Chilli leaves become yellow and curled - The plant becomes bushy and bears many branches - The plant cannot produce flowers or fruits. - Warm weather favours the disease, and summer varieties seriously suffer - Within a few days the whole field may become affected - It has become a destructive disease in the last 4-5 years	LEAF CURL OF CHILI. Could possibly be due to mite damage, viral, or a *Colletotrichum* dieback (M.R. Ali, pers. com.). **MP:** Uproot infested plant. Apply ash. Application of zinc and 'agro grow' (a vitamin)
coconut	**MAJRA POKA ● KIRA POKA** - Large white worm-like pest that bores the soft part of the top of the fruit and eat inside - The central part is destroyed resulting in the central leaf dying and within a few days the whole plant may die - Also eats the young leaves - Infestation occurs all the year round	RHINOCEROS BEETLE GRUB. Coleopteran beetle, Family Scarabaeidae *Oryctes* spp. **MP:** Control measures are not adopted
eggplant	**MAJRA POKA** - Bores the tender shoots and eats the insides - As the plant bears young shoots, the infestation starts and remains the entire crop season. Infestation is highest during flowering and fruiting stage - Infestation has been around since the beginning of brinjal cultivation, but within the last 10-15 years, it has seriously damaged the crop	BRINJAL FRUIT AND SHOOT BORER. Lepidopteran larvae of the Family Pyralidae. *Leucinodes orbonalis* **MP:** Chemicals such as Ripcord, Cymbush, Acalux, Fenfen, Indian oil, Marshal, Suntap etc are used. Remove the infested plant parts

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
eggplant	**HOLUD POKA** - Yellow coloured, soft spiny insect that eats the green parts of the leaf - Infests the plant from the seedling stage but infestation is greatest at the vegetative stage - Lives on the underside of the leaf and is difficult to control by chemicals - Growth of the plant is reduced and the plant bears very few fruits	EPILACHNA BEETLE. *Epilachna* spp. **MP:** Chemicals such as Fenfen, Malathion, Cymbush etc are used. Apply ash
eggplant	**LEDA POKA** - Lives on the underside of leaves - Cuts the young seedlings just above the soil surface - Serious damage is done in the morning - Cannot tolerate excess water and infestation favours soft and dry soil conditions	CUTWORM. *Agrostis ipsilon* is common in Bangladesh **MP:** Farmers flood the field. Hand pick the insect. Molasses, and rice husk mixed with Cymbush is applied
eggplant	**PHULA ROG** - Leaves are small and curl - Plants bears many branches, and becomes bushy - Plants bear few flowers and fruits. If fruits are produced, they are deformed - Disease generally starts from the fruiting stage	UNIDENTIFIED. Likely to be little leaf of brinjal **MP:** Chemicals are not used. Uproot infested plant
eggplant	**GORA SHUKNA ROG • SEPHTI ROG** **GORA MORA ROG** - The base part of the plant is dried and become narrow - Roots of the plant become rotten - Sometimes black spots are seen and the stem cracks and sticky substances are exuded - Plant turns pale and dies - Sometimes fruits become rotten - Disease has become a serious problem in the last 3-4 years - Generally matured plants are affected	UNIDENTIFIED FOOT ROT . Strong possibility of interaction between fungi and nematodes (J. Bridge, pers. com.). **MP:** Application of Tute and lime
eggplant	**DUL MORA ROG • KALO POCHA ROG** **AGA MORA ROG** - Black lesions are observed on branches of one side of the plant - Infested branches are dried. The disease gradually spreads backwardly and finally the whole plant dies - Severely infected plants have no leaves - Considerable damage has been observed in the last 4-5 years	UNIDENTIFIED DIEBACK . Most likely to be die back caused by *Phomopsis vexans* (J.Waller, pers.com.) **MP:** Uproot infested plant
eggplant	**GUTI ROG** - The roots of the plant become knotted - Most roots are damaged - The plant cannot uptake fertilizers and turns yellow - Bears few flowers or fruits - Within a few days the plant may die - Generally found in matured plants - In the last 4-5 years it has become a serious problem	Root knot of brinjal. *Meloidogyne* spp. **MP:** Uproot infested plant

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
eggplant	**SEPHṬI ROG** - Blackish lesions are seen first on the base part of the plant stem - Infested part dies within few days then the whole plant may die - Sometimes the branches and fruits show the symptom - Infested bark sometimes cracks and sticky substances are secreted - Generally found in matured plants and has caused considerable damage for the last 3-4 years	UNIDENTIFIED DIEBACK. . Most likely to be die back caused by *Phomopsis vexans* (J.Waller, pers.com.) **MP:** Application of Dithane M-45, mixed with a sticky starch 'aqua wint' (available at poultry suppliers)
gourd: bitter gourd	**LEDA POKA** - Bores into the bitter gourd and within a few days, the fruit turns yellow and finally rots - Whitish worm-like insect are found inside the fruit - Hot and cloudy weather favours the infestation of this insect - In severe infestations 50% of the fruits are damaged	DIPTERAN LARVA. Possibly the Cucurbit fruit fly. Diptera, Family Tephritidae. *Bactrocera cucurbitae* (D. Sarker, pers. com.) **MP:** Application of chemicals such as Cymbush, Fyfanon, Decis etc. Apply ash
gourd: sweet gourd	**PHULA ROG ●BHAIRASH** - The leaves turned into yellowish coloured and the virus of the leaf becomes white - Sometimes the leaves become curled - Plant produces few fruits or flowers. - If the plant bears fruits, it becomes wrinkled and deformed, and with in a few days it is spoiled. - The disease generally affects in the summer season	UNIDENTIFIED. **MP:** Apply ash. Uproot infested plant
gourd: teasel gourd (see also bean)	**HOLUD POKA ● KATALI POKA** - Round, yellow insect with soft spines - Eats the young leaves leaving the leaf skeleton, which looks like a net - Eats the tender shoots and young fruits - Can be found on the lower surface of the leaf - Plant growth is reduced and produces few fruits - Hot weather favours the infestation - Has been identified as a serious pest in the last 6-7 years - Infestation starts one month after transplanting and remains throughout the season	GRUB OF EPILACHNA BEETLE . Coleoptera Family: Coccinellidae **MP:** Application of Malathion, Dursban, Decis etc. Apply ash
gourd: teasel gourd; bitter gourd	**PATA MORANO POKA ● GHORA POKA** - Larvae fold themselves inside the leaf and remain inside - Greenish coloured worm-like insect that eat the leaf as well as the tender shoots - Infestation starts when plants begin to produce leaves and it remains throughout the season - Infestation has become very high within the last 5-6 years - Also eats the young fruits. - Dry wealthy favours its infestation	PUMPKIN CATERPILLAR, LEAF FOLDER. Pumpkin caterpillar, Lepidoptera, Family: Crambidae. *Diaphania indica.* Leaf-folder, many spp. of Lepidoptera of Family: Crambidae. (The description may be confusing 2 insects) **MP:** Application of chemicals such as Fenfen, Dursban, Cymbush, Regent, Sevin, etc. Hand picking during artificial pollination
gourd: white gourd	**MACHHI POKA ● BHOMRA POKA** - Small yellow coloured fly insect, with a sting behind its body - Bores the young fruits with the help of the sting - The infested fruits turn yellow and finally die - Fruits become deformed if they grow large - If pesticides are applied, it temporarily flies away but cannot be eliminated - The most damaging pest of white gourd	CUCURBIT FRUIT FLY. Diptera, Family Tephritidae. *Bactrocera cucurbitae* (D. Sarker, pers. com.). **MP:** Application of chemicals such as Sevin, Dursban, Fenfen, Fyfanon, Tafgor etc

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
groundnut	**GORA POCHA** - The roots of the young plants are damaged and plants can be uprooted easily - Within a few days the plant turns yellow and finally dies - Dry weather favours the disease	FOOT ROT OF GROUNDNUT. This could possibly be due to damping off caused by *Phytopthora* spp. (M.R. Ali, pers. com.). **MP:** Uproot infested plant and apply water. Chemicals are not used
hog palm	**PATA KHAOWA POKA** - Infestation starts when the young leaves emerge - It is a worm like hairy insect - In severe infestations, the plant produces no leaves - The pest eats the entire leaf apart from the midrib	HOG PALM CATERPILLAR. **MP:** Chemicals are not used. Hand pick the insect. Twists of straw, burned to produce smoke are placed under tree
onion	**AGA MORA ● AGA SHUKNA ROG** - Starts at the seedling stage and remains until harvesting - The top part dies first then gradually spreads downwards - During the rainy season, infestation is high - The most damaging disease of onion, causing considerable damage in the last 8-10 years	UNIDENTIFIED **MP:** Application of chemicals such as Rovral, Antracol etc
onion	**GORA POCHA** - Roots as the immature bulb become rotted - The infested plant can be uprooted easily - Plant turns yellow and wilts - The disease favours rainwater conditions - Found mostly in the summer season, in summer varieties	UNIDENTIFIED. . . More problems are being reported on onions, as they are being grown in summer now as well as a winter vegetable (M. R. Ali, pers. com.) **MP:** Application of chemicals such as Rovral, Antracol etc
papaya	**PHULA ROG ● BHAIRASH ROG** - Initially the young leaves turn yellow and curl - Gradually all the leaves become curled - Growth of the plant is reduced - Leaf stalk length is reduced - The plant cannot produce flowers or fruits - Unaffected plants in gardens close to affected plants rapidly become affected	UNIDENTIFIED. . The symptoms could be due to virus, MLO or caused by nematode damage (J.Waller, pers.coms.). **MP:** Uproot infested plant. Apply water
pomegranate	**DALIMER KIRA ● LAL KIRA POKA ● MAJRA POKA** - Infestation starts at the flowering stage - Bores the flowers and young fruits making a circular hole. A red worm-like insect is found in the fruit - Infested part turns black, and drop within a few days - The internal part of the fruit blackens - It can damage up to 80-90% fruits in severe infestation - Hot weather favours the infestation	POMEGRANATE FRUIT BORER OR GUAVA FRUIT BORER. Lepidoptera Family Lycaenidae. . *Virachola isocrates*, preferred scientific name *Deudorix isocrates* is common in Bangladesh (D. Sarker, pers. com.). **MP:** Application of Malathion, Fyfanon, Cymbush, etc. Wrap the fruits
rice	**MAJRA POKA** - Worm-like insect that cuts the central stem - Central leaf is dried and can be easily pulled out - Infests the rice plant after 30-40 days of transplanting - Comes from a kind of flying insect called 'phuti poka' which is the most damaging insect of transplanted Aman rice - Infestation starts at the tillering stage and remains until harvesting	RICE STEM BORER. There are five major species that affect rice in Bangladesh, *Chilo suppressalis, C. auricilius. C. polychrysus Scirpophaga incertulas* and *Sesamia inferens* (CPC 2005) **MP:** Application of pesticides such as Curaterr, Briffer, Basudin, Furadan, Regent, and Cymbush. Put a stick in the field to attract birds. Application of laundry detergent (wheel powder) Fitkari (Alum or white vitriol), and Gul (powdered tobacco leaf) mixed with fertilizer

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
rice	**PAMRI POKA ● KATA POKA** - Scrapes the leaf making it go white - This insect does not affect all fields, but if affected, fields have the appearance of being burned by fire - Small, very hard, spiny insect - Infestation starts after one month of transplanting, and remains until panicle initiation stages - Infestation not as serious a few years ago, but now, in some cases, it caused considerable damage - Generally this pest infests late transplanted rice field	RICE HISPA. Coleoptera. Family: Chrysomelidae *Dicladispa armigera* (CPC 2005) **MP:** Application of insecticides such as Cymbush, Marshal, Faster, Regent. Laundry detergent, Gul and Fitkari are mixed with fertilizers and applied to the crop. Rope soaked in kerosene is used
rice	**CHEKUR ● PIPRA HOWA** - Leaf becomes piped shaped instead of flattened (like an onion leaf) - It is appeared at tillering stage and the infested tillers cannot bear panicles - Possibly caused by a kind of disease - In case of severe infestation, 10-20% tillers are damaged - It first appeared 8-10 years ago, but severe damage has appeared in the last 2-3 years - In every hill, 5-12 tillers are affected, but affected tillers bear no insect - Disease is a serious problem in Aman rice - Favours dry weather	RICE GALL MIDGE. Diptera. Family: Cecidomyiidae . *Orseolia oryzae* (CPC 2005) **MP:** Control measures are not adopted. Sometimes fungicides are used but give no result
rice	**GHUGRI POKA** - Lives under soil - Cuts the rice plant from below ground - Appears mostly in dry land - Generally Aman rice fields are affected	FIELD CRICKET. *Tarbinskiellus portentosus* is common in rice in Bangladesh (D. Sarker, pers. com.) **MP:** Farmers flood their fields to control this pest. Chemicals are not used
rice	**SHOBUJ POKA ● PATA KATA POKA** - Eats the leaf making it a white colour - Cuts the tip of the leaf - Insect usually damages Aman rice fields that are flooded and damage has become considerable in the last 2-3 years	RICE CASE WORM. *Parapoynx* spp. are common in Bangladesh (D. Sarker, pers. com.) **MP:** Application of chemicals such as Basudin, Furadan etc. Sometimes Acalux, Kinalux, Rhison etc are applied
rice	**POCHA ROG ● GORA POCHA ● POCHA KANA** - Starts two months after transplanting and remains until the panicle initiation stage - Severe infestation is found during hot weather and the rainy season and the most damage occurs during panicle initiation stage - A rot symptom is seen from the middle to lower part of the rice plant and an unpleasant odour arises from infested fields - It appeared 10-12 years ago. 'Shorna dhan' (a variety from India) is highly affected, BR-11 is moderately affected	SHEATH BLIGHT OF RICE. *Rhizoctonia* spp.. Symptoms are also similar to that caused by rice sheath blast, causal agent, *Pyricularia* sp. (M.R. Ali, pers. com.) **MP:** Chemicals such as Folicur, Tilt etc are applied. Tute (CuSO4) mixed with boric powder is applied
rice	**PATA POCHA** - Leaves are rotted and dried - Hot weather and standing water favours the disease - The disease is generally found in young seedlings	LEAF BLIGHT OF RICE. Could possibly be damping off or bacterial in origin (M.R. Ali, pers. com.) **MP:** Control measures are not adopted

CROP	LOCAL NAME(S) AND DESCRIPTION OF PLANT HEALTH PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
sugarcane	**MAJRA POKA** - Infestation starts after one month of transplanting, and remains until harvesting - Bores into the soft tender part and eats inside the cane - In hot weather, infestation is high especially if fertilizer is applied - Middle leaf of infested cane can be pulled out easily - Several larvae are found if the cane is split, and the middle part generally turns red	Sugarcane stem borer. Six species are common in Bangladesh, *Scirpophaga nivella, S. excerptalis, Chilo infuscatellus, C. tumidicostalis, Sesamia inferens and Emmalocera depressalis* **MP:** Chemicals such as Curaterr, Vriper, Furadan etc are used. Cut and remove the infested plant parts
sugarcane	**GORA POCHA • KUSHORER MORA ROG** - Inner part of the cane turns red and gradually the whole cane is affected - Rot symptom starts from the base of the plant - The plant turns pale and finally it dies - The main disease of sugarcane and remains all the year round	RED ROT OF SUGARCANE. Possibly *Fusarium* wilt (M. R. Ali, pers. com.) **MP:** Remove infested plant parts. Chemicals are not used
turmeric	**POCHA ROG** - Leaves are rotten. Initially the top part of the leaf dries first, then the rot gradually spreads downwards - This disease may be caused by soil problems or nutrient deficiency - Infestation starts one month after transplanting and remains until harvesting - During rainy season, its infestation is high - This disease is caused by a small larvae) known as 'majra poka' - Severe damage started in the last 10-12 years	LEAF BLIGHT OF TURMERIC. **MP:** Application of chemicals such as Marshal, Regent, Curaterr, Furadan, Basudin, etc. Apply ash
wood apple	**PHOL CHHIDROKARI POKA• PHOLER SHADA POKA** - White worm-like insect - Makes round hole in the fruits and eats the insides - The fruit turns black inside and is unfit to consume - In severe infestation, 30-40 fruits are destroyed - The most damaging pest of this fruit	WOOD APPLE FRUIT BORER. **MP:** Control measures are not adopted

Table B8: Knowledge and management plant health problems in Norsingdi (Summer II)

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
gourd: bottle gourd	**MOROK ROG** - The disease starts from the flowering stage - The main root is rotted and the roots contain knot like structure - Initially the top part of the plant is died and gradually the whole plant is died. - If this disease infests a field, two-third of the crops are destroyed. - It has caused serious damage for the last 4-5 years	PROBLEM UNIDENTIFIED; possibly root knot nematode **MP:** Application of Bavistin, Tilt, Knowin, Dithane M-45 etc
gourd: bottle gourd	**KANDO POCHA** - The vine cracks and produces a sticky substance - Within a few days the infected part turn black and becomes narrow - Infected part turns yellow and dies - Initially the top part dies and hangs down. The foot region is rotted	UNIDENTIFIED FOOT ROT. Most likely to be a complex of fungi (M. R. Ali, pers. com.). **MP:** Application of Bavistin, Tilt, Knowin, Dithane M-45 etc
cabbage	**GORA POCHA** - Drying is observed at the base of the stem - Plant wilts during daytime and recovers at night - Generally seen in the seedling stage - The most damaging disease of cabbage and cauliflower	FOOT ROT. The symptoms describe damping off caused by *Phytopthora* spp. (M. R. Ali, pers. com.). **MP:** Application of Bavistin, Dithane M-45 Remove excess water from field Application of water
cauliflower	**KAÙUI POKA • LEDA POKA** - Soft-bodied insect that lives in the soil - Cuts the seedlings just above the soil surface - Comes out from soil in the morning and evening - Can be found in the soil near to the cut plants - Also cuts the seedlings of other Winter crops	CUTWORM. *Agrotis ipsilon* is common in Bangladesh. **MP:** Apply water. Application of pesticides such as Tafgor, Basudin etc. Wrap the seedlings with polythene
gourd: bottle gourd; sweet gourd	**PAKRA LAGA • BHAIRASH LAGA** - Leaves turn yellow and curl - The vines of the leaf turn white - Plant growth is reduced and the plant cannot produce many fruits or flowers - Fruits are small and deformed	UNIDENTIFIED. **MP:** Uproot infested plant Application of Bavistin, Dithane M-45 etc. Application of Malathion
bean: yard long bean	**KIRA POKA • MAJRA POKA** - Bores the fruit and eats the insides - Dark brown worm-like insect - Similar to the worm of country bean - Only seen at the fruiting stage - Can damage up to 50% of the fruits in severe infestations - Has become difficult to control with chemicals in the last 4-5 years	BEAN POD BORER. Lepidoptera Family: Crambidae . *Maruca testulalis* is common in Bangladesh (D. Sarker, pers. com.) **MP:** Application of chemicals such as Fenfen, Melfen, Basathrin, Tafgor, Relothrin, Fenitox, etc. Application of Fenfen mixed with crushed Naphthalene
bean: country bean	**PACHHI POKA** - Small insect that sucks sap from the young shorts and fruits - Thousands of insects attack one plant - Plant growth is reduced and flowers are shed - Severally infested plants produce few fruits which are deformed - Generally found in winter crops such as yard long bean and country bean. Within the last 2-3 years it has also been found in summer crops	BEAN APHID. *Aphis craccivora* and *A. fabae* are found in Bangladesh. **MP:** Application of chemicals such as Malathion, Fenfen, Tafgor, Dursban, Cymbush etc. Apply ash

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
cucumber, teasel gourd	**PATA MORANO POKA** - Long green insects that folds the leaves - Eats the young under shoots and leaves and hides itself inside the folded leaves - Also bores into the young fruits - Infestation starts one month after transplanting and remains the entire crop season	PUMPKIN CATERPILLAR. Lepidoptera, Family: Crambidae. *Diaphania indica* **MP:** Application of Dursban, Decis, Cymbush etc
gourd: bitter gourd, white gourd, bottle gourd	**BOLTA POKA ● MACHHI POKA** - Yellow fly insect that bores the young fruits - Sticky substance is secreted from the infested part - The fruit turns yellow and rots - Fruits are deformed - Within the last 5-6 years, the crop cannot be grown without using pesticides	CUCURBIT FRUIT FLY. **MP:** Application of chemicals such as Fenfen Dursban, Sevin, Cymbush, Fyfanon, Tafgor etc
rice	**MAJRA POKA** - Worm-like insect that enters the inside of the rice stem from the base - Cuts the central part of rice plant - Infested part dies, and can be pulled out easily - 'Machhi poka' (adult moth) is the mother of this insect - The rice plant is damaged by this worm as well as "machhi poka" - The most damaging pest of rice. Infestation starts at the tillering stage and remains until the panicle initiation stage	RICE STEM BORER. **MP:** Application of pesticides such as Basudin, Furadan, Sunfuran, Furafuran, etc
rice	**ACHHI POKA** - Small, hard bodied, black insect, with spines on its body - It eats the leaf and only the veins are left - Considerable damage has been observed within the last 5-6 years - It is only generally found in the rice season	RICE HISPA. **MP:** Generally chemicals are not used
eggplant	**MAJRA POKA** - The most destructive pest of brinjal - Infestation starts soon after branching and remains the entire crop season - Bores the tender shoot which then wilt - Even with a frequent application of pesticides, it is impossible to control - It can damage up to 80-100% of fruits, if chemicals are not applied	BRINJAL SHORT AND FRUIT BORER. **MP:** Application of Cymbush, Marshal, Fenfen, Ripcord, Dursban, Basathrin, Fenitox, and Indian oil. Application of neem extract mixed with Cymbush. Cut and remove infested plant part

Table B9: Knowledge and management of plant health problems in Moulvibazar (Summer II)

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
rice	**LOHARI POKA** - Small, black, hard insect, which scraps the leaf which turns white - In the last 3-4 years this has become a serious pest of Aman rice. It has also started to attack Boro rice too - Attacks the field in large numbers and within damages the whole field within a week - Initially the field becomes infested on one side and then pest gradually spreads. Many rice fields are destroyed in an entire area - From a distance, the infested fields have the appearance of being burnt by fire	RICE HISPA. **MP:** Application of chemicals such as Malathion, Relothion, Ustad, Fedy, although they are not effective. Application of crushed Naphthalene, kerosene oil etc. A large rope dipped in kerosene oil is pulled over the field
rice	**KATRA POKA ● KATRA ROG** - White colored insect, with a black head - Scrapes the leaf making it white - Cuts the leaves of the rice plant and floats on the standing water with the help of the cut leaves - From a distance, the infested field can be easily distinguished by its white colour - Infestation very high in the last 3-4 years - Pest generally affects late transplanted rice fields - Pest favours the young, dark green rice plants	RICE CASE WORM. **MP:** Remove excess water from the field. Application of Malathion, Dursban etc
rice	**CHUNGI CHHORA** - Leaves turns a pipe shape - In a hill, 4-5 tillers are infested - Panicles cannot emerge from the affected rice tillers - The damage is comparatively higher in Aman rice season	RICE GALL MIDGE. **MP:** Chemicals are not generally used.
rice	**MAJRA POKA ● MANJARA POKA** - Cuts the central leaves of rice plants which can be easily pulled out - Both the 'shada phuti' (white adult moth) and the larvae damage the rice plant - The infestation starts from tillering stage and remains until harvesting	RICE STEM BORER. **MP:** Application of granular pesticides such as Basudin, Furadan, Sunfuran etc. Application of liquid pesticides such as Malathion, Diazinon etc
rice	**CHHAT ROG** - Infested rice plant becomes very tall and the nodes are long - The tallest rice plants can be easily identified by their yellow, green colour - Panicle are not produced from the infested plant - If panicles are slightly affected, grain filling cannot occur. - If the disease affects the fields, it is understood that the field will only produce a low amount of grain - Unhealthy seeds may cause this disease. If the seeds are collected from BADC, a comparatively low amount of infestation is observed	BAKANAE DISEASE OF RICE. *Gibberella fujikuroi* [teleomorph] **MP:** *Fusarium moniliforme.* Uproot infested plant. Chemicals are not used
rice	**GORI POCHA** - Appears at tillering stage and remains until the panicle initiation stage - Rainwater and hot temperatures favours the disease - The sheath blade of the rice plant rots near the base - Appeared 5-6 years ago, and the greatest infestation is found in Aman rice	SHEATH BLIGHT OF RICE. *Rhizoctonia* spp. Symptoms also similar to that caused by rice sheath blast, causal agent, *Pyricularia* sp.(M. R. Ali, pers. com.). **MP:** Generally chemicals are not used. Sometimes chemicals such as Cupravit are used
rice	**BAU LAGA** - Caused by bad wind - Leafs are burned - Generally disease is greatest at the tillering stage - The disease is mostly found in the Aman rice season	UNIDENTIFIED. **MP:** Control measures are not adopted

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
bean: country bean	**IDLE POKA ● LAWRI POKA** - Small, soft-bodied insect that sucks sap from the tender shoots, leaves and young fruits - Growth of the plant is reduced and the infested plants become pale and curl - Identified as the most damaging pest in the last 5-6 years	BEAN APHID. **MP:** Application of chemicals such as Malathion, Fyfanon etc. Application of ash mixed with crushed Naphthalene
tomato	**JHAR MORA ● GORA POCHA** - Initially the base of the plant become soft, water soaked lesion appear and base of plant finally rots - Whole plant rots within few days - The roots also rot - Wet condition favours the disease	FOOT ROT. This could be caused by a fungi, bacteria, etc. A positive identification is required (M. R. Ali, pers. com.) **MP:** Application of chemicals such as Dithane, Ridomil etc
eggplant	**KIRA POKA ● MAJRA POKA** - Bores the fruit as well as the tender shoots and eats the insides - Infestation starts at the seedling stage and remain all the year round - The infested shoots wilt on sunny days - It is the most damaging insect of brinjal	BRINJAL SHOOT AND FRUIT BORER. **MP:** Application of chemicals such as Tafgor, Malathion, Cymbush, Dursban etc. Cut and remove infested plant parts
lemon	**PATAR KALO BEMAR** - The upper part of the leaf turn black - Growth of the plant is reduced and the plant produces few flowers or fruits - If the leaves are touched, black powder comes off in the hand - The infested leaf becomes dull in colour - Infestation is comparatively low in the rainy season	UNIDENTIFIED. Anthracnose, scab or rust are possibilities. Identification is required (M. R. Ali, pers. com.). Melanose is also likely (J.Waller, pers.com.) **MP:** Control measures are not adopted
lemon	**DAUDA ROG** - Fruits as well as the leaves bears scars - The leaves turn yellow - Fruits are small, and the market value is reduced - The Alachi lebu (large aromatic lemon) is seriously damaged by this disease	SCAB OF LEMON. Possibly *Elsinoë fawcettii* or a bacterial canker (J.Waller, pers.coms.). **MP:** Application of chemicals such as Diazinon, Cythion etc
bean: country bean, yard long bean	**BAU LAGA** - The upper side of the leaf turns red - It is generally found in a mature plants - Growth of the plant is reduced and it cannot take up fertilizers - It may be caused by bad wind	RUST OF BEAN. Numerous causes e.g. nematodes, *Cercospora* leaf spot etc. (M. R. Ali, pers. com.) **MP:** Generally control measures are not adopted
coconut, betel nut	**JHORA LARA ● ISAI KHAOWA** - Immature fruits drop - The outer surface of the coconut remain good, but the inner parts and kernel is deformed - Sometimes the fruit produces no water - The bud spikelet of betel nut turns black, then red, then drops - About half of the fruits drop	BUD ROT OF COCONUT, betel nut. Complex of different factors (M. R. Ali, pers. com.) **MP:** Control measures are not adopted. Sometimes cow dung and other fertilizers are applied
chilli	**GHUGRI POKA** - Brown, hairy insect that has strong mouthparts - It lives in the soil and cuts the roots and stems of young seedlings - Infestation is more serious in uncompacted soil	UNIDENTIFIED. Farmers describe the mole or field cricket (D. Sarker, pers. com.). **MP:** Chemicals are not used. Farmers flood the field

Table B10: Local knowledge of plant health problems in Natore (Winter)

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
banana	**DAUDA ROG • DAG PORA ROG • SHOLMA ROG** - Young leaves and fruits are scarred with black spots - Possibly caused by a black, small, hard insect that lives in the leaf blade - Generally found in the old banana gardens - Infested fruits take more time to ripe and lower market value.	BANANA LEAF AND FRUIT BEETLE. **MP:** Application of chemicals such as Biesteren, Basudin, Briffer etc mixed with fertilizers
banana	**CHERA LAGA** - Pest eats the central stem which turns a yellow colour - Pest also eats the roots and the whole plant may die within a few days - Sometimes the stem may crack - Generally found in the mature banana bunch	PROBLEM UNIDENTIFIED. Possibly the banana stem weevil **MP:** Application of chemicals such as Biesteren, Basudin, Briffer etc mixed with fertilizers
betel nut	**PHOL JHORA** - Immature fruits are dropped - Bud spikelet turns black or red and then drops - About half of the fruits drop - Sometimes immature fruits also crack	BUD ROT OF BETEL NUT. **MP:** Control measures are not adopted, although sometimes fertilizers are applied
betel vine	**KHAONI** - People apply soil from the bottom of ponds to the vine to fertilise it. Stems that come into contact with this muck become diseased - Base of stem turns white or black, is soft, sticky and rotten and an gives off an unpleasant odour - The disease worsens after the rainy season - Infestations rapidly increases in warm weather and when oil cake and fertilizers are applied. May be caused by the gas produced from the decomposition of the mustard oil cake - Soil surrounding the infested part becomes wet - This destructive disease has been observed for 10-20 years in gardens	FOOT ROT OF BETEL VINE. **MP:** Application of pesticides such as Tilt, Bavistin, and Knowin, Cupravit, Vestivax, Agrovax etc. Apply sand to the soil
betel vine	**SHUKNA KHOUNI** - Rot symptoms are seen in the middle of the stem - Dry rot symptom grows to a 2-4 inch lesion - Disease favours foggy and warm conditions - The disease affects the adventitious roots growing from the vine, which turn black - Whole plant may die when infection severe	STEM ROT OF BETEL VINE. **MP:** Application of Knowin, Cupravit, Tilt etc. Apply dry sand to the soil.
betel vine	**TELA LAGA** - Black to brown spots observed on leaf - Disease is found all year round but more severe in the rainy season - Disease is more severe when oil cake is applied in wet or excessively dry soil - Shade plants influence disease. Dense or thin shade favours the disease. - Excess fertilizer application and nutrient deficiency favours the disease - Production can be halved during severe infestations	LEAF SPOT OF BEETLE VINE. **MP:** Apply smaller amount of oil cake and cow dung.
betel vine	**SHOLMA ROG** - Leaves become scarred and curl - Disease starts at the tip and gradually spreads to the whole plant - Tender part becomes narrow - Disease favours warm weather - Severe infestation may destroy the whole garden	PROBLEM UNIDENTIFIED. Possibly caused by virus. **MP:** Uproot infested plant.

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
gourd: **bitter gourd**	**LEDA POKA** - Bores into bitter gourd and eats the fruit from inside - Fruit turns yellow within a few days and finally rots - White worm-like insects are found inside the fruit - Hot and cloudy weather favours the insect infestation - In severe infestations 50% of the fruits are damaged	DIPTERAN LARVA. The description sounds like cucurbit fruit fly (D. Sarker, pers. com.) **MP:** Application of chemicals such as Cymbush, Fyfanon, Decis etc. Apply ash
gourd: **bottle gourd, sweet gourd**	**JALA MORA ● GUTI POCHA** - Immature fruits are small and turn yellow - Infected fruit is wrinkled and dried - Problem observed when plant bears a few fruits	UNIDENTIFIED. **MP:** Control measures are not adopted
gourd: **bottle gourd, sweet gourd**	**BHOMRA POKA** - Yellow coloured small fly insect, which has a sting behind its body - Bores into the fruit with the help of its sting - Infested fruits turn yellow and die - Fruits are deformed if they grow large - When pesticides are applied, the insect temporarily flies away and cannot be controlled - The most damaging pest of white and sweet gourd	CUCURBIT FRUIT FLY. **MP:** Application of chemicals such as Sevin, Dursban, Fenfen, Fyfanon, and Tafgor and others.
gourd: **bottle gourd, sweet gourd,**	**MACHHI POKA ● BHOMRA POKA** - Small, yellow coloured fly insect, which has a sting behind its body - Bores into the young fruit with its sting - Infested fruits turn yellow and die - If fruits mature they are deformed - When pesticides are applied, the insect temporarily flies away and cannot be controlled - The most damaging pest of white gourd	CUCURBIT FRUIT FLY. **MP:** Application of chemicals such as Sevin, Dursban, Fenfen, Fyfanon, Tafgor and others.
cabbage (see also cauliflower)	**LEDA POKA** - Brown coloured long worm, which eats inside folded leaves - Cabbage remains small - Rot symptoms are sometimes found on the head of cabbage and cauliflower - Infestation starts when the plant is immature. Severe damage is observed at the mature stage - Problem has got worse within the last 4-5 years	CABBAGE BUTTERFLY. *Spodoptera litura* (D. Sarker, pers. com.). **MP:** Application of Diazinon, Melfen, Fenfen, Dursban, Cymbush, Fyfanon, Diazinon.
cauliflower (see also cauliflower)	**LEDA POKA** - Brown coloured long worm, which eats inside folded leaves - Cabbage remains small - Rot symptoms are sometimes found on the head of cabbage and cauliflower - Infestation starts when the plant is immature. Severe damage is observed at the mature stage - Problem has got worse within the last 4-5 years	CABBAGE BUTTERFLY. *Spodoptera litura* (D. Sarker, pers. com.). **MP:** Application of Diazinon, Melfen, Fenfen, Dursban, Cymbush, Fyfanon, Diazinon.
chilli	**KUKRA LAGA** - Chilli leaves curl and become yellow - Plant branches excessively, giving a bush-like appearance - Plants cannot bear flowers or fruits - Disease favours warm weather, and summer varieties most affected - Whole field affected within a few days - Has become a destructive disease within the last 4-5 years - Radish and cucurbits also affected	LEAF CURL OF CHILLI. Could be either leaf curl, phytoplasma, or mite damage (M. R. Ali, pers. com.). **MP:** Uproot infested plant. Application of ash.

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
chilli	**LEDA POKA ● KALO POKA** - Soft-bodied insect that lives under the soil - Cuts the young seedlings just above the soil surface - Causes the most damage in the morning - Cannot tolerate excess water - Insect infestation favours soft and dry soil conditions	CUTWORM. **MP:** Apply flood water. Hand picking. Molasses and rice husk mixed with Cymbush is applied.
chilli	**KUKRA LAGA ● THUPA DHORA ● BHAIRASH ROG** - Leaves curl and turn yellow - The plant appears bushy - Plants cannot produce flowers or fruit - Disease favours warm weather and summer varieties suffer most - The whole field may be affected within a few days of attack - Has become a destructive disease in the last 4-5 years	LEAF CURL OF CHILLI. **MP:** Uproot infested plant. Apply ash. Application of zinc fertilizers and Agro grow.
coconut	**MAJRA POKA ● KIRA POKA** - Large white worm bores into the soft part of the top of the tree and eats the tip of the tree from the inside - The centre of the growing tip is destroyed and the central leaf dies and the whole plant may die within a few days - Also eats the young leaves - Infestation occurs all year round	GRUB OF RHINOCEROS BEETLE.. **MP:** Control measures are not adopted.
coconut, betel nut	**PHOL JHORA ROG** - Immature fruits drop - Outer coconut surface remains good, but the kernel is deformed - Sometimes the fruit contains no water - Betel nut spikelet bud turns a blackish red colour then drops - Half the fruits drop	Bud rot of coconut, betel nut. Complex of interacting factors (M. R. Ali, pers. com.) **MP:** Cow dung and other fertilizers are sometimes applied but generally control measures are not adopted
bean: country bean	**JAOWA POKA ● ICHHI POKA ●MENDA POKA JAB POKA** - Brown to blackish coloured insect that sucks sap from the tender shoots, young leaves and fruits - Plant and the fruits stop growing - Insect also attacks the yard long bean - Infested fruit is curved and deformed - Pest infestation favours cold weather	BEAN APHID. Aphis spp. **MP:** Chemicals such as Cymbush, Fyfanon, Fenfen, Malathion etc are applied. Application of ash mixed with kerosene oil. Apply extract of tobacco leaf
bean: country bean	**MAJRA POKA ● LAL KIRA ● LEDA POKA** - Bores into and eats the fruits - Dark brown worm-like insect, similar to the worm of brinjal - Appears only at the fruiting stage and causes severe infestations which can damage 50% of the fruits - Has become difficult to control with chemicals during the last 4-5 years	Bean pod borer. Lepidoptera Family: Crambidae . *Maruca testulalis* is common in Bangladesh (D. Sarker, pers. com.) **MP:** Application of chemicals such as Fenfen, Melfen, Basathrin, Tafgor, Relothrin, Fenitox, etc.
eggplant	**MAJRA POKA** - Main pest of brinjal - Bores the tender shoots and eats from inside - Infestation starts when plants are immature and remains the entire crop season. Infestation is highest during flowering and fruiting stage - Pest has been around since the beginning of brinjal cultivation, but it has become a serious pest in the last 10-15 years - Infestation is comparatively low during winter season	Brinjal shoot and fruit borer **MP:** Chemicals such as Ripcord, Cymbush, Ekalux, Rider, Kartap, Suntap, Fenfen, Indian oil and Marshal are used . Remove infested plant parts

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
eggplant	**HOLUD POKA** - Yellow coloured, soft spiny insect that eats the green part of the leaf - Infests the plant from the seedling stage but infestation greatest at vegetative stage - Remains on the lower surface of the leaves and is difficult to control with chemicals - Plant growth is reduced and yields few fruits	EPILACHNA BEETLE. **MP:** Chemicals such as Fenfen, Malathion and Cymbush are used. Application of ash
eggplant	**LEDA POKA** - Very soft-bodied insect that lives under the soil - Cuts the seedlings just above the soil surface - Serious damages plants during the morning - Cannot tolerate excess water - Favours soft and dry soil condition	CUTWORM. **MP:** Application of floodwater. Hand picking. . Apply molasses and rice husk mixed with Cymbush
eggplant	**PHULA ROG** - Leaves curl and are small - The plant produces excess branches and appears bushy - Plants yield few fruits and flowers - Fruits are deformed - Disease usually starts at the fruiting stage	LITTLE LEAF OF BRINJAL. **MP:** Chemicals are not used. Uproot infested plant
eggplant	**GORA SHUKNA ROG • SAIPTI ROG** **GORA MORA ROG** - Base of plant is dried and narrow and roots rot - Black spots are sometimes seen on the stem, which is cracked and produces a sticky substances - Generally matured plants are affected which turn pale and die - Sometimes fruits also rot - Disease has become severe within the last 3-4 years	UNIDENTIFIED. Possibly caused by foot rot. Could be *Phomopsis* on fruit or damping off of seedlings (M. R. Ali, pers. com.). **MP:** Application of Tute and lime
eggplant	**DUL MORA ROG • KALO POCHA ROG** **AGA MORA ROG** - Black lesions are seen on one side of the plant - Infested branches are dried. Disease progresses backwards and finally the plant dies - Severely infected plants have no leaves - Has become severe within the last 4-5 years	DIE BACK. **MP:** Uproot the infested plant. Application of Dithane M-45, Indofil, Bavistin, Tafgor, Karate and Vegimax
eggplant	**GUTI ROG** - Many of the roots are knotted - Plant cannot take up fertilizers - Plant turn yellow - Only a few fruits and flowers are produced - Within a few days infected plants may wilt or die - Generally found in matured plants - Has become severe pest of brinjal within the last 4-5 years	ROOT KNOT OF BRINJAL. *Meloidogyne* spp. **MP:** Uproot infested plant
eggplant	**SEPHṬI ROG** - Brown to blackish lesions are initially seen on the base of the stem - Infested part dies within few days then the whole plant may die - Branches of plant and fruits may also show symptoms - Infected bark may crack and sticky substances are produced - Usually found in mature plants - Has become more damaging within the last 3-4 years	PROBLEM UNIDENTIFIED. Possibly due to stem rot **MP:** Application of Dithane M-45, with a sticky starch 'aqua wint' . Application of Rovral.

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
garlic	**MATHA LAL HOWA** - Tip part of the plant dies - Starts at the seedling stage and remains until harvesting - The top part of the plant dies first then gradually spreads downward - Severe cases occur when rice is frequently cultivated - The problem has got worse within the last 4-5 years	UNIDENTIFIED. . Symptoms similar to downy mildew (J.Waller, pers.coms.) **MP:** Pesticides such as Thiovit, Ridomil, and Folicur etc are used. Application of ash
guava	**PHOLER KIRA** - Worm-like pest that bores into and eats the fruit - Attack starts at the immature stage and continues until fruits are mature - In severe cases, it can damage 50-70% of fruits	GUAVA FRUIT BORER. **MP:** Control measures are not adopted
jackfruit	**MUCHI JHORA** - Initially bud spike turns red - Gradually the immature fruits turned black and finally drop - A black powder-like substance is observed on damaged immature fruits - Only immature fruits (1-4 inches) are affected	*RHIZOPUS* ROT OF JACKFRUIT (M. R. Ali, pers. com.). **MP:** Control measures are not adopted
lentil	**SHUKNA ROG** - Initially the plant turns red - Plant cannot grow large and are unable to take up fertilizers - Roots are damaged and within a few days the plant may die - Disease favours foggy conditions	FOOT ROT OF LENTIL. This could be fungi, bacteria, or complex of lots of fungi (M. R. Ali, pers. com.) **MP:** Application of Bavistin, Tilt etc.
mango	**TATA POKA** - Bores into the stem and eats the inside of the stem - Sawdust like matter is found on the infested plant parts - Infested plant parts sometimes produce a sticky substance - Damaged plant parts can be broken when the wind blows - Infestation may be greater in hot weather	MANGO STEM BORER. *Bactrocera rubus* **MP:** Control measures are not adopted
mango	**KUKRA DHORA** - The tip part of the branches become bushy - Leaves become smaller, and are bunched and clustered - Affected parts cannot bear flowers - Generally younger plants are affected (3-10 years old plants) - Has become a major problem within the last 2-3 years	UNIDENTIFIED. Possibly due to a nutritional deficiency, or malformation of mango **MP:** Control measures are not adopted
mustard	**JAOWA POKA** - Brownish black insect that sucks the sap from the tender shoots, young leaves, flowers and fruits - The plant stops growing - Insect also attacks bean and yard long bean - Infested pod is deformed - Pest infestation favours cold weather	MUSTARD APHID. *Lipaphis erysimi* **MP:** Application of chemicals such as Cymbush, Fyfanon, Fenfen, Malathion etc. Application of ash mixed with kerosene oil. Apply extract of tobacco leaf
onion	**AGA MORA • AGA SHUKNA ROG** - Starts at the seedling stage and remains until harvest - Top part dies first then disease progresses downwards - Infestation is highest during the rainy season - The most damaging disease of onion - Has become more damaging within the last 8-10 years	UNIDENTIFIED. **MP:** Application of chemicals such as Rovral, Antracol etc

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
onion	**GORA POCHA** - Roots and immature bulbs rot - Infested plant can be easily uprooted - Plant turn a yellow colour and wilts - Disease favours rainwater - Found mostly in the summer season, in summer varieties	STEM ROT OF ONION. Could also be *Fusarium* basal bulb rot or white rot (J.Waller, pers.coms.) **MP:** Application of chemicals such as Rovral, Antracol etc
papaya	**PHULA ROG • BHAIRASH ROG** - Initially young leaves turn yellow and curl, then all leaves begin to curl - Growth of the plant is reduced - Leaf stalk length is shortened - Plant cannot bear flowers or fruits - Disease spreads rapidly to other plants when affected plants are found in the plot	LEAF CURL VIRUS OR BUNCHY TOP MLO. **MP:** Uproot infested plant. Apply water
gourd: **pointed gourd**	**HOLUD POKA** - Yellow coloured soft spiny insect that eats the green part of the leaf - Infests young plants in vegetative stages. - Pest located on the underside of the leaf and therefore difficult to control with chemicals - Few fruits are produced - Growth of the plant is reduced	EPILACHNA BEETLE. **MP:** Chemicals such as Fenfen, Malathion and Cymbush are used. Apply ash
pomegranate	**DALIMER KIRA • LAL KIRA POKA** **MAJRA POKA** - Infestation starts from the flowering stage - Bores into flowers and young fruits making a circular hole - Worm -like red insects are found inside the fruit - Infested part turns black and drops within a few days - The fruit blackens on the inside - 80-90% fruits can be damaged in severe infestations - Infestation favours hot weather	POMEGRANATE FRUIT BORER. **MP:** Application of Malathion, Fyfanon, Cymbush etc. Wrap the young fruits
potato	**LEDA POKA** - Soft-bodied insect that lives under the soil surface - Cuts the seedlings just above the soil surface - More active in the morning and at dawn - Found in the soil near the cut plant - Cuts seedlings of other winter crops	CUTWORM . **MP:** Application of water. Application of pesticides e.g. Tafgor, Basudin etc. Wrap the seedling in polythene
potato	**DAUDA ROG** - Scar-like symptom appears on potato skin - Potatoes remain small - Infected potato rots in a few days if it is stored - The problem has got worse within the last 4-5 years	SCAB OF POTATO. *Streptomyces scabiei* **MP:** Control measures are not adopted
potato	**MOROK ROG** - Initially only a few plants are affected - The tender leaves become rotten - Disease spreads rapidly and within 2-3 days the whole field is affected - Unpleasant odour arises from affected field - Foot and root region rot - Disease worsens in foggy conditions - Within the last 4-5 years, it has become impossible to grow the crop without pesticides	LATE BLIGHT OF POTATO *Phytopthora infestans.* **MP:** Application of Dithane M-45, Indofil, Ridomil, etc

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
amaranth, red	**LAL MACHHI ● SHUNDORI MACHHI ● URA POKA** - Red coloured fly insect - Eats the leaves making round holes - Infestation starts when the plant starts to grow leaves - The plant cannot grow large and market value is reduced	RED PUMPKIN BEETLE. **MP:** Application of Malathion, Fyfanon etc. Apply ash
amaranth, red	**GHORA POKA** - Green coloured, soft-bodied pest that eats the leaves - Lives inside folded leaves - Pest causes damage in the field within a few days if pesticides are not used - Infestation is comparatively low in the rainy season	CATERPILLAR OF RED AMARANTH. Species unknown (D. Sarker, pers. com.) **MP:** Application of Fenfen, Cymbush etc
rice	**CHERA** - Tiny, red coloured, worm-like pest which lives under the soil - Eats young roots so that plant cannot take up nutrients - Plants turn red and do not grow - Only appears in irrigated rice (Boro season) - Infestation has become serious within the last 4-5 years	UNIDENTIFIED. Farmers may be blaming the innocent earthworms for damage by leafhoppers (P. Jones, pers. com.) **MP:** Indian oil is applied. Application of granular insecticides such as Furadan, Basudin etc. Sun dry the field
spinach	**POCHA KANA ● GORA POCHA** - Base of the plant initially become soft, water soaked lesion appear and plant finally rots - Whole plant rots within a few days - Roots also rot - Disease favours wet conditions	FOOT ROT **MP:** Application of chemicals such as Dithane M-45, Ridomil etc.
sugar-cane	**MAJRA POKA** - Infestation starts after one month of transplanting and remains up to harvesting - Bores into tender parts and eats inside the cane - Fertilizer application, and hot weather favours infestation - Middle leaf of infested cane can be easily pulled out - Several larvae can be found inside the cane, which turns a red colour	SUGARCANE STEM BORER **MP:** Chemicals such as Curaterr, Briffer and Furadan are used. Cut and remove infested plant parts
gourd: **sweet gourd**	**PHOLA ROG ● BHAIRASH** - Leaves turn yellow and leaf rib becomes white - Sometimes the leaves curl - The plant cannot bear fruits or flowers - Fruit shrivel within a few days and spoil - Disease generally affects the plant in the summer season	UNIDENTIFIED. **MP:** Apply ash and uproot infested plant
tomato	**BHAIRASH DHORA** - Leaves curl and plant growth is stunted - Plant bears few flowers or fruits, fruits are small - Possibly caused by nutrient deficiency or 'bad wind' - Problem has occurred since the beginning of tomato cultivation - Generally, matured plants are affected	LEAF CURL OF TOMATO. Could also be due to nematode damage (M. R. Ali, pers. com.). **MP:** Chemicals are not used. Sometimes ashes are used
tomato	**HOSHI POKA ● MENDA POKA** - Small black-coloured pest - Sucks the sap from the leaves, vines and flowers - Plant cannot bear flowers and becomes pale coloured - Pest also attacks brinjal, potato and mustard	TOMATO APHID. *Aphis* spp. **MP:** Fenfen, Decis, Dursban etc are applied
tomato	**POCHA ROG** - Initially the base of the plant become soft, water-soaked lesions appear and plant finally rots - Whole plant rots in a few days, including the roots - Disease favours wet conditions	FOOT ROT . Could be damping off in early stage (M. R. Ali, pers. com.) **MP:** Application of chemicals such as Dithane, Ridomil etc

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
turmeric	**POCHA ROG** - Leaves dry from the tip down - Disease may be caused by soil problems or nutrient deficiency - Infestation starts one month after transplanting and continues until harvesting - Infestation is high during the rainy season - Disease may be caused by a small worm known as 'majra poka' - Has become severe within the last 10-12 years	LEAF BLIGHT OF TURMERIC. Could be due to migratory nematode such as *Pratylenchus or Radophulus* (J. Bridge, pers.coms.) **MP:** Application of chemicals such as Marshal, Regent, Curaterr, Furadan, Basudin, etc. Apply ash
turmeric	**POCHA KANA ● HOLUD POCHA ROG** - Initially the tip of the young rhizome rots - The upper part of the plant is healthy but the lower part is rotted - Serious infestation causes the whole rhizome to rot - 70 -80% yield can be lost due to the disease - In some cases, leaves also rot - Has become more severe within the last 2-3 years	Rhizome rot of turmeric **MP:** Application of Karate, and Cymbush although results are poor
wheat	**MORA LAGA** - Plant cannot grow large and are unable to take up fertilizer - Initially the plant turns red - Roots are damaged and within a few days the plant may die - A few areas of the field contain smaller, pale or red coloured plants that can be easily seen - Has become seriously damaging within the last 5-6 years	FOOT ROT OF WHEAT. *Cochliobolus sativa* is a most likely pathogen (J.Waller, pers.coms.) **MP:** Application of Tilt, Bavistin etc,
bean: **yard long bean, teasel gourd**	**HOLUD POKA ● KATHALI POKA** - Yellow coloured round insect, with soft spines - Eats the young leaves leaving the net [leaf skeleton], the tender shoots and also the young fruits - Lives on the underside of the leaf - Plant growth is reduced, and plants cannot yield many fruits - Infestation favours hot weather - Has become a serious pest within the last 6-7 years - Infestation starts one month after transplanting and remains the whole season	GRUB OF EPILACHNA BEETLE **MP:** Application of Malathion, Dursban, Decis etc. Application of ash

Table B11: Local knowledge of plant health problems Norsingdi (Winter)

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
cauliflower	**PHUL MELA ROG • PHUL PHOTA ROG** - Affected head become loose - The head turns a brown purple - Top part of the curd sometimes rots which then gradually spreads downwards - Roots are sometimes rotted - Symptoms appear in immature curds, which cannot grow large. Plants often flower early - Occurred within the last 10-15 years. - Disease favours hot weather and late transplanting	RICEYENESS OF CAULIFLOWER. **MP:** Application of Dithane M-45, Indofil, Tafgor etc. Uproot infected plant
cabbage, cauliflower	**KIRA POKA • HOLUD KIRA • BADAMI KIRA** - Brown worm about 1-1½ inch long - Eats the inside of folded leaves - Cabbage remains small - Infestation starts when the plant is young but is worse when the plant matures - Damages has become severe in the last 5-6 years	LARVAE OF CABBAGE BUTTERFLY. *Spodoptera litura* (D. Sarker, pers. com.). **MP:** Application of Diazinon, Melfen, Fenfen etc
bean: country bean, yard long bean	**PACHHI POKA • ICHHI POKA • JAB POKA** - Small insect that sucks the sap from the young shoots and fruits - Thousands of insects attack the plant at the same time - Growth of the plant is hindered and flowers are shed - Severely infested plants yield only a few fruits, which are deformed - Found generally in winter crops such as yard long bean and country bean. In the last 2-3 years it has also been seen in summer crops	BEAN APHID. *Aphis* spp. **MP:** Application of chemicals such as Malathion, Fenfen, Tafgor, Dursban, Cymbush etc. Apply ash
bean: country bean, yard long bean	**MAJRA POKA • SHADA POKA** **MACHHI POKA • SHIMER KIRA** - Bores into fruit and eats the inside - Dark brownish worm-like insect - Similar to the worm of country bean - Present at fruiting stage - Up to 50% of the fruits can be damaged in severe infestations - Has become difficult to control by chemicals in the last 4-5 years	BEAN POD BORER. Lepidoptera Family: Crambidae . *Maruca testulalis* is common in Bangladesh (D. Sarker, pers. com.). **MP:** Application of chemicals such as Indian bish Fenfen, Melfen, Basathrin, Tafgor, Relothrin, Fenitox, Karate etc. Application of Fenfen mixed with crushed Naphthalene
bean: country bean	**KANDO POCHA • POCHA ROG** **PATA POCHA • KÆNSHER** - Brown to reddish brown spots appear on the leaf which gradually rots - Disease rapidly spreads when fresh leaves come into contact with infected leaves - Gradually the vine becomes contaminated - Fruits, especially young fruits, rot and die and finally the whole plant rots and dies - Disease has become more severe in the last 4-5 years	UNIDENTIFIED. **MP:** Remove the infested plant parts. Application of Dithane M-45, Indofil, Corolux, Fentiox, Melfen, Bavistin, Sevlon, Planofix etc.
bean: country bean	**MURGA POKA** - Round, yellow to red coloured insect - Eats the leaves leaving the veins looking like a net - Insect attacks the immature plant - Also damages bitter gourd, teasel gourd etc - Pest favours dry weather	EPILACHNA BEETLE. **MP:** Application of Fenfen, Melfen, Basathrin, Cymbush, Dursban, Decis etc . Apply ash

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
country bean	**JHORA ROG • SHIM JHORA • POCHA LAGA** - Damage widespread on young fruits - White powder-like substance covers the inflorescence and young fruits - Flowers and fruits drop within a few days - In case of severe damage, the plant cannot bear any flowers or pods. - From the last 4-5 years it becomes a serious problem in Country bean cultivation.	**MP:** Application of pesticides such as Dithane M-45, Thiovit, Cupravit etc. . Pesticide application does not give effective results
bottle gourd	**MOROK ROG** - Disease present during the flowering stage - Main root rots and the roots contain knots - Top part of plant dies and gradually the whole plant dies - Up to two thirds of the field can be destroyed if this disease is present - Has caused serious damage for the last 4-5 years	UNIDENTIFIED. . Most likely to be a root knot nematode as this is a very susceptible host (J. Bridge, pers.coms.) **MP:** Application of Bavistin, Tilt, Knowin, Dithane M-45 etc
bottle gourd	**GACHH MORA • MORA LAGA** **DOGA MORA • SHUKNA ROG** - Brown to black spots seen on the leaves which enlarge and the whole leaf rots - Young leaves and vines also show rot symptoms - In severe cases, the whole plant may die	UNIDENTIFIED. **MP:** Application of Bavistin, Thiovit etc.
bottle gourd	**KANDO POCHA** - Vine cracks and sticky substances are secreted - Within a few days the infected part turns black and becomes narrow - Infected plant part turns yellow and dies - Top part dies first then hangs down. The base region rots	UNIDENTIFIED. **MP:** Application of Bavistin, Thiovit etc.
chilli	**PIPRI LAGA • PUKRA LAGA** **PHULA ROG • BHAIRASH ROG** - Leaves curl and turn yellow - Plant produces many branches and appears bushy - Plant do not yield flowers or fruits - Disease favours warm weather and summer varieties are most affected - Affects the whole field within a few days - Has become a destructive disease in the last 4-5 years	LEAF CURL OF CHILLI. **MP:** Uproot infested plant. Apply ash
cabbage	**GORA POCHA** - Dry rot extends from ½ inch below the ground to ½ inch above the ground - The skin of base of the stalk dries out - Plant wilts during the day but recovers at night - Starts at the seedling stage - The most damaging disease of cabbage and cauliflower seedlings	FOOT ROT. **MP:** Application of Bavistin, Dithane M-45. Some farmers drain the fields, others irrigate infested fields
potato	**MOROK ROG • PATA SHUKNA ROG** - Initially affects only a few plants in the field. Tender leaves become rotten - Disease spreads rapidly and destroys the whole crop within 2-3 days - Unpleasant odour comes from seriously affected fields - Base region and roots also rot - Disease favours foggy conditions - Within the last 4-5 years it has - become impossible to grow the crop without pesticides	LATE BLIGHT OF POTATO: *Phytopthora infestans.* **MP:** Application of Dithane M-45, Ridomil, Indofil etc.

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
potato	**KATA POKA • LEDA POKA** - Soft-bodied insect that lives in the soil - Cuts the seedlings just above the soil surface - Comes out from soil in the morning and at dawn - Can be located in the soil near the cut plant - Also cuts the seedlings of other winter crops	CUTWORM. **MP:** Apply water. Application of pesticides such as Tafgor, Basudin Dursban, Furadan, Cymbush etc. Wrap the seedling with polythene
tomato	**GORA POCHA** - The skin of base of the stalk is dried - Dry symptom extends from ½ inch below the ground to ½ inch above the ground - Plant wilts during the daytime, but recovers at night - Found from the seedling stage	FOOT ROT. **MP:** Application of Bavistin, Dithane M-45. Some drain fields, others irrigate fields
tomato	**GACHHI PHULA • KUKRA ROG** - Chilli leaves curl and turn yellow - Plant produces many branches giving a bushy appearance - Plant cannot bear flowers or fruits - Disease favours warm weather - Has become a destructive disease within the last 4-5 years	LEAF CURL OF CHILLI. **MP:** Application of Bavistin, Indofil etc. Uproot infested plant. Apply ash
bottle gourd, sweet gourd	**PAKRA LAGA • BHAIRASH LAGA** - Leaves curl and turn yellow - Vines of the leaf turn white - Plant growth is restricted and cannot yield fruits or flowers - Fruits are small and deformed	LEAF CURL OF CUCURBITS. The roots should be checked as these symptoms could be caused by the root knot nematode (J. Bridge, pers.coms.). **MP:** Uproot infested plant. Application of Bavistin, Dithane M-45 etc. Application of Malathion
sweet gourd	**POCHA LAGA** - Immature fruits are small and turn a yellow colour - Infected fruit is wrinkled and dry - Problem occurs when the plant begins to produce a few fruits	UNIDENTIFIED. **MP:** Control measures are not adopted
cucumber, teasel gourd	**PATA MORANO POKA** - Long green coloured insect that folds the leaves - Eats young tender shoots and leaves and hides inside folded leaves - Bores into the young fruits - Infestation starts one month after transplanting, and remains the entire crop season	PUMPKIN CATERPILLAR. **MP:** Application of Dursban, Decis, Cymbush etc
cucumber, bitter gourd	**PIPRI LAGA • PAKRA LAGA** - Leaves are curled and turn yellow - Plant growth is limited - Plant produces few flowers or fruits - Fruits are curled and the skin becomes smooth - Finally the vines die - Has become a major problem in the last 4-5 years	LEAF CURL OF CUCURBIT. The roots should be checked as these symptoms could be caused by the root knot nematode (J. Bridge, pers.coms.). **MP:** Application of Cupravit, Thiovit, Macuprax, Homai etc, but results are disappointing
bottle gourd, sweet gourd, bitter gourd	**BOLTA POKA • MACHHI POKA BHOMRA POKA** - A yellow fly bores the young fruits - Sticky substance is produced from the infested plant part - Fruits are deformed - Within the last 5-6 years it is impossible to grow the crop without using pesticides	CUCURBIT FRUIT FLY. **MP:** Application of chemicals such as Fenfen Dursban, Sevin, Cymbush, Fyfanon, Tafgor etc.

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
wheat	**MORA LAGA** - Plant initially turns a red colour - Plant growth is limited and are unable to take up fertilizers - Roots are damaged plant may die within a few days - Problem has become seriously damaging within the last 4-5 years - A few areas of the field contain smaller, pale or red coloured plants that can be easily seen	FOOT ROT OF WHEAT. **MP:** Application of Thiovit, Cupravit, Tilt, Bavistin etc
banana	**PATA MORA** - Yellow spots first appear on the leaves - Gradually the spots enlarge and within a few days the leaf may dry up. - The midrib of the leaf breaks down, and severely infected plants contain only dried leaves - Infected plants cannot grow large - Fruits are small, and ripen early, within a few days - Has become as a serious problem in banana cultivation within the last 6-7 years	BANANA SIGATOKA. **MP:** Application of Bavistin, Knowin, Dithane M-45, Topsin etc
eggplant	**MAJRA POKA ● BEGUNER KIRA** - The most destructive pest of brinjal - Infestation starts soon after transplanting and remains the entire crop season - Bores into the tender shoot resulting in wilt symptoms - Impossible to control without frequent application of pesticides - Can damage 80-100% of fruits if chemicals are not applied	BRINJAL SHORT AND FRUIT BORER. **MP:** Application of Cymbush, Marshal, Indian bish, Fenfen, Ripcord, Dursban, Basathrin, Fenitox etc. Application of neem extract mixed with Cymbush. Cut and removing infested plant parts
eggplant	**MORA LAGA ● KÆNSHER** - The branches of the plant bears black lesson in one side. - Infested branches are dried and the disease gradually enlarged backwardly and finally the whole plant is died. - Severely infected plant has no leaf - Considerable damage is observed from the last 5-6 years	DIE BACK OF BRINJAL. . Could be due to *Phomopsis* or root knot nematode (M. R. Ali, pers. com.) **MP:** Uproot infested plant. Application of Dithane M-45, Indofil, Bavistin, Tafgor, Karate, Vegimax etc.
eggplant	**POCHA LAGA** - Brown to blackish lesions first appear at the base of the stem - Infested part dies and within a few days the whole plant may die - Branches of the plant and the fruits sometimes show rot symptom - Infested bark may crack and secreted a sticky substance - Generally found in mature plants - Has become considerably damaging in the last 4-5 years	UNIDENTIFIED. **MP:** Application of Dithane M-45, Tilt, Thiovit, Champion etc
lemon	**GORA POCHA ● GORA FATA ROG** - Brown lesions first appear on the base of the plant which gradually enlarge - Bark of the infected area cracks and a sticky substance is secreted - Leaves turn yellow and drop - Plants do not produce flowers or fruits and finally die	GUMMOSIS OF LEMON *Phytophthora parasitica* and *citrophora.* **MP:** Application of Tilt, Bavistin etc
lemon	**SHOLMA ROG** - Scars appear on the leaves and fruit skin and - Young fruits cannot grow large and are sometimes deformed - Infection by the disease reduces the market value of the fruit	SCAB OF LEMON. **MP:** Control measures are not adopted

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
lemon	**LEDA POKA** - Eats the entire leaf apart from the mid rib - Lives inside the folded leaves	LARVA OF LEMON BUTTERFLY. **MP:** Application of Melfen, Fenfen, Basathrin etc.
guava	**LEDA POKA** - Long, soft-bodied green coloured pest that eats the leaves - Eats the entire leaf (apart from the mid rib) starting from the margin - Infestation is high when the plant produces young fresh leaves	UNIDENTIFIED CATERPILLAR OF GUAVA. **MP:** Application of Fenfen, Melfen etc
guava	**MAKORSHA** - Type of spider that produces webs on the flowers and eats the inner part of the flower - Flower gradually turns black and finally dies - Web also found on the lower part of the fruit which becomes rotten - Small white pest is seen in the infested part	UNIDENTIFIED MITE OF GUAVA. **MP:** Control measures are not adopted

Table B12: Local knowledge of plant health problems Moulvibazar (Winter)

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
potato	**KUKRI BEMAR ● KUKRA ROG** - Leaves are curled and plant growth is restricted - Tubers cannot grow large and the are frequently peanut shaped - Disease appears when the plant has produced only a few leaves and remains until maturity. - First observed about 10-15 years ago, but has become severe in the last 5-6 years. - Contaminated tubers may be the cause of this disease	UNIDENTIFIED VIRUS. **MP:** Dithane M-45, Ridomil etc are applied but gives poor result
potato	**BICHHA POKA** - Very small greenish brown insect - Infestation starts when the plants are young - Worm produces a web-like arrangement and lays eggs inside its nest - Eats the entire leaf leaving a net - First observed 4-5 years ago	UNIDENTIFIED CATERPILLAR OF POTATO **MP:** Pesticides are not applied
potato	**MORKI BEMAR ● POCHA MOROK** **POCHA ROG ● KÆNSHER** - Initially only a few plants are affected. Affected tender leaves become rotted - Disease spreads rapidly and within 2-3 days the whole field is destroyed - Unpleasant odour comes out from seriously affected fields - The foot region and roots are become rotten - Disease favours foggy conditions - Has become impossible to grow the crop without pesticides, since the last 4-5 years	LATE BLIGHT OF POTATO. **MP:** Application of Dithane M-45 such as Indofil, Mancozeb, Ridomil, Melfen.
cauliflower	**GORA POCHA ● GORA SHUKNA** - Base of the plant rots then symptoms gradually extent towards the top - Disease is first seen at the seedling stage although is seen more in matured plants - Roots sometimes rot	UNIDENTIFIED. **MP:** Pesticides are not used
tomato, potato, chilli, eggplant	**KAÙUI POKA ● LEDA POKA ● KALO POKA** - Soft-bodied insect that lives in the soil - Cuts the seedlings just above the soil surface - Comes out from soil during the morning and evening - Can be found in the soil near the cut plants - Also cuts the seedlings of other winter crops	CUTWORM. **MP:** Apply water. Application of pesticides such as Tafgor, Basudin. Wrap the seedling in polythene
country bean	**IDLA POKA ● LAWRI POKA ● JAB POKA** - Small, soft-bodied insect that sucks sap from the tender shoots, leaves and young fruits - Plant growth is reduced and the infested plants become pale and curled - Identified as the most damaging pest since the last 5-6 years	BEAN APHID. **MP:** Application of chemicals such as Malathion, Fyfanon etc. Application of ash mixed with crushed Naphthalene
country bean	**KIRA POKA ●SHIMER KIRA** - Bores the fruit and eats the insides - Brownish coloured worm-like pest - Similar to the worm of the country bean - Seen only at the fruiting stage - Up to 50% of the fruits can be damaged in severe infestations - Has become difficult to control in the last 4-5 years	BEAN POD BORER. **MP:** Application of chemicals such as Fenfen, Basathrin, Tafgor, Relothrin, Fenitox.

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
red amaranth	**SHADA ROG** - Numerous small white spots appear on the underside of the leaf - Leaves turn pale coloured - Plant cannot grow large - Has become a major problem in the last 3-4 years - Market value is greatly reduced	WHITE RUST OF RED AMARANTH. **MP:** Control measures are not adopted
tomato	**JHAR MORA ● GORA POCHA** - The base of the plant becomes soft, and water soaked lesions appear which rots the whole plant (including roots) within a few days - Disease favours wet conditions	FOOT ROT. **MP:** Application of chemicals such as Dithane M-45, Ridomil.
tomato	**KUKRA ROG** - Leaves are curled and plant growth is limited - Plant rarely produces flowers or fruits. If fruits are produced they are small - May be caused by nutrient deficiency or contaminated by 'bad wind' - The disease has been observed since the beginning of tomato cultivation - Generally matured plants are affected	LEAF CURL OF TOMATO. **MP:** Chemicals are not used. Sometimes ashes are applied
eggplant	**KIRA POKA ● MAJRA POKA** - Bores the fruit and tender shoots and eats the inner parts - Infestation starts from the seedling stage and remains all the year round - Infested shoots wilt during sunny days - The most damaging insect of brinjal	BRINJAL SHOOT AND FRUIT BORER. **MP:** Application of chemicals such as Tafgor, Malathion, Cymbush, Dursban. Cut and remove the infested plant parts
lemon	**DAUDA ROG** - Fruits and leaves bear scar symptoms - Leaves turn yellow - Growth of the fruit is limited and market value is reduced - This disease severely damages the large aromatic lemon (Alachi lebu)	SCAB OF LEMON. **MP:** Application of chemicals such as Diazinon, Cythion.
country bean, yard long bean	**BAU LAGA** - Leaves turn red on the upper side - It is generally found in a mature plant. - Growth of the plant is reduced and it cannot take up fertilizers - May be caused by bad wind	RUST OF BEAN. **MP:** Generally control measures are not adopted
.coconut, betel nut	**JHORA LARA ● ISAI KHAOA** - Immature fruits drop - Outer surface of the coconut remains good, but the kernel is deformed - Sometimes the fruit bears no water. - The bud spikelet of betel nut turns black or red then drops - About half of the fruits drop	BUD ROT OF COCONUT, BETEL NUT. Possibly a complex (M. R. Ali, pers. com.). **MP:** Control measures are not adopted but sometimes cow dung and other fertilizers are applied
chilli	**GHUGRI POKA** - Brownish coloured hairy insect, which has strong mouthparts - Live in the soil - Cuts the roots and stems of young seedlings - Infestation is high in loose soil	FIELD OR MOLE CRICKET is described (D. Sarker, pers. com.). **MP:** Chemicals are not used. Apply excess water

CROP	LOCAL NAME: DESCRIPTION OF THE PROBLEM	SUGGESTED CAUSE (S) AND MANAGEMENT PRACTICES (MP)
chilli	**GORA POCHA ● JHAR MORA** - Base of plant rots - Generally affects young plants - Within a few days of disease infection, the plant may die - Damp soil condition favours the disease	FOOT ROT OF CHILLI. Could be *Phytopthora, Pythium or Fusarium* (M. R. Ali, pers. com.). **MP:** Control measures are not adopted
pomegranate	**MOROK ROG** - Black lesions initially occur on the skin of young fruits which gradually enlarge and rot the whole fruit - Disease also damages mature fruits - Inner part of the fruit turns black - Fruits crack before ripening - Leaves with black spots are shed	FRUIT ROT OF POMEGRANATE. **MP:** Control measures are not adopted
sweet gourd	**KURI JHORA** - Initially the immature fruits turn yellow and gradually the fruit shrivels. Within a few days the fruit is spoiled - It may be caused by a nutritional deficiency - Considerable damage has been observed in the last 5-7 years	UNIDENTIFIED. **MP:** Application of Malathion, Dimethion, Agromethion etc
cabbage, red amaranth	**LEDA POKA** - Green coloured pest that is found on the lower surface of leaves - In severe infestation, can eat the entire leaf, leaving only the stalk - Damaged leaves look like they have been cut by scissors - Severe damage has been observed in the last 4-5 years	LARVA OF CABBAGE BUTTERFLY. **MP:** Application of pesticides such as Tafgor, Sobicron etc
French bean	**GORA POCHA** - Reddish coloured spots are found on the base of the leaf - Plant stops growing - In severe infestations, the base rots about 2-4 inches and may die in a few days - Severe damage has been observed in the last 2-3 years	UNIDENTIFIED. **MP:** Chemicals are not used

Annex C: Use of pesticides for pest management

CROP	PEST	COMMERCIAL NAME OF THE CHEMICALS	APPLICATION TECHNIQUE	EFFECTIVENESS
rice	Earthworm	Indian oil (Kripcord)	After 15-30 days of transplanting, this chemical is sprayed 1-2 times at the rate of 1 bottle per bigha	Good result obtained
		Furadan, Basudin etc.	These are used 1-2 times at the rate of 12-16 kg per acre	Satisfactory results not obtained
	Rice stem borer	Basudin, Furadan, Sunfuran,	After one month of transplanting these chemicals are used 1-2 times at the rate of 1-1.25 kg per bigha	Pest can be controlled by using these pesticides
		Malathion, Diazinon	When the plants grow to panicle initiation stage, pesticides are applied once at the rate of 10-15 ml per 10 L water	
eggplant	Brinjal shoot and fruit borer	Ripcord, Cymbush, Ekalux, Fenfen, Indian oil, Marshal, Kartap, Suntap, Rider etc	These chemicals are used for 10-20 days in a month at the rate of 10-20 ml per 10 L water On an average, these chemicals are applied 50-70 times in a crop season but in some case this may rise to 180-200 times. During the rainy season when infestation is severe, pesticides are applied almost daily	It is quite impossible to grow brinjal without frequent pesticide application Pesticide application can stop the infestation of this pest for 1-2 days only
country bean	Bean pod borer	Fenfen, Milfen, Basathrin, Tafgor, Relothrin, Fenitox, Karate, Indian oil	These are applied from fruiting stage 2-3 times in a week at the rate of 2-4 cork per 10 L water In a crop season about 25-50 sprays are made	Frequent application can give results
chilli	Leaf curl	Zinc, Agro grow	These are applied 1-2 times at the rate of 5-10 ml per 10 L of water	These chemicals give no results
sugarcane	Sugarcane stem borer	Briffer, Curaterr, Furadan	After rain, these are applied 1-2 times at the rate of 16 kg per acre as the infestation starts	Not effective
bitter gourd	Lepidopteran larvae, Fruit fly	Cymbush, Fyfanon, Decis	Immediately after flowering, it is applied 10-15 times in a season, at 7-10 day intervals, at the rate of 10 ml per 10 L of water	Effective result
country bean, yard long bean	Bean pod borer	Fenfen, Milfen, Basathrin, Tafgor, Relothrin, Fenitox, Karate, Indian bish	These are applied from fruiting, 2-3 times a week at the rate of 2-4 cork per 10 L water. In a crop season 15-45 sprays are made on average	Frequent application can give results
bottle gourd, sweet gourd	Cucurbit fruit fly	Fenfen Dursban, Sevin, Cymbush, Fyfanon, Tafgor	These are sprayed for 1-3 times in a week at the rate of 2-3 cork per 10 L water In a crop-growing season, about 15-20 sprays are made. After 1-2 days of application, the pest attacks again	This pest cannot be controlled effectively Comparatively Tafgor gives better result
cauliflower	Riceyness, Buttoning	Dithane M-45, Indofil, Tafgor	These are applied before the flowering stage 1-2 times a week, at the rate of 25-50 gm per 10 L water. In a crop season about 8-10 sprays are made	Not effective
chilli	Leaf curl	Bavistin, Indofil	As infestation starts, these chemicals are used 1-2 times at the rate of 2-3 spoons per 10 L water	Not effective
potato	Cutworm	Tafgor, Basudin, Dursban, Furadan, Cymbush	These are applied 2-3 times at 5-7 day intervals during the seedling stage at the rate of 2-3 cork per 10 L water	Not very effective
	Late blight of potato	Dithane, Mencozeb, Milfen, Indofil	These are applied 3-4 times in a crop season at 10-15 day intervals at the rate of 40-50 mls per 15 L of water Spraying starts when only a few infected plants are observed	These chemicals can reduce the rapid damage

CROP	PEST	COMMERCIAL NAME OF THE CHEMICALS	APPLICATION TECHNIQUE	EFFECTIVENESS
cauliflower, cabbage	Foot rot	Dithane M-45, Bavistin	These are applied at the seedling stage, 1-3 times at the rate of 1.5-2.5 spoons per 10 L of water	Not effective
bottle gourd, sweet gourd	Cucurbit fruit fly	Fenfen Dursban, Sevin, Cymbush, Fyfanon, Tafgor	These are sprayed 1-3 times a week at the rate of 2-3 cork per 10 L water. In a crop-growing season, about 15-20 sprays are made. After 1-2 days of application, the pest attacks again	This pest cannot be controlled effectively. Comparatively Tafgor gives a better result
onion	Purple blotch of onion	Rovral, Antracol	As the infestation starts, these chemicals are applied 2-6 times at the rate of 30 g per 10 L of water at 15-20 day intervals	Good results
tomato	Foot rot	Ridomil, Dithane M-45, Champion	When the infestation starts, these are used 3-7 times at the rate of 15-20 ml per 10 L water at 7-10 day intervals	Not effective

Annex D: Farmer innovations for pest management

CROP	PEST	DESCRIPTION OF THE METHOD	EFFECTIVENESS	COST
rice	Earthworm	Application of crushed Naphthalene mixed with urea fertilizer. Only applied when urea fertilizer is added to the field	Reasonably effective	25-30 Tk per bigha
	Rice stem borer	Laundry powder, Gul, and Fitkari is mixed together with urea fertilizer then applied to the field as the pest appears 4 packets of Gul (1 Tk per pile), 4 packets laundry powder (2 Tk per packet) and 250 g Fitkari (white vitriol) are applied to one bigha of land, 1-2 times	Pest is effectively controlled	20-30 Tk per bigha
	All insects	The seeds of a white variety of jute (deshi pat) are dried in sunlight and crushed by traditional equipment to make dust. This is mixed with water and sprayed in the rice field at the rate of 3 kg per bigha	Insects can not attack the rice plant	Negligible
	Sheath blight, Sheath rot	Tute and Boric powder is mixed and then applied in the rice field, twice. 500 g 'Tute' (42 Tk) and 200 g boric powder (14 Tk) is mixed and applied to 1 bigha	If these are applied before the infestation, it gives good result,	56 Tk per bigha
	All kinds of insects	1 kg neem leaf and 100 g of tobacco leaf (Ala pata) or 4 packets Gul is boiled in 4 L water. When the boiled mixture reduces to 2 L, the mixture is allowed to cool and the mixture is filtered. The filtered solution is mixed with additional water and applied using a sprayer. 2 kg liquid mixture is mixed with 4 drum of water (1 drum is equal to10 L) and is sprayed onto1 bigha of land. Spraying is made up to 3 times in a season	No need to apply pesticides as results are good	20-30 Tk per bigha
wheat	Rat	An irritable substance 'soas gura' is applied to the rat's pathway. When a rat comes to contact with the substance, it gives off an alarm response, which the other rats sense and run from the field	Effective result is obtained	Negligible
		A large straight walled aluminum pot is placed inside the field near the rat burrow. It is buried so that it is the same level of the field. Inside the pot, fruits with a strong, attractive odour, such as banana, mango and coconut are placed. The rat is attracted by the fruit smell, falls into the pot and cannot escape due to the straight walled design of the pot. Three to five rats can be trapped by one pot. Foods are removed and replaced each day		
white gourd	Red pumpkin beetle, Epilachna beetle	Application of ashes with crushed Naphthalene applied during the early morning gives good result	Effective	Negligible
cucurbits	Red pumpkin beetle	Crushed Naphthalene and ashes are mixed and sprayed in the morning when plant bear little moisture	Effective	Negligible
eggplant	Foot rot, Stem rot	100 g Dithane M-45 and 50 g of Aqua wint is mixed in 1-1.5 L water. A rough cloth is used to apply the solution to the infected plant. Within a few hours, the solution dries, and a protective layer is formed around the plant, which cannot be removed by water. Used 2-3 times when the infestation is observed or as a protectant before infestation starts. This method is used when the base of the plant is dried and cracked	60-70% of the disease can be controlled using this method	60 Tk per bigha

CROP	PEST	DESCRIPTION OF THE METHOD	EFFECTIVENESS	COST
	Brinjal shoot and fruit borer, Epilachna beetle	Application of Gul, crushed dried chilli and neem leaf extract mixed with water, sprayed 1-2 times a week	It can protect the infestation for 2-4 days	25-30 Tk per bigha
country bean	Bean pod borer	Gul mixed with water is sprayed on the infested plant. 4-5 packs of Gul is mixed with 10 L water and sprayed 1-3 times. 100 g tobacco leaf are soaked in 1 L water overnight. The extract of tobacco leaf is mixed with 40 L water then sprayed onto infested plant parts. It is also used against the bean aphid	Effective	20-30 Taka per bigha
tomato	Tomato aphid	Application of tobacco leaf extract soaked in water for 24 hours. 100-150 g tobacco leaf is used per 1 bigha	It gives good results	20-30 Tk per bigha
garlic, onion	Purple blotch disease	1 kg Tute and 1 kg Fitkari is mixed with 4 drum of water and sprayed onto1 bigha of land. Spraying is done 1-2 times as soon as the disease symptom appeared	Very effective to control this disease	145 Tk per bigha Tute = 80 Tk, Fitkari = 65 Tk per kg
lemon	Foot rot, Gummosis	Application of lime mixed with water, applied 1-2 days a week.150-200 g lime is mixed with 10 L of water. The limewater is applied before the disease infestation is observed	Plants are not generally affected by this disease if limewater is applied before disease infestation starts	15-20 Tk per spray
fruits	Fruit borer	Application of tobacco leaf extract soaked in water for 24 hours. 100 g tobacco leaf are needed per 1 bigha	Used in fruits when it is difficult to use pesticides	20-25 Tk per bigha
cabbage, cauliflower	Cutworm	Polythene is used to cover the base of the plant up to 2-3 inches depth from the ground level, so that the pest cannot come in contact the plant. Pest attack is avoided due to this barrier	Although it is time consuming and costly, it gives very good results	100-150 Tk per bigha (although reuseable)
seedlings	Cutworm	A small channel is created around the seedling in the seedbed, which is sometimes filled with kerosene water	Effective	Negligible
		Polythene is used to cover the base of the plant up to 2-3 inches depth from the ground level, so that the pest cannot come in contact the plant. Pest attack is avoided due to this barrier		
eggplant, cabbage	Cutworm	Kerosene oil is applied at the base of the plant	Effective	Negligible
vegetables	All pests	Neem leaf, cloth soap, Tute and water are boiled for half an hour then sprayed on all types of vegetables to protect them from insect and diseases. Sometimes Borax (Sohaga) is added	Effective	Negligible
gourds	Cucurbit fruit fly	Cooked rice by-product is pasted onto bright yellow cloth pieces and placed on a stick. The yellow cloth attracts the fruit fly which becomes trapped on the sticky trap	Effective	Negligible
		Ripe jackfruit spikes are dipped in liquid pesticides such as Malathion, and then are hung in the crop fields		

Figure 1a: Frequency of plant health problems (insects) at 30 villages in 3 districts (2004 Summer-I)

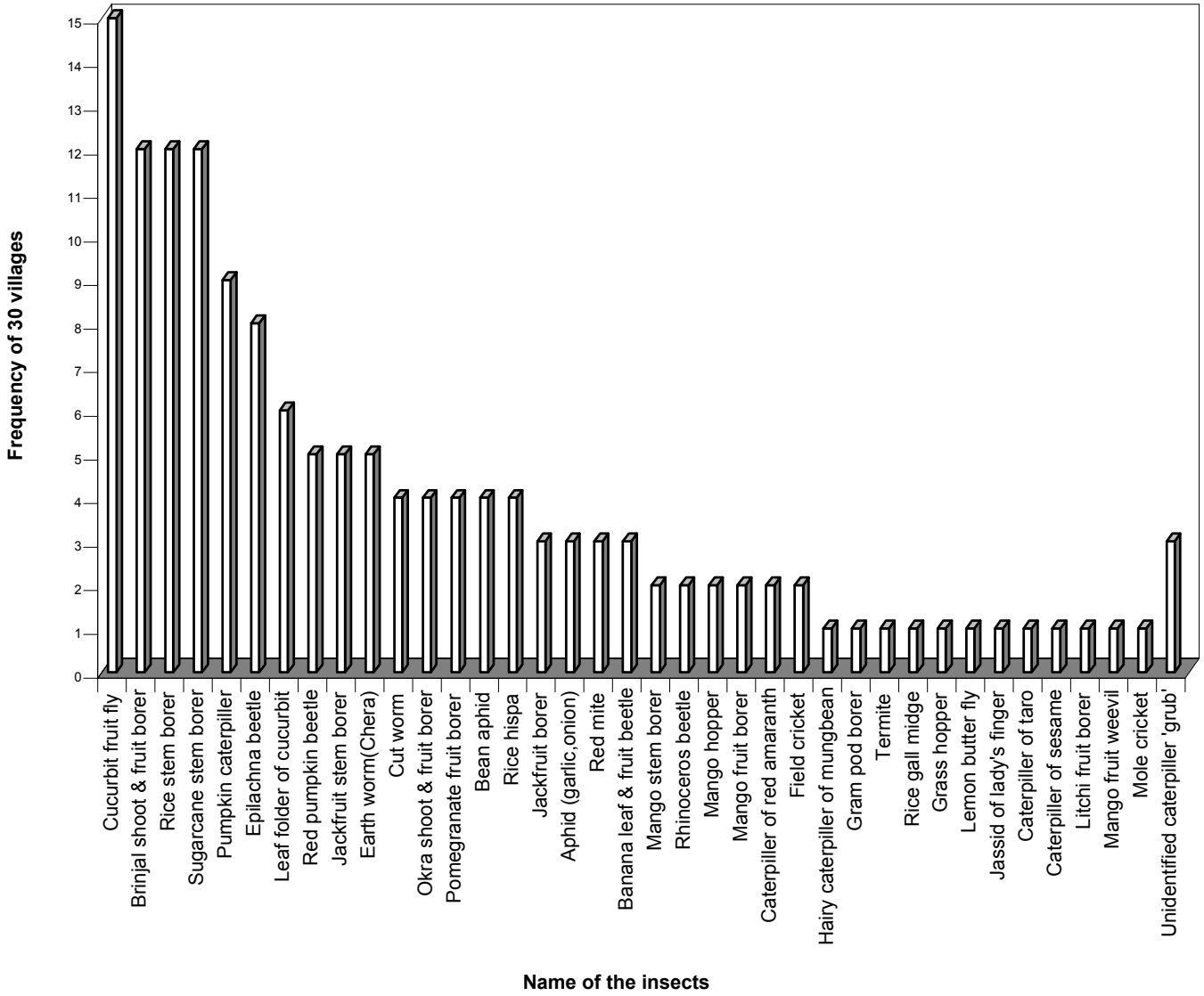

Figure 1b: Frequency of plant health problems (diseases and disorders) at 30 villages in 3 districts (2004 Summer-I)

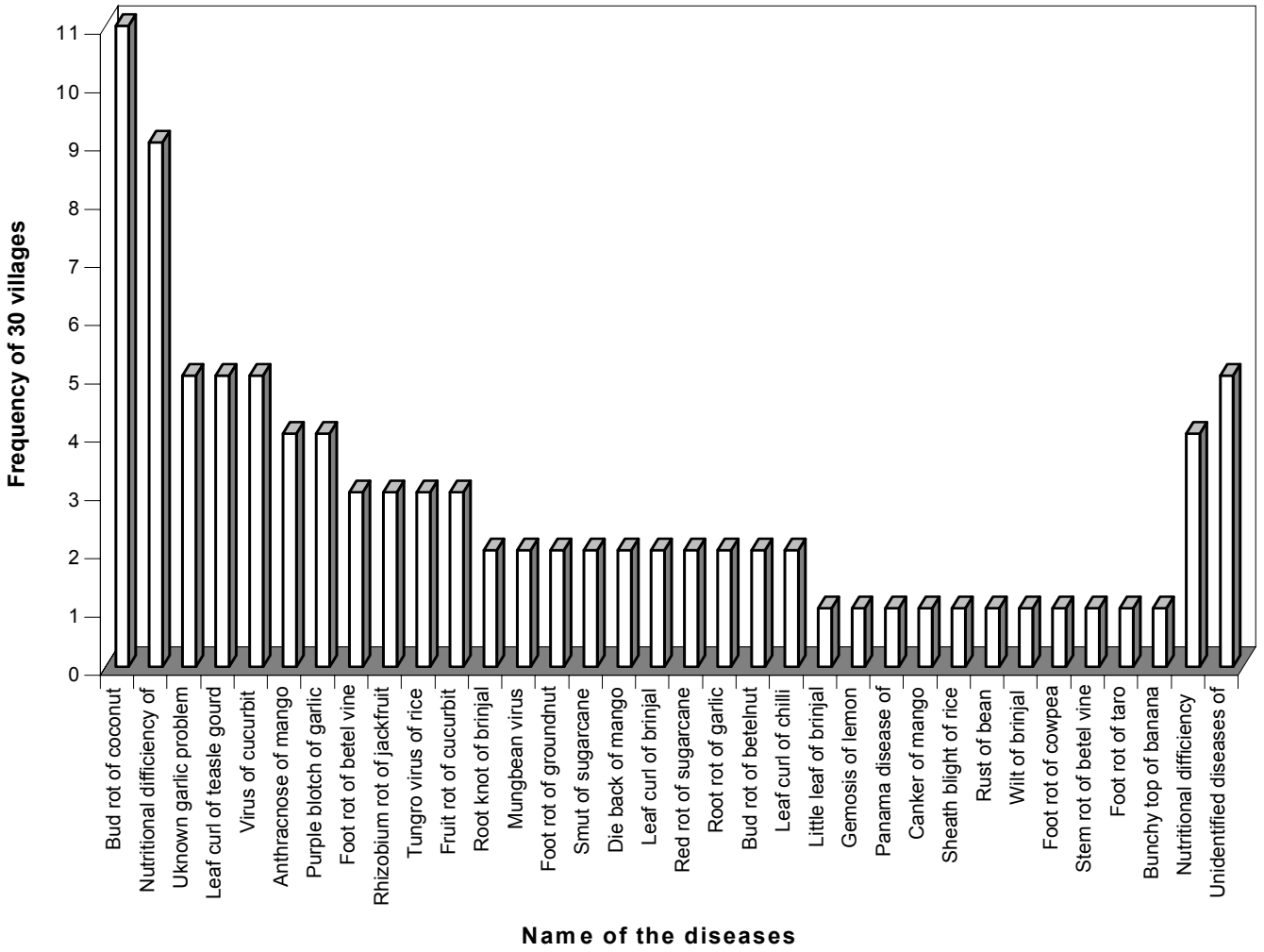

Figure 2a: Frequency of plant health problems (insects) at 12 villages in 3 districts (2004 Summer-II)

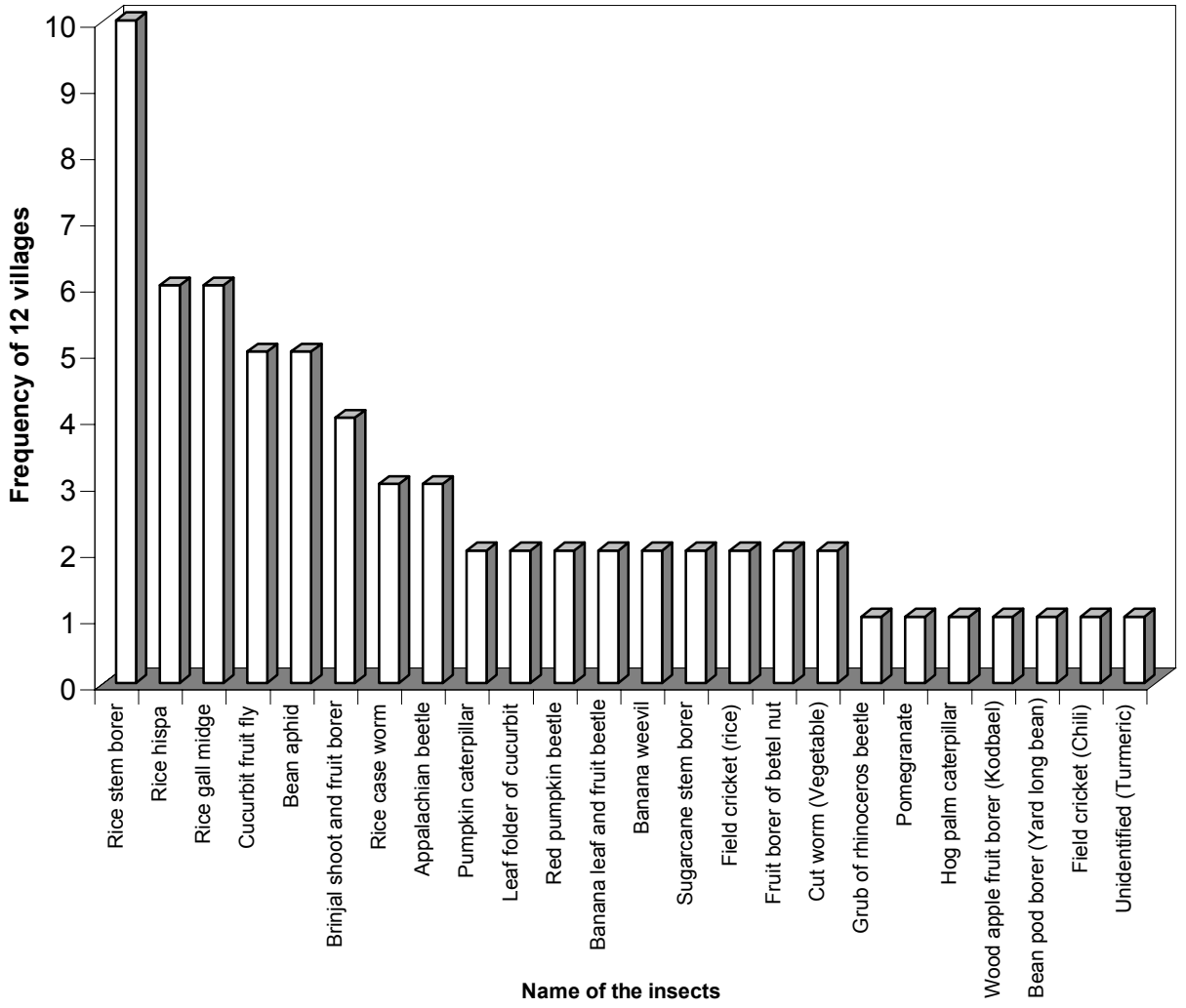

Figure 2b: Frequency of plant health problems (diseases and disorders) at 12 villages in 3 districts (2004 Summer-II)

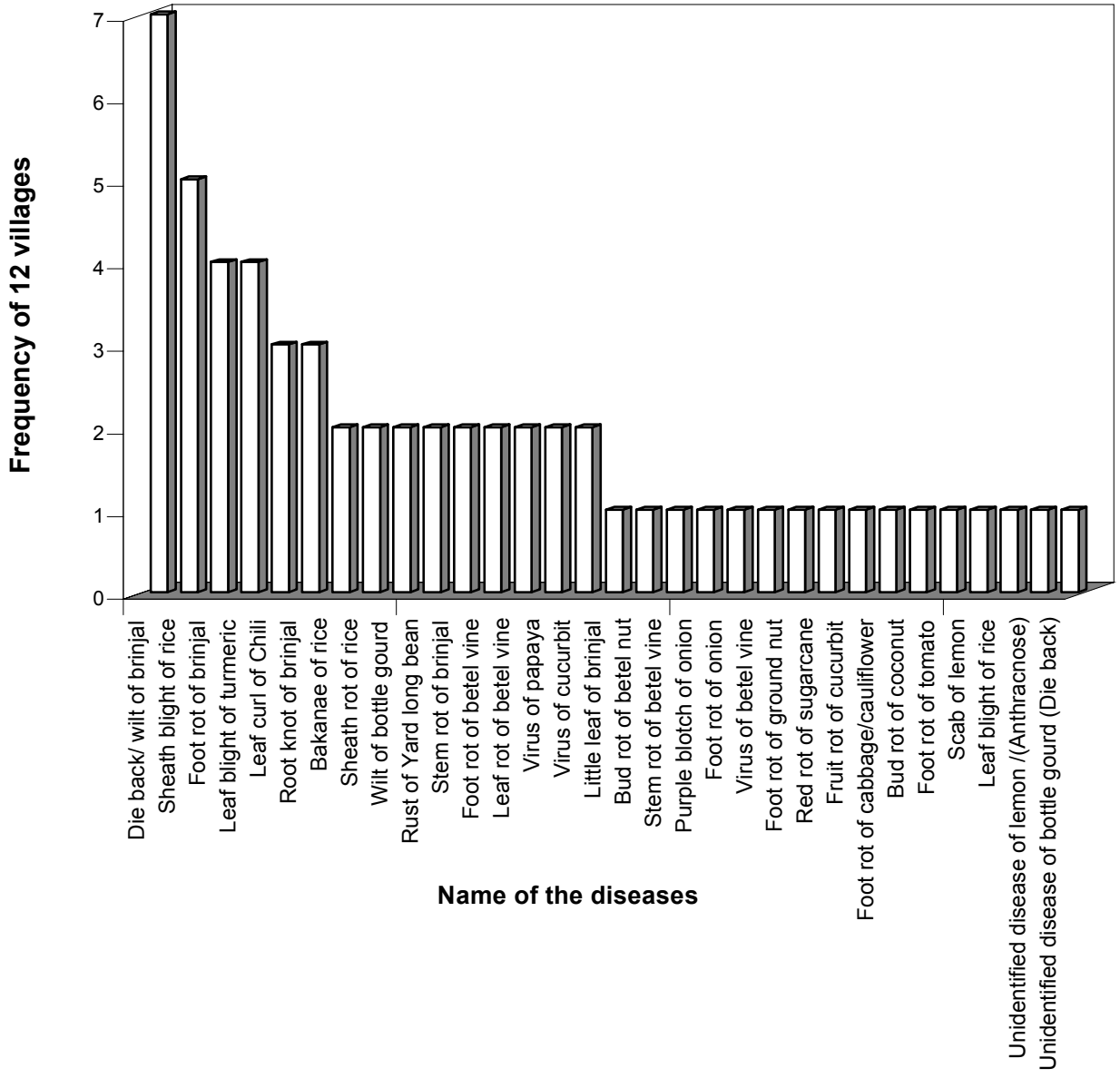

Figure 3a: Frequency of plant health problems (insects) at 17 villages in 3 districts (2004 Winter)

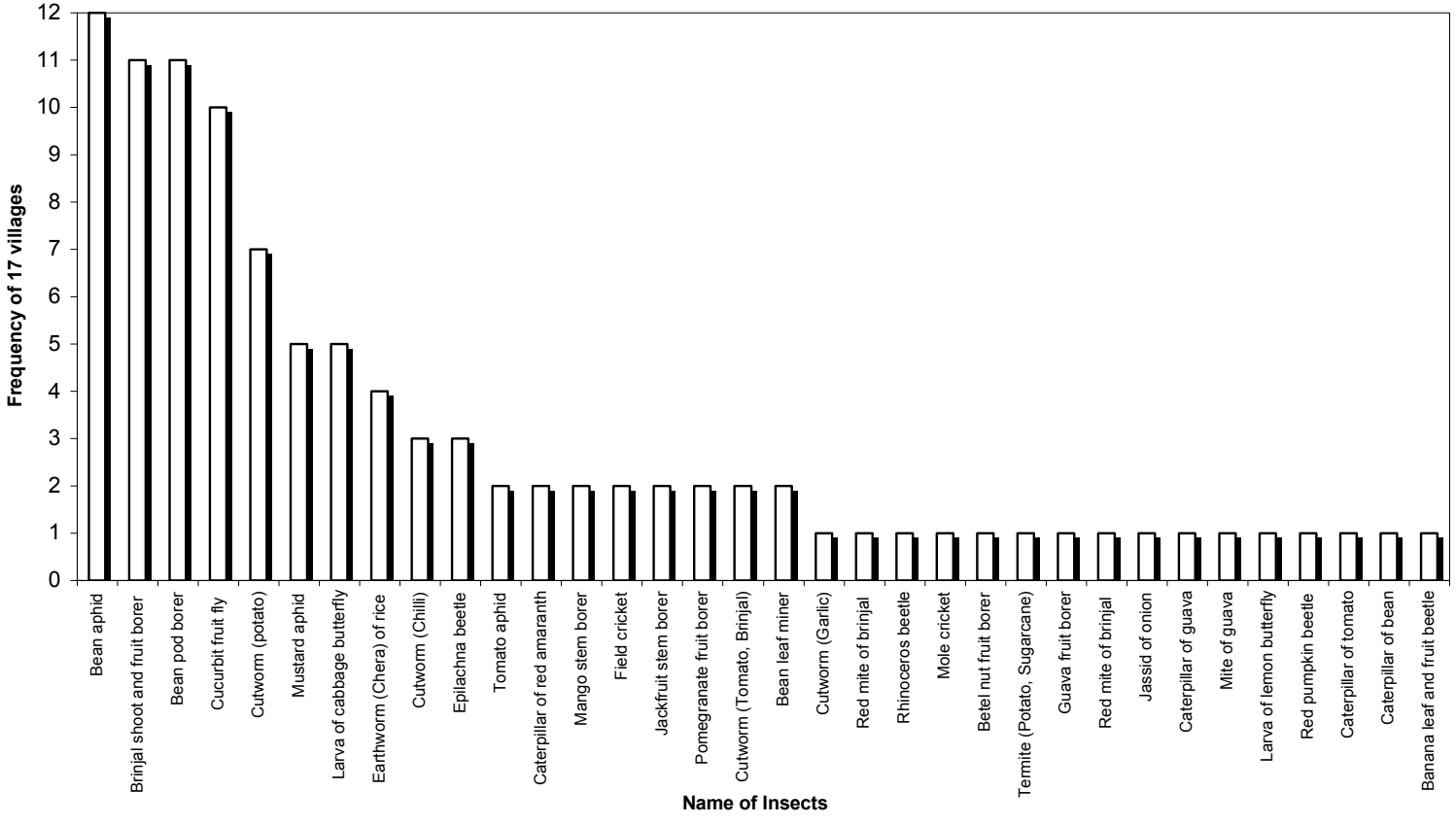

Figure 3b: Frequency of plant health problems (diseases and disorders) at 17 villages in 3 districts (2004 Winter)