A Special Study:

Plant Clinic Operation in Bangladesh
Performance and Impacts

Rural Development Academy (RDA)
Agricultural Advisory Society (AAS)
Shushilan

Prepared by:

Md. Harun-Ar-Rashid
Executive Director, AAS

Submitted to:

Global Plant Clinic, CABI

Bakeham Lane, Egham, Surry TW20 9TY, U.K.
plant clinic @ cabi.org, www. globalplantclinic.org

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Acronyms

AAS	Agricultural Advisory Society
BADC	Bangladesh Agricultural Development Corporation
BLB	Bacterial Leaf Blight
BSFB	Brinjal shoot and fruit borer
CABI	-
CPD	Community Plant Doctor
DAE	Department of Agricultural Extension
DFID	Department For International Development
FC	Financial Capital,
FDFI	Flower dropping & fungus infection
FDII	Fruit dropping & insect infestation
Fig	Figure
FRD	Fruit reddening & dropping
GPC	Global Plant Clinic
ha	hectare
HC	Human Capital
Kg	-
NC	Natural Capital
Nr.	Number
PC	Physical Capital
PRSV	Papaya ring sport virus
RDA	Rural Development Academy
SC	Social Capital
SE	Standard Error
Shushilan	-
Sig	Significant
SPSS	Statistical Package For Social Science
t	ton
tk	taka
TV	Television
UK	United Kingdom
YVCMV	Yellow Vein Clearing Mosaic Virus

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 150 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 49,000 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 found 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, AAS, RDA and Shushilan have established 18 plant clinics in Natore, Bogra and Satkhira districts.

The plant clinic is a centre where investigation and diagnosis of plant health problems can be undertaken and advice on control measure dispensed. It can also provide a base for undertaking surveys of crop health problems and farmers' needs and as an information centre for extension service providers and farmers. Plant clinic is a new approach for providing effective plant health services on plant health problems to the rural farmers. The approach has been introduced for the farmers in Shahjahanpur upazila of Bogra district from 2004, in Baraigram upazila of Natore district by AAS from 2005 and in Kaliganj upazila of Satkhira district from 2006 under the funding and technical support from CABI, UK. In view of the objectives of Global plant clinic (GPC) a DFID funded project of CABI, AAS, RDA and Shushilan have established network of model plant health management permanent 18 plant clinics to ensure better plant health management services to the farmers in Natore, Bogra and Satkhira districts, so that they can enhance their crop production, reduce cost of production by avoiding the frequent use of chemicals, increase their income and remove the risk of crop failure due to the pest and disease infestation and finally, they save the environment from pollution.

Purpose and Objectives

Purpose

Assess the performance and impacts of plant health services among the involved farmers from plant clinics of AAS, RDA and Shushilan for future scale-up the plant clinic approach and strategy in Bangladesh.

Objectives

(i) To assess the present status of plant clinics operation by AAS, RDA and Shushilan;

(ii) To evaluate the performance of plant clinic services among the farmers in Natore, Bogra and Satkhira districts;

(iii) To assess the impact of plant clinic services among the client farmers in Natore, Bogra and Satkhira districts.

Study design, sites and Methodology

Study design

The study was designed appropriately to the study for gathering necessary information needed to assess the status plant clinic operation, performance and impact in Bangladesh. The primary design and methodologies of the study was prepared jointly Dr. Jeffery W. Bentley, CABI and Harun-Ar-Rashid, AAS, which were later tested at field and shared with relevant staff of involved organizations. Based on important suggestions and feedback, the overall study design and methodologies were finalized.

The design employed a number of methodologies to assess and evaluate three import issues relevant for providing plant health services such as operation, performance and impacts of plant clinic operation in Bangladesh. To assess the progress of each factor the following parameters were determined:

Operation	Performance	Impact
▪ Organization	▪ Prescription	▪ Area
▪ Plant clinic	▪ Diagnosis	▪ Crop yield
▪ Service providers	▪ Recommendation	▪ Price
▪ Services	▪ Remembering	▪ Cost
▪ Documentation	▪ Adoption	▪ Income
▪ Land holding		▪ Livelihoods
▪ Information source		

Study sites and respondents

The study was conducted at 18 sites within the command areas of 18 plant clinics of Agricultural Advisory Society (AAS), Shushilan and Rural Development Academy (RDA) in Natore, Satkhira and Bogra districts. District and upazila-wise 18 study sites and 350 respondents of AAS, Shushilan and RDA are present in the following Table1 and district location is provided in Fig 1.

Table.1: Respondents from 18 plant clinics of AAS, Shushilan and RDA

Plant Clinic	Respondents[1]	
	Farmers (Nr.)	%
AAS (Upazila: Baraigram, District: Natore)		
1. Ahmedpur	25	7.14
2. Ramagari	18	5.14
3. Raynavorot	10	2.86
4. Merigachhi	18	5.14
5. Perbagdob	10	2.86
6. Moukhara	20	5.71
7. Tirail	31	8.86
8. Chandai	20	5.71
9. Rajandropur	18	5.14
10. Jonail	20	5.71
11. Parcole	20	5.71
12. Kachua	20	5.71
Total AAS	**230**	**65.69**
Shushilan (Upazila: Kaliganj, District: Satkhira)		
1. Kushulia	20	5.71
2. Kalikapur	20	5.71
3. Zirongacha	20	5.71
Total Shushilan	**60**	**17.13**
RDA (Upazila: Shahjahanpur, District: Bogra)		
1. Maria	20	5.71
2. Radhanagar	20	5.71
3. Amrul	20	5.71
Total RDA	**60**	**17.13**
Grand Total	**350**	**100.00**

[1] Respondents duplicated with few cases due to acceptance of separate prescription by one farmer for two different crops.

Study team

The study was conducted by Harun-Ar-Rashid, AAS in collaboration with relevant staff of AAS, Shushilan and RDA under overall guidance of Dr. Jeffery W. Bently, CABI. Field data was collected by Mr. Alok Kumar Biswas, AAS in collaboration with relevant staff of AAS, Shushilan and RDA under overall guidance and supervision of Harun-Ar-Rashid, AAS. Data entry and analysis were done by AHM Asadur Rahman, AAS under guidance and supervision of Harun-Ar-Rashid, AAS

Study Methodology

Questionnaire: At the beginning of the field data collection a single page structured questionnaire was developed by Dr. Jeffery W. Bently, CABI and Harun-Ar-Rashid, AAS. In the development process a preliminary questionnaire was prepared, which was finalized through field testing at plant clinics of AAS in Natore district. The questionnaire includes relevant information collection from prescription book, diagnosis and recommendations from plant clinic, use of diagnosis and recommendations, cost of crop protection, Land area under crop protection, crop yield, price of crop products, extra income and its use, land holdings, source of information about plant clinic and first-last use of recommendations.

Field data collection: Field data collected by Alok Kumar Biswas, Plant Doctor, AAS from 18 plant clinics of AAS, Shushilan and RDA under the overall guidance and supervision of Harun-Ar-Rashid, AAS through using finalized single page structured questionnaire. A total of 350 farmers were interviewed at 18 sites (plant clinics) in collaboration with relevant staff of AAS, Shushilan and RDA, of which 230 respondent farmers from 12 plant clinics in Natore district with AAS, 60 respondent farmers from 3 plant clinics each of Shushilan and RDA in Satkhira and Bogra districts respectively.

Data Analysis: Collected primary data were processed and entered in MS Excel spreadsheet and analyzed using MS Excel and SPSS software programs. Descriptive statistics, mean, proportion and Students T Test were performed as and when necessary for comparison of before and after adoption of plant health services of 18 plant clinics of AAS, Shushilan and RDA in Natore, Satkhira and Bogra districts..

Duration and Organizations

The special study was conducted by Harun-Ar-Rashid, Executive Director, AAS as per contract with GPC, CABI from September 2009 to January 2010 with three member organizations such Rural Development Academy (RDA), Agricultural Advisory Society (AAS) and Shushilan

Findings

1. Prescription on crops

To provide the services on plant health management, the plant doctors of AAS, Shushilan and RDA provided prescriptions on 72 crops with 350 farmers (respondents). The highest number of crops estimated with AAS (31) followed by RDA (21) and Shushilan (20). The prescriptions provided on the number of crops for AAS, Shushilan and RDA are provided in the following Table 2.

Table.2: Comparative prescription on the number of crops of AAS, Shushilan and RDA.

Organization	Working district	Crop (Nr.)[1]	Respondents (Nr.)
AAS	Natore	31	230
Shushilan	Satkhira	20	60
RDA		21	60
Total		72	350

[1] Total number of crops are 31

The highest number of prescriptions provided by the plant doctors of 12 plant clinics of AAS in Natore district on rice (18.70%) followed by Mango (13.04%), pointed gourd (7.83%), Brinjal/Country bean/Garlic/Sugarcane (6.52%), Litchi (5.22%) and remaining 23 crops with minimum farmers between 0.44% to 3.91%. The crop wise number of respondents and their percentage of AAS are provided in the following Table 3.

Table.3: Crop-wise respondent(s) received prescription from plant clinics of AAS

SL #	Crop	Respondent	
		Nr.	%
1.	Rice	43	18.70
2.	Mango	30	13.04
3.	Pointed gourd	18	7.83
4.	Brinjal	15	6.52
5.	Country bean	15	6.52
6.	Garlic	15	6.52
7.	Sugarcane	15	6.52
8.	Litchi	12	5.22
9.	Jackfruit	9	3.91
10.	Mung bean	8	3.48
11.	Betel leaf	6	2.61
12.	Okra	6	2.61
13.	Coconut	5	2.17
14.	Jujube	5	2.17
15.	Banana	4	1.74
16.	Chilli	3	1.30
17.	Sweet gourd	3	1.30
18.	Bottle gourd	2	0.87
19.	Maize	2	0.87
20.	Papaya	2	0.87
21.	Pomegranate	2	0.87
22.	10 crops[1]	10	4.35
Total	**31 crops**	**230**	**100.00**

[1] Ash gourd, betel nut, carambola, custard apple, guava, jute, musk melon, pummelo, tomato & turmeric (1 respondent for each crop)

The highest number of prescriptions provided by the plant doctors of 3 plant clinics of Shushilan in Satkhira district on Mango/Rice (15%) followed by Brinjal (11.67%), Coconut/Cucumber/Yard long bean (6.67%), Banana/Bottle gourd/Pointed gourd (5.00%), Cauliflower/Potato/Red Amaranth (3.33%) and remaining 8 crops with minimum farmers (1.67%). The crop wise number of respondents and their percentage of Shushilan are provided in following Table.4.

Table .4: Crop-wise respondents received prescription from plant clinics of Shushilan

SL #	Crop	Respondents	
		Nr.	%
1.	Mango	9	15.00
2.	Rice	9	15.00
3.	Brinjal	7	11.67
4.	Coconut	4	6.67
5.	Cucumber	4	6.67
6.	Yard long bean	4	6.67
7.	Banana	3	5.00
8.	Bottle gourd	3	5.00
9.	Pointed gourd	3	5.00
10.	Cauliflower	2	3.33
11.	Potato	2	3.33
12.	Red amaranth	2	3.33
13.	8 crops[1]	8	13.33
Total	**20 crops**	**60**	**100.00**

[1] Chilli, Country bean, Guava, Jackfruit, Knolkhol, Okra, Onion & Taro (1 respondent for each crop)

The highest number of prescriptions provided by the plant doctors of 3 plant clinics of RDA in Bogra district on Brinjal (15.00%) followed by country bean/Pointed gourd (11.67%), yard long bean (10.00%), Bottle gourd (6.67%), Bitter gourd/Guava/Jack fruit/Rice (5.00%), Cabbage/Okra/Pomegranate (3.33%) and remaining 9 crops with minimum farmers. The crop wise number of respondents and their percentage of RDA are provided in the following Table 5.

Table.5: Crop-wise respondents received prescription from plant clinics of RDA

SL #	Crop	Respondents	
		Nr.	%
1.	Brinjal	9	15.00
2.	Country bean	7	11.67
3.	Pointed gourd	7	11.67
4.	Yard long bean	6	10.00
5.	Bottle gourd	4	6.67
6.	Bitter gourd	3	5.00
7.	Guava	3	5.00
8.	Jackfruit	3	5.00
9.	Rice	3	5.00
10.	Cabbage	2	3.33
11.	Okra	2	3.33
12.	Pomegranate	2	3.33
13.	9 crops[1]	9	15.00
Total	**21 crops**	**60**	**100**

[1] Ash gourd, Banana, Chilli, Cucumber, Litchi, Mango, Papaya, Red amaranth & Tomato (1 respondent for each crop)

2. Crop-wise diagnosed plant health problems

To provide the plant health services, plant doctors of AAS, Shushilan and RDA diagnosed the plant health problems for five types' crops (Vegetables, Fruits, Spices, Cereals and Pulses) at 18 plant clinics in Natore, Satkhira and Bogra districts. Crop type-wise diagnosed plant health problems of AAS, Shushilan and RDA are explained below under each involved crop:

(a) Vegetables:

Plant doctors of AAS diagnosed 25 plant health problems with 7 vegetable crops at 12 plant clinics in Boraigram upazila of Natore district. The highest number plant health problems diagnosed with Root knot nematode of pointed gourd (14.74%) followed by Brinjal shoot and fruit borer-BSFB (13.11%), Anthracnose of Country bean/Insect infestation of Country bean (8.20%), Insect infestation of Brinjal/Pod borer of Country bean/Okra YVCMV (6.56%), Red mite of Pointed gourd (4.92%), fruit fly of sweet gourd/Root rot of Pointed gourd (3.28%) and remaining 15 health problems with minimum farmers (1.64%). Total of 25 health problems of 7 vegetable crops of AAS in Natore district are provided in the following Table 6.

Table.6: Plant health problem of vegetables diagnosed by the plant clinics of AAS

Vegetable	Problem diagnosed	Respondent	
		Nr.	%
Ash gourd	Fruit borer	1	1.64
Bottle gourd	Fruit rot	1	1.64
	Leaf curling	1	1.64
Brinjal	BSFB[1]	8	13.11
	Fruit rot	1	1.64
	Growth reduction	1	1.64
	Insect infestation	4	6.56
	Root rot	1	1.64
Country bean	Anthracnose	5	8.20
	Fungal infection	1	1.64
	Insect infestation	5	8.20
	Pod borer	4	6.56
Okra	Beetle	1	1.64
	Cutworm	1	1.64
	Okra YVCMV[1]	4	6.56
Pointed gourd	Foot rot	1	1.64
	Fruit fly	1	1.64
	FRD[1]	1	1.64
	Insect infestation	1	1.64
	Red mite	3	4.92
	Root knot	9	14.75
	Root rot	2	3.28
Sweet gourd	Fruit fly	2	3.28
	Leaf deformation	1	1.64
	Leaf curl	1	1.64
Total	**25 problems (7 vegetables)**	**61**	**100.00**

[1] BSFB = Brinjal shoot and fruit borer, FRD = Fruit reddening & dropping
YVCMV = Yellow Vein Clearing Mosaic Virus

Plant doctor of Shushilan diagnosed 23 health problems of 12 vegetable crops at 3 plant clinics in Kaliganj upazila of Satkhira district. The highest number of plant health problems diagnosed with BSFB-Brinjal shoot and fruit borer (22.58%) followed by fruit fly of Bottle gourd/Aphid infestation of cucumber (6.45%) and remaining 20 health problems with minimum farmers (3.23%). Total of 23 health problems of 12 vegetable crops of Shushilan are provided in the following Table 7.

Table.7. Plant health problem of vegetables diagnosed by the plant clinics of Shushilan

Vegetable	Problem diagnosed	Respondent	
		Nr.	%
Bottle gourd	Fruit fly	2	6.45
	Insect infestation	1	3.23
Brinjal	BSFB[1]	7	22.58
Cauliflower	Aphid Infestation	1	3.23
	Insect infestation	1	3.23
Country bean	Aphid Infestation	1	3.23
Cucumber	Aphid Infestation	2	6.45
	Insect infestation	1	3.23
	Virus	1	3.23
Knolkhol	Reduced growth	1	3.23
Okra	Okra	1	3.23
Pointed gourd	Insect infestation	1	3.23
	Leaf curling	1	3.23
	Root knot	1	3.23
Pointed gourd	Late blight	1	3.23
	Wilt of potato	1	3.23
Red amaranth	Insect infestation	1	3.23
	Red mite	1	3.23
Taro	Insect infestation	1	3.23
Yard long bean	Aphid infestation	1	3.23
	Caterpillar	1	3.23
	Leaf curling	1	3.23
	Pod borer	1	3.23
Total	**23 problems (12 vegetables)**	**31**	**100.00**

1 BSFB = Brinjal shoot and fruit borer

Plant doctors of RDA diagnosed 27 health problems of 17 vegetable crops at 3 plant clinics in Shajahanpur upazila of Bogra district. The highest number of plant health problems diagnosed with BSFB-Brinjal shoot and fruit borer (18.18%) followed by fruit fly of cucumber, Pod borer of yard long bean (6.82%), Root rot and Root Knot of Pointed gourd/Aphid infestation of Country bean (4.55%) and remaining 19 health problems with minimum

farmers (2.27%). Total of 27 health problems of 17 vegetable crops of RDA are provided in the following Table 8.

Table.8: Plant health problem of vegetables diagnosed by the plant clinics of RDA

Vegetable	Problem diagnosed	Respondents	
		Nr.	%
Ash gourd	Fruit borer	1	2.27
Bitter gourd	Fruit fly	1	2.27
	Fruit rot	1	2.27
	Leaf curl	1	2.27
Bottle gourd	Aphid Infestation	1	2.27
	Fruit rot	1	2.27
	Fungal infection	1	2.27
	Red pumpkin beetle	1	2.27
Brinjal	BFSB	8	18.18
	Wilt	1	2.27
Cabbage	Butter fly	1	2.27
	Cutworm	1	2.27
Country bean	Aphid Infestation	2	4.55
	Mite infestation	1	2.27
	Pod borer	4	9.09
Cucumber	Fruit fly	1	2.27
Okra	Pod borer	2	4.55
Pointed gourd	Fruit fly	2	4.55
	Insect infestation	1	2.27
	Root knot	2	4.55
	Root rot	2	4.55
Red amaranth	Insect infestation	1	2.27
Tomato	Early blight	1	2.27
Yard long bean	Caterpillar	1	2.27
	Fungal infection	1	2.27
	Pod borer	3	6.82
	Virus	1	2.27
Total	**27 problems (17 vegetables)**	**44**	**100.00**

(b) Fruits:

Plant doctors of AAS diagnosed 40 health problems of 13 fruit crops at 12 plant clinics in Baraigram upazila of Natore district. The highest number of plant health problems diagnosed with Die-back of Mango (21.62%) followed by Insect infestation of Mango/Die-back and Insect infestation of Litchi/Fruit dropping of Coconut (5.41%), fruit dropping Jack fruit (4.03%), Leaf yellowing of Banana/Insect infestation of Jack fruit/Flower dropping/Fruit bearing problems/Mango hopper (2.70%) and remaining 29 health problems of 13 fruit crops with minimum farmers (1.35%). Total of 40 health problems of 13 fruit crops of AAS are provided in the following Table 9.

Table.9: Plant health problem of fruits diagnosed by the plant clinics of AAS

Crop	Problem diagnosed	Respondent	
		Nr.	%
Banana	Beetle	1	1.35
	Leaf yellowing	2	2.70
	Sigatoka	1	1.35
Carambola	FDII[1]	1	1.35
Coconut	Anthracnose	1	1.35
	Fruit dropping	4	5.41
Custard apple	Fruit borer	1	1.35
Guava	Mealy bug	1	1.35
Jackfruit	Ants	1	1.35
	Charcoal rot	1	1.35
	Fruit borer	1	1.35
	Fruit cracking	1	1.35
	Fruit dropping	3	4.05
	Insect infestation	2	2.70
Jujube	Die-back	1	1.35
	Flower dropping	1	1.35
	FDFI[1]	1	1.35
	Insect infestation	1	1.35
	Leaf rust	1	1.35
Litchi	BLB & Sulfur deficiency	1	1.35
	Die-back	4	5.41
	Insect infestation	4	5.41
	Leaf blight	1	1.35
	Leaf curling	1	1.35
	Mite infestation	1	1.35
Mango	Anthracnose	1	1.35
	Die-back	16	21.62
	Flower dropping	2	2.70
	Flowering problem	1	1.35
	Fruit bearing problem	2	2.70
	Fruit rot	1	1.35
	Insect infestation	4	5.41
	Mango hopper	2	2.70
	Nutrient deficiency	1	1.35
Musk melon	Leaf curling	1	1.35
Papaya	Foot rot	1	1.35
	Virus	1	1.35
Pomegranate	Fruit rot	1	1.35
	Insect infestation	1	1.35
Pummelo	Insect infestation	1	1.35
Total	**40 problems (13 fruits)**	**74**	**100.00**

[1] FDII = Fruit dropping & insect infestation, FDFI = Flower dropping & fungus infection

Plant doctors of Shushilan diagnosed 12 problems of 5 fruit crops at 3 plant clinics in Kaliganj upazila of Satkhira district. The highest number of plant health problems diagnosed with Mango hopper (22.22%) followed by fruit dropping of Coconut/Inflorescence discoloration of Mango (11.11%) and remaining 9 health problem of 5 fruit crops with minimum farmers (5.56%). Total of 12 health problems of 5 fruit crops of Shushilan are provided in the following Table 10.

Table.10: Plant health problem of fruits diagnosed by the plant clinics of Shushilan

Crop	Problem diagnosed	Respondent	
		Nr.	%
Banana	Foot rot	1	5.56
	Insect infestation	1	5.56
	Sigatoka	1	5.56
Coconut	Boron deficiency	1	5.56
	Fruit dropping	3	16.67
Guava	Powdery mildew	1	5.56
Jackfruit	*Rhizopus* rot	1	5.56
Mango	Inflorescence discoloration	2	11.11
	Lack of vigour	1	5.56
	Mango defoliator	1	5.56
	Mango fruit fly	1	5.56
	Mango hopper	4	22.22
Total	**(5 fruits) 12 problems**	**18**	**100.00**

Plant doctors of RDA diagnosed 9 problems of 7 fruit crops at 3 plant clinics in Shahjahanpur upazila of Bogra district. The highest number of plant health problems diagnosed with white fly of Guava (25.00%) followed by virus disease of Jackfruit and remaining 7 health problems of 7 fruit crops with minimum farmers (8.33%). Total of 9 health problems of 7 fruit crops of RDA are provided in the following Table 11.

Table.11: Plant health problem of fruits diagnosed by the plant clinics of RDA

Crop	Problem diagnosed	Respondent	
		Nr.	%
Banana	Beetle	1	8.33
Guava	White fly	3	25.00
Jackfruit	Fungus	1	8.33
	Virus	2	16.67
Litchi	Red mite	1	8.33
Mango	Stem-end rot	1	8.33
Papaya	PRSV-p	1	8.33
Pomegranate	Flower & fruit dropping	1	8.33
	Fruit fly	1	8.33
Total	**9 problems (7 fruits)**	**12**	**100.00**

(c) Spice:

Plant doctors of AAS, Shushilan and RDA diagnosed 22 plant health problems with 4 spice crops in Natore, Satkhira and Bogra districts. Out of 22 diagnosed plant health problems, 19 problems diagnosed by the plant doctors of AAS and rest 3 problems by Shushilan and RDA. The highest number of health problems diagnosed with Garlic (15) by AAS plant doctors. Total of 22 diagnosed health problems of 4 spices crops of AAS, Shushilan and RDA are provided in the following Table 12.

Table.12. Plant health problem of spices diagnosed by the plant doctors of 3 organizations

Crop	Problem diagnosed	AAS	Shushilan	RDA	Total
Chilli	Insect infestation	1	-	1	2
	Leaf curling	1	1	-	2
	Leaf yellowing	1	-	-	1
Garlic	Borer	2	-	-	2
	Clove splitting	1	-	-	1
	Purple blotch	1	-	-	1
	Root rot	1	-	-	1
	Seed-borne disease	1	-	-	1
	Seedlings weakening	9	-	-	9
Onion	Leal curling	-	1	-	1
Turmeric	Leaf spot	1	-	-	1
Total	**11 Problems (4 Crops)**	**19**	**2**	**1**	**22**

(d) Cereal

Plant doctors of AAS, Shushilan and RDA diagnosed 57 plant health problems with 2 cereal crops (Rice and Maize) in Natore, Satkhira and Bogra districts. Out of 57 diagnosed health problems of rice and Maize, 45 health probelms diagnosed by AAS, 9 health problems diagnosed by Shushilan and 3 health problems diagnosed by RDA. The highest number of health problems diagnosed with rice stem borer (22) followed by Zinc deficiency of rice (12) and the rest health problems of rice and maize were found at minimum level. The highest number of diagnosis on Zinc deficiency of rice was with AAS (83%) followed by Shushilan (17%). This might be due to serious Zinc deficiency in the soil of Natore district. Total of 57 diagnosed health problems of Rice and Maize with AAS, Shushilan and RDA are provided in the following Table 13.

Table.13. Plant health problem of cereals and pulse diagnosed by the plant doctors of 3 organizations

Crop	Problem diagnosed	Organization			Total
		AAS	Shushilan	RDA	
Rice	Blast	1	-	-	1
	Brown plant hopper	3	-	-	3
	Dwarfing	1	-	-	1
	Foot rot	1	-	-	1
	Rusty leaf yellowing	1	-	-	1
	Nutrient deficiency	1	-	-	1
	Reduced growth	1	-	-	1
	Young leaf yellowing	4	-	-	4
	Ear cutting caterpillar	1	-	-	1
	Rice stem borer	2	-	-	2
	Rice stem bug	1	-	-	1
	Salinity problem	-	1	-	1
	Stem borer	13	6	3	22
	Weed infestation	2	-	-	2
	White tip	1	-	-	1
	Zinc deficiency	10	2	-	12
Maize	Insect infestation	2	-	-	2
Total	**17 problems (2 crops)**	**45**	**9**	**3**	**57**

(e) Pulse

Plant doctors of AAS diagnosed 8 plant health problems with Mugbean in Natore district. The highest number of health problems diagnosed with common insect infestation (3) followed by pod borer (2) and Aphid infestation/Leaf rolling/Virus (1). Mugbean is a major crop during early summer season in Natore district. Total 8 diagnosed health problems of Mugbean with AAS are provided in the following Table 14.

Table.14: Plant health problems of Mugbean diagnosed by the plant doctors of 3 organizations

Problem diagnosed	AAS	Shushilan	RDA	Total
Insect infestation	3	-	-	3
Aphid infestation	1	-	-	1
Mugbean leaf rolling	1	-	-	1
Pod borer virus	2	-	-	2
Virus	1	-	-	1
Total	**8**	**-**	**-**	**8**

3. Causal agent-wise diagnosed plant health problems

For better understanding of plant health problems under various causal agents of vegetable crops are presented for AAS, Shushilan and RDA in the following paras. Plant doctors of

AAS diagnosed 61 samples of vegetables under 7 causal agents with 23 plant health problems. The highest number of health problems diagnosed with insects infestation (45.90%) followed by fungal infections (19.67%), Nematode infestation (16.39%), Virus infection (9.84%), Mites (4.92%) and Bacterial infection/physiogenic problems (1.64%) at plant clinics of AAS in Natore district. Total of 61 diagnosed health problems of vegetables under 7 causal agents with 23 plant health problems are provided in the following Table 15.

Table.15: Causal agent wise plant health problem of vegetables diagnosed by plant doctors of plant clinics of AAS

Causal agent	Problem diagnosed	Respondent	
		Nr.	%
1. Bacteria	Root rot of brinjal	1	1.64
2. Fungus		12	19.67
	i. Anthracnose	5	8.20
	ii. Foot rot	1	1.64
	iii. BSFB	2	3.28
	iv. Fungus	1	1.64
	v. Growth reduction	1	1.64
	vi. Root rot	2	3.28
3. Insect		28	45.90
	i. Beetle	1	1.64
	ii. Borer	1	1.64
	iii. Brinjal fruit & shoot borer	6	9.84
	iv. Caterpillar	1	1.64
	v. Cutworm	1	1.64
	vi. Fruit borer	1	1.64
	vii. Fruit fly	3	4.92
	viii. Insect infestation	9	14.75
	ix. Pod borer	4	6.56
	x. Stem borer	1	1.64
4. Mites	Red mite	3	4.92
5. Nematode		10	16.39
	i. Fruit reddening & dropping	1	1.64
	ii. Root knot	9	14.75
6. Physiogenic	Leaf deformation	1	1.64
7. Virus		6	9.84
	i. Leaf curling	2	3.28
	ii. Mosaic virus	1	1.64
	iii. Okra leaf yellowish colour	2	3.28
	iv. Virus	1	1.64
	Total	**61**	**100.00**

Plant doctor of Shushilan diagnosed 31 samples of vegetables under 6 causal agents with 14 plant health problems. The highest number of plant health problems diagnosed with insects infestation (70.79%) followed by virus infection (12.90%), Fungal infection (6.45%) and mites infestation/ Nematode infestation/Psychogenic problems (3.23%) at plant clinics in Satkhira district. Total of 31 diagnosed health problems of vegetables under 6 causal agents with 14 plant health problems are provided in the following Table 16.

Table.16. Causal agent-wise plant health problem of vegetables diagnosed by plant doctors of plant clinics of Shushilan

Causal agent	Problem diagnosed	Respondent	
		Nr.	%
1 Fungus		2	6.45
	i. Late blight	1	3.23
	ii. Wilt of potato	1	3.23
2 Insect		22	70.97
	i. Aphid Infestation	5	16.13
	ii. Brinjal fruit & shoot borer	7	22.58
	iii. Caterpillar	1	3.23
	iv. Fruit fly	1	3.23
	v. Insect infestation	6	19.35
	vi. Pod borer	2	6.45
3 Mites	Red mite	1	3.23
4 Nematode	Root knot	1	3.23
5 Physiogenic	Reduced growth	1	3.23
6 Virus		4	12.90
	i. Leaf curling	2	6.45
	ii. Okra YVCMV	1	3.23
	iii. Virus	1	3.23
	Total	**31**	**100.00**

Plant doctors of RDA diagnosed 44 samples of vegetables under 6 causal agents with 21 plant health problems. The highest number of plant health problems diagnosed with insects infestation (72.73%) followed by fungal infection (13.64%), nematode infestation/Virus infection (4.55%) and mites infestation/Bacterial infection (2.27%) at plant clinics in Bogra districts. Total of 44 diagnosed health problems of vegetables under 6 causal agents with 21 plant health problems are provided in the following Table 17.

Table.17: Causal agent-wise plant health problem of vegetables diagnosed by plant doctors of plant clinics of RDA

Causal agent	Problem diagnosed	Respondent	
		Nr.	%
1. Bacteria	Wilt of pointed gourd	1	2.27
2. Fungus		6	13.64
	i. Early blight	1	2.27
	ii. Fruit rot	1	2.27
	iii. Fungus	2	4.55
	iv. Root rot	2	4.55
3. Insect		32	72.73
	i. Aphid Infestation	3	6.82
	ii. BSFB	8	18.18
	iii. Butter fly	1	2.27
	iv. Caterpillar	1	2.27
	v. Cutworm	1	2.27
	vi. Fruit borer	1	2.27
	vii. Fruit fly	4	9.09
	viii. Fruit rot	1	2.27
	ix. Insect infestation	2	4.55
	x. Pod borer	6	13.64
	xi. Red pumpkin beetle	1	2.27
	xii. Stem borer	3	6.82
4. Mites	Red mite	1	2.27
5. Nematode	Root knot	2	4.55
6. Virus		2	4.55
	i. Leafcurl of bitter gourd	1	2.27
	ii. Virus	1	2.27
	Total	**44**	**100.00**

4. Crop type-wise diagnosed causal agent

For better understanding about prevalence of causal agents on the type of crops are summarized for AAS, Shushilan and RDA. Out of total 350 diagnosed plant health problems, the highest health problems estimated with insects infestation (171) followed by Fungal infection (84), Physiogenic problems (42), Virus infection (21), Nematode infestation (19), Mites infestation (7), Bacterial infection (3), Weed infestation (2) and Ants (1). The highest diagnosed health problems recorded with AAS (230) followed by Shushilan and RDA (60). Causal agent wise number of crops and their health problems of AAS, Shushilan and RDA are provide in the following Table 18.

Table.18: Causal agents, number of crops and their health problems of 3 organizations

Causal Agent	Crop Type Nr.	Health Problems diagnosed (Nr.)			
		AAS	Shushilan	RDA	Total
Ants	1	1	-	-	1
Bacteria	2	2	-	1	3
Fungus	5	66	10	8	84
Insect	5	95	35	41	171
Mites	2	4	1	2	7
Nematode	3	16	1	2	19
Physiogenic	5	33	8	1	42
Virus	5	11	5	5	21
Weed	2	2	-	-	2
Total	**30**	**230**	**60**	**60**	**350**

Plant doctors diagnosed plant health problems of crop types under each causal agent of AAS, Shushilan and RDA in Natore, Satkhira and Bogra districts are provided in the following Table 19.

Table.19: Crop type-wise causal agents diagnosed by plant doctors of AAS, Shushilan and RDA

Causal agent	Crop type	Respondent			Total
		AAS	Shushilan	RDA	
Ants	Fruits	1	-	-	1
Bacteria	Vegetables	1	-	1	2
	Fruits	1	-	-	1
Fungus	Vegetables	12	2	6	20
	Fruits	33	7	2	42
	Cash crops	15	-	-	15
	Spices	4	1	-	5
	Cereals & pulse	2	-	-	2
Insect	Vegetables	28	22	32	82
	Fruits	26	7	5	38
	Cash crops	8	-	-	8
	Spices	4	-	1	5
	Cereals & pulse	29	6	3	38
Mites	Vegetables	3	1	1	5
	Fruits	1	-	1	2
Nematode	Vegetables	10	1	2	13
	Spices	4	-	-	4
	Cereals & pulse	2	-	-	2
Physiogenic	Vegetables	1	1	-	2
	Fruits	9	4	1	14
	Spices	6	-	-	6
	Cereals & pulse	17	3	-	20
Virus	Vegetables	6	4	2	12
	Fruits	3	-	3	6
	Spices	1	1	-	2
	Cereals & pulse	1	-	-	1
Weed	Cereals & pulse	2	-	-	2

5. Proportion of wrong and correct diagnosis

To know the quality of plant health services in the form of diagnosis and recommendation provided by the plant doctors of the 18 plant clinics of AAS, Shushilan and RDA, the survey team recorded causal agent wise correct and wrong services through verification of prescriptions documents of plant clinic and farmers' opinions during impact field survey. Overall, out of total 350 respondents, 331 (94.51%) and 19 (5.43%) respondents received correct and wrong diagnosis/recommendation respectively from plant doctors of AAS, Shushilan and RDA in Natore, Satkhira and Bogra districts. Among the 3 organizations, the highest correct diagnosis was found with RDA (96.67%) followed by AAS (94.78%) and Shushilan (91.69%). Out of total 350 respondents (farmers), the highest number of respondents were received correct diagnosis with insect infestation (164) followed by fungal infection (78), physiogenic (42), virus (18), nematode (17%) and remaining 4 causal agents at lower levels. The quality of plant health services (diagnosis), under two categories such as correct and wrong of farmers' response with AAS, Shushilan and RDA in the following Table 20.

Table.20: Respondents of correct and wrong diagnosis on 9 causal agents by 3 organizations

Causal agent	Diagnosis type	Respondent (Nr.)				
		AAS	Shushilan	RDA	Total	%
Ants	Correct	1	0	0	1	100.00
	Wrong	0	0	0	0	00.00
Bacteria	Correct	2	0	1	3	100.00
	Wrong	0	0	0	0	00.00
Fungus	Correct	61	9	8	78	92.86
	Wrong	5	1	0	6	7.14
Insect	Correct	92	32	40	164	95.91
	Wrong	3	3	1	7	4.09
Mites	Correct	4	0	2	6	85.71
	Wrong	0	1	0	1	14.29
Nematode	Correct	14	1	2	17	89.47
	Wrong	2	0	0	2	10.53
Physiogenic	Correct	33	8	1	42	100.00
	Wrong	0	0	0	0	00.00
Virus	Correct	9	5	4	18	85.71
	Wrong	2	0	1	3	14.29
Weed	Correct	2	0	0	2	100.00
	Wrong	0	0	0	0	00.00
Total		**230**	**60**	**60**	**350**	**100.00**
Total	**Correct**	**218 (94.78%)**	**55 (91.69%)**	**58 (96.67%)**	**331**	**94.57**
	Wrong	**12 (5.22%)**	**5 (8.33%)**	**2 (3.33%)**	**19**	**5.43**

6. Remembering recommendations

To understand the farmers' remembering the plant clinic recommendation evaluated by the survey team on three basis logics, such as remember nothing, remember a little and remember the most. Overall, the highest recommendations remembered under remember

the most (96.00%) followed by remember nothing (2.86%) and remember a little (1.14%). Similar trends are found among the 3 organizations such as AAS, Shushilan and RDA. Respondent remembered the plant clinic recommendations of AAS, Shushilan and RDA at three levels are provided in the following Table 21.

Table.21: Status of respondent remembered the plant clinic recommendation of 3 organizations

Remembered recommendations (Category)	Respondent							
	AAS		Shushilan		RDA		Total	%
	Respondents	%	Respondents	%	Respondents	%		
Remember nothing	5	2.17	4	6.67	1	1.67	10	2.86
Remember a little	3	1.30	1	1.67	0	0.00	4	1.14
Remember the most	222	96.52	55	91.67	59	98.33	336	96.00
Total	**230**	**100.00**	**60**	**100.00**	**60**	**100.00**	**350**	**100.00**

7. Adoption of plant clinic recommendations

For better understanding the farmers' adoption of plant clinic recommendations on plant health managements assessed by the study team on three categories such as no adoption, partial adoption and full or nearly full adoption. Overall, the highest recommendations adopted by the farmers within the command area of the plant clinics of AAS, Shushilan and RDA with full or nearly full adoption (95.14%) followed by No adoption (3.43%) and partial adoption (1.43). Incase of AAS, the highest adoption is estimated under full or nearly full adoption (95.22%) followed by No adoption (3.04%) and partial adoption (1.74%). Similar trends are found with Shushilan and RDA. But, incase of RDA, there is no respond under partial adoption of the recommendation. Adoption of plant clinic recommendations under three categories with AAS, Shushilan and RDA is provided the following Table 22.

Table. 22: Adoption of plant clinic recommendations by the farmers under 3 organizations

Adoption Category	Respondent							
	AAS		Shushilan		RDA		Total	%
	Nr.	%	Nr.	%	Nr.	%		
No adoption	7	3.04	4	6.67	1	1.67	12	3.43
Partial adoption	4	1.74	1	1.67	0	0.00	5	1.43
Full or nearly full adoption	219	95.22	55	91.67	59	98.33	333	95.14
Total respondents	230	100.00	60	100.00	60	100.00	350	100.00

8. Cost for crop protection

To determine the cost reduction for crop protection, the study team estimated the cost after adopting the plant clinic recommendations in Natore, Satkhira and Bogra districts

Overall, the plant protection cost significantly decreased with few exceptions after adoption of plant clinic recommendations. Average crop protection cost decreased Tk. 1160 per hectare (13.74%) of 18 plant clinics under AAS, Shushilan and RDA. The highest cost reduction for crop protection was estimated with RDA (Tk. 1412/ha) followed by AAS (Tk. 1321/ha) and Shushilan (tk. 291/ha).

Average crop protection cost before and after adopting the plant clinic recommendations of 18 plant clinics of AAS, Shushilan and RDA and relevant findings of statistical analysis are provided in the following Table 23.

Table.23: Average cost for crop protection of 18 plant clinics of 3 organizations before and after adopting the plant clinic recommendations

SL #	Plant Clinic	Crop protection cost (Tk/ha)		Mean difference	% Change	t-statistic	Sig.
		Before	After				
1.	Ahmedpur	10620.43	8688.81	-1931.62	-18.19	-4.27	0.0003
2.	Ramagari	10087.38	9172.40	-914.98	-9.07	-1.58	0.1320
3.	Raynavorot	2717.00	3942.27	1225.27	45.10	1.70	0.1242
4.	Merigachhi	7392.22	6483.01	-909.21	-12.30	-2.96	0.0088
5.	Perbagdob	4129.02	3276.12	-852.90	-20.66	-6.65	0.0001
6.	Moukhara	18305.44	14515.55	-3789.89	-20.70	-2.27	0.0351
7.	Tirail	6903.89	6074.16	-829.74	-12.02	-2.96	0.0060
8.	Chandi	10622.00	7937.06	-2684.94	-25.28	-1.26	0.2234
9.	Rajandropur	9975.22	9819.41	-155.82	-1.56	-0.24	0.8114
10.	Jonail	11991.29	9019.52	-2971.77	-24.78	-1.38	0.1836
11.	Parcole	3924.67	3378.69	-545.98	-13.91	-2.65	0.0159
12.	Kachua	4313.46	4406.30	92.84	2.15	0.17	0.8655
	AAS	**8805.72**	**7484.31**	**-1321.41**	**-15.01**	**-4.07**	**0.0001**
13.	Kushulia	5494.41	4993.27	-501.14	-9.12	-1.53	0.1434
14.	Kalikapur	8417.71	8049.02	-368.69	-4.38	-0.92	0.3715
15.	Zirongachha	6221.28	6217.65	-3.63	-0.06	-0.01	0.9936
	Shushilan	**6711.13**	**6419.98**	**-291.15**	**-4.34**	**-1.28**	**0.2041**
16.	Maria	8485.21	7043.65	-1441.57	-16.99	-1.24	0.2303
17.	Radhanagar	8010.69	8435.30	424.60	5.30	0.43	0.6728
18.	Amrul	9852.84	6633.40	-3219.44	-32.68	-2.08	0.0515
	RDA	**8782.91**	**7370.78**	**-1412.13**	**-16.08**	**-1.91**	**0.0607**
	Total	**8442.74**	**7282.39**	**-1160.34**	**-13.74**	**-4.61**	**0.0001**

9. Area under crop protection

To find out the area under crop protection, the study team estimated the area under crop protection after adopting plant clinic recommendations at 18 plant clinics in Natore, Satkhira and Bogra districts with AAS, Shushilan and RDA. Overall, average land areas increased significantly with major exceptions after adoption of plant clinic recommendations. Average land area increased only about 3.5 decimals per family (6.27%). The highest land area under crop protection estimated with AAS (4.4 decimals/family) followed by RDA (2.57 decimals/family) and Shushilan (0.97 decimal/family).

Average area under crop protection before and after adopting plant clinic recommendations of 18 plant clinics of AAS, Shushilan and RDA and relevant findings of statistical analysis are provided in the following Table 24.

Table.24: Average area under crop protection of 18 plant clinics of 3 organizations before and after adopting plant clinic recommendations

SL #	Plant Clinic	Crop protection area (decimal/farmer)		Mean difference	% Increase	t-statistic	Sig.
		Before	After				
1.	Ahmedpur	31.32	32.76	1.44	4.60	1.244	0.226
2.	Ramagari	45.33	45.56	0.22	0.49	1.000	0.331
3.	Raynavorot	39.70	39.70	-	-	-	-
4.	Merigachhi	236.50	240.61	4.11	1.74	1.368	0.189
5.	Perbagdob	36.80	38.00	1.20	3.26	1.000	0.343
6.	Moukhara	89.00	92.65	3.65	4.10	2.111	0.048
7.	Tirail	89.87	106.90	17.03	18.95	1.455	0.156
8.	Chandi	37.75	42.55	4.80	12.72	1.876	0.076
9.	Rajandropur	32.50	32.50	-	-	-	-
10.	Jonail	90.45	99.45	9.00	9.95	1.715	0.103
11.	Parcole	54.75	54.75	-	-	-	-
12.	Kachua	74.65	75.15	0.50	0.67	1.000	0.330
	AAS	**73.58**	**77.99**	**4.40**	**5.98**	**2.588**	**0.010**
13.	Kushulia	38.75	39.65	0.90	2.32	1.000	0.330
14.	Kalikapur	22.75	24.05	1.30	5.71	1.412	0.174
15.	Zirongachha	24.43	25.13	0.70	2.87	1.000	0.330
	Shushilan	**28.64**	**29.61**	**0.97**	**3.39**	**2.229**	**0.030**
16.	Maria	13.35	14.70	1.35	10.11	2.204	0.040
17.	Radhanagar	9.65	9.75	0.10	1.04	1.000	0.330
18.	Amrul	21.55	27.80	6.25	29.00	1.268	0.220
	RDA	**14.85**	**17.42**	**2.57**	**17.31**	**1.542**	**0.128**
	Total	**55.81**	**59.31**	**3.50**	**6.27**	**3.023**	**0.003**

10. Crop Yield

To find out the crop yield status, the study team estimated the average crop yield (t/ha) after adopting plant clinic recommendations at 18 plant clinics in Natore, Satkhira and Bogra districts with AAS, Shushilan and RDA. Overall, average yield increased significantly with very few exceptions after adoption of plant clinic recommendations. Average crop yield increased about 1.43 per ha after adoption of plant clinic recommendations. The highest average crop yield estimated with RDA (2.41 t/ha) followed by AAS (1.24 t/ha) and Shushilan (1.15 t/ha). Average crop yield before and after adopting plant clinic recommendations of 18 plant clinics of AAS, Shushilan and RDA and relevant findings of statistical analysis are provided in the following Table 25.

Table.25: Average crop yield (t/ha) of 18 plant clinics of 3 organizations before and after adopting plant clinic recommendations

SL #	Plant Clinic	Crop Yield (t/ha)		Mean difference	% Increase	t-statistic	Sig.
		Before	After				
1.	Ahmedpur	23.92	25.54	1.62	6.77	5.402	0.0000
2.	Ramagari	26.26	27.62	1.36	5.18	2.183	0.0434
3.	Raynavorot	8.97	9.77	0.80	8.92	2.222	0.0534
4.	Merigachhi	47.65	48.99	1.34	2.81	5.129	0.0001
5.	Perbagdob	14.96	16.03	1.06	7.09	1.895	0.0906
6.	Moukhara	14.81	16.84	2.03	13.71	3.317	0.0036
7.	Tirail	10.38	11.18	0.79	7.61	2.643	0.0129
8.	Chandi	14.23	15.44	1.21	8.50	1.478	0.1559
9.	Rajandropur	13.05	14.63	1.59	12.18	2.834	0.0114
10.	Jonail	10.44	11.88	1.44	13.79	1.611	0.1236
11.	Parcole	7.71	8.58	0.87	11.28	1.435	0.1676
12.	Kachua	14.67	15.37	0.69	4.70	1.636	0.1183
	AAS	**17.22**	**18.47**	**1.24**	**7.20**	**7.733**	**0.0000**
13.	Kushulia	10.05	10.81	0.76	7.56	2.723	0.0135
14.	Kalikapur	13.61	15.28	1.66	12.20	3.206	0.0046
15.	Zirongachha	8.04	9.08	1.04	12.94	4.708	0.0002
	Shushilan	**10.57**	**11.72**	**1.15**	**10.88**	**5.445**	**0.0000**
16.	Maria	11.72	16.88	5.15	43.94	1.549	0.1378
17.	Radhanagar	13.96	15.45	1.49	10.67	3.330	0.0035
18.	Amrul	12.76	13.36	0.60	4.70	0.843	0.4096
	RDA	**12.82**	**15.23**	**2.41**	**18.80**	**2.093**	**0.0407**
	Total	**15.33**	**16.76**	**1.43**	**9.33**	**6.292**	**0.0000**

11. Price of crop products

To find out price status of quality products, the study team estimated the average price of the crop products after adopting plant clinic recommendations at 18 plant clinics in Natore, Satkhira and Bogra districts with AAS, Shushilan and RDA. Overall average price of crop products increased significantly after adoption of plant clinic recommendations, Average crop price increased about Tk. 5/Kg (22.1%) after adoption of plant clinic recommendations.. The highest average crop price estimated with AAS (Tk. 5.63/Kg) followed by RDA (Tk. 4.40/Kg) and Shushilan (Tk. 3.31/Kg). Average crop products price before and after adopting plant clinic recommendations of 18 plant clinics of AAS, Shushilan and RDA along with relevant findings of statistical analysis are provided in the following Table 26. Average crop production (Kg/farmer) of 18 plant clinics of 3 organizations before and after adopting plant clinic recommendations is provided in Annex. VI.

Table.26: Average price of crop products of 18 plant clinics of 3 organizations before and after adopting plant clinic recommendations

SL #	Plant Clinic	Crop products price (Tk/kg)		Mean difference	% Increase	t-statistic	Sig.
		Before	After				
1.	Ahmedpur	12.82	17.75	4.93	38.46	6.008	0.000
2.	Ramagari	24.36	32.31	7.94	32.59	6.518	0.000
3.	Raynavorot	31.50	36.80	5.30	16.83	2.657	0.026
4.	Merigachhi	4.47	7.07	2.60	58.17	1.556	0.138
5.	Perbagdob	21.45	28.08	6.63	30.91	4.216	0.002
6.	Moukhara	18.15	20.23	2.08	11.46	2.545	0.020
7.	Tirail	25.24	30.04	4.80	19.02	2.554	0.016
8.	Chandi	38.09	44.30	6.21	16.30	4.018	0.001
9.	Rajandropur	29.00	35.08	6.08	20.97	3.337	0.004
10.	Jonail	50.23	55.41	5.19	10.33	4.152	0.001
11.	Parcole	41.18	53.43	12.25	29.75	4.707	0.000
12.	Kachua	20.23	24.70	4.48	22.15	4.985	0.000
	AAS	**26.22**	**31.85**	**5.63**	**21.47**	**11.459**	**0.000**
13.	Kushulia	15.60	18.75	3.15	20.19	6.366	0.000
14.	Kalikapur	13.93	17.03	3.10	22.25	4.392	0.000
15.	Zirongachha	19.00	22.68	3.68	19.37	5.352	0.000
	Shushilan	**16.18**	**19.48**	**3.31**	**20.46**	**9.123**	**0.000**
16.	Maria	15.65	20.25	4.60	29.39	5.370	0.000
17.	Radhanagar	15.45	19.55	4.10	26.54	4.375	0.000
18.	Amrul	16.20	20.70	4.50	27.78	4.025	0.001
	RDA	**15.77**	**20.17**	**4.40**	**27.90**	**7.928**	**0.000**
	Total	**22.71**	**27.73**	**5.02**	**22.10**	**14.546**	**0.000**

12. Farmers' gross income

To determine the average gross income of farmers, the study team estimated the average gross income of the involved farmers after adopting plant clinic recommendations at 18 plant clinics in Natore, Satkhira and Bogra districts with AAS, Shushilan and RDA. Overall, farmers' average gross income increased significantly after adoption of plant clinic recommendations on 3 working districts. Average farmers' gross income increased about Tk. 93,942 per hectare (37.5%) after adoption of plant clinic recommendations. The highest farmers' gross income increased with AAS (Tk. 1.08,151/ha) followed by RDA (Tk. 76,346/ha) and Shushilan (Tk. 57,069/ha) Average gross income of respondents (farmers) before and after adopting plant clinic recommendations of 18 plant clinics of AAS, Shushilan and RDA along with relevant findings of statistical analysis are provide in the following Table 27.

Table.27: Farmers' average gross income (Tk/ha) of 18 plant clinics of 3 organizations before and after adopting plant clinic recommendations

Plant Clinic		Gross income (Tk/ha)		Mean difference	% Increase	t-statistic	Sig.
		Before	After				
1.	Ahmedpur	260499.09	379573.25	119074.16	45.71	7.481	0.0000
2.	Ramagari	532627.46	750582.63	217955.17	40.92	5.284	0.0001
3.	Raynavorot	170235.39	220969.69	50734.30	29.80	2.578	0.0298
4.	Merigachhi	149509.36	189492.78	39983.42	26.74	3.505	0.0027
5.	Perbagdob	216759.72	320273.67	103513.96	47.76	3.302	0.0092
6.	Moukhara	333896.60	426936.13	93039.54	27.86	1.980	0.0624
7.	Tirail	283039.71	364182.90	81143.19	28.67	3.178	0.0034
8.	Chandi	327709.18	403151.10	75441.92	23.02	2.668	0.0152
9.	Rajandropur	293955.10	400012.28	106057.18	36.08	4.338	0.0004
10.	Jonail	386788.54	491029.51	104240.97	26.95	2.684	0.0147
11.	Parcole	353883.21	565934.18	212050.97	59.92	1.289	0.2128
12.	Kachua	227489.62	307111.94	79622.32	35.00	2.766	0.0123
	AAS	**301398.51**	**409549.00**	**108150.49**	**35.88**	**6.506**	**0.0000**
13.	Kushulia	132468.79	176772.49	44303.70	33.44	5.373	0.0000
14.	Kalikapur	172609.59	235467.72	62858.13	36.42	5.082	0.0001
15.	Zirongachha	175145.62	239192.03	64046.42	36.57	4.010	0.0007
	Shushilan	**160074.67**	**217144.08**	**57069.42**	**35.65**	**7.877**	**0.0000**
16.	Maria	136602.38	255329.01	118726.63	86.91	2.359	0.0292
17.	Radhanagar	171081.81	233366.68	62284.87	36.41	6.713	0.0000
18.	Amrul	129489.05	177514.78	48025.74	37.09	4.247	0.0004
	RDA	**145724.41**	**222070.16**	**76345.75**	**52.39**	**4.331**	**0.0001**
	Total	**250484.58**	**344426.07**	**93941.50**	**37.50**	**8.211**	**0.0000**

13. Farm size

To find out the involved farmers' category, the study team estimated average land holdings (decimals/family) at 18 plant clinics in Natore, Satkhira and Bogra districts with AAS, Shushilan and RDA. Overall, average farm size was estimated about 226 decimals per family. Highest average farm size was estimated with AAS (280 decimals/family) followed by RDA (226 decimals/family) and Shushilan (109 decimals/family). Thus, comparatively rich farmers are involved with AAS in Natore district (farm size ranged from 103-603 decimals) than RDA in Bogra district (farm size ranged from 77-206 decimals) and Shushilan in Satkhira district (farm size ranged from 103-115 decimals). Average land holdings (decimals/family) of 18 plant clinics of AAS, Shushilan and RDA are provided in the following Table 28.

Table.28: Average land holdings per family of 18 plant clinics of 3 organizations

Plant Clinic		Average land area (decimal/farmer)	
		Mean	**SE**
1.	Ahmedpur	165.44	44.96
2.	Ramagari	432.39	179.22
3.	Raynavorot	205.50	42.15
4.	Merigachhi	602.72	151.29
5.	Perbagdob	175.10	28.96
6.	Moukhara	207.75	61.62
7.	Tirail	217.39	36.64
8.	Chandi	258.75	42.74
9.	Rajandropur	103.44	14.69
10.	Jonail	450.40	89.01
11.	Parcole	279.00	76.84
12.	Kachua	269.00	80.95
	AAS	**280.32**	**25.27**
13.	Kushulia	109.15	11.05
14.	Kalikapur	114.55	8.93
15.	Zirongachha	103.45	10.47
	Shushilan	**109.05**	**5.81**
16.	Maria	124.35	13.19
17.	Radhanagar	77.20	9.35
18.	Amrul	205.65	49.57
	RDA	**135.73**	**18.43**
	Total	**226.17**	**17.39**

14. Extra income earning

To know whether farmers' earned or not earned extra income through adopting plant clinic recommendations, the impact study team assessed the extra income of the responded 350 farmers at 18 plant clinics of AAS, Shushilan and RDA in Natore, Satkhira and Bogra districts. Overall, about 95% farmers earned extra income through adopting plant clinic recommendation in 3 working districts of AAS, Shushilan and RDA. The highest proportion of farmers earned extra income with RDA (98.33%) followed by AAS (95.22%) and Shushilan (88.33%) in their respective working districts. Total number and proportion of respondents under earned and not earned categories through adopting plant clinic recommendations of AAS, Shushilan and RDA are provided in the following Table 29.

Table.29: Status of respondents earned extra income by adopting plant clinic recommendations

Extra income status	Respondent						Total	%
	AAS		Shushilan		RDA			
	Nr.	%	Nr.	%	Nr.	%		
Respondents not earned extra income	11	4.78	7	11.67	1	1.67	19	5.43
Respondents earned extra income	219	95.22	53	88.33	59	98.33	331	94.57
Total	**230**	**100.00**	**60**	**100.00**	**60**	**100.00**	**350**	**100.00**

15. Livelihoods impact

The study team assessed the livelihoods impact of 350 farmers at 18 plant clinics in Natore, Satkhira and Bogra districts with AAS, Shushilan and RDA. The study team recorded 19 types of livelihoods options with 350 farmers based on their claimed during field data collection. Overall, about 96% farmers earned extra income through adopting the plant clinic recommendations in 3 study districts. Among 3 organizations, the highest proportion of farmers earned extra income from RDA (98.34%) followed by AAS (97.33%) and Shushilan (88.34%).

Overall, highest proportion of farmer respondents were found with children's education (25.71%) followed by Domestic purpose (20.57%), cattle purchase (12.57%), fruit orchard establishment (9.14%), land purchase (8.86%), crop cultivation (7.15%), Agricultural activities (5.14%), Fish cultural (2.0%), Loan pay back (1.14%) and remaining 10 livelihoods options were found at minimum levels.

According to DFID, there are five main "Capitals" which much is improved in order to have a positive impact on the livelihoods of poor farmers, such as human, social, physical, financial and natural capitals. Among the five main capitals, Natural Capital option was found the highest (9) followed by Physical Capital (4), Social Capital (3), Financial Capital (2) and Human Capital (1). Purpose of extra income expenses, livelihood impact (type of capitals) and their respondents of AAS, Shushilan and RDA are provided in the following Table 30.

Table.30: Purpose-wise proportion of expenses on the extra income of respondents of 3 organizations

SL #	Purpose of expenses (Impact)	Capital type[1]	Respondents (%)			
			AAS	Shushilan	RDA	Total
1	Agricultural activities	NC	1.30	-	25.00	5.14
2	Crop cultivation	NC	7.81	8.33	3.34	7.15
3	Fruit orchard establishment	NC	13.48	1.67	-	9.14
4	Fish culture	NC	0.43	10.00	-	2.00
5	Shrimp culture	NC	-	1.67	-	0.29
6	Land purchase	NC	11.74	6.67	-	8.86
7	Land lease in	NC	0.87	-	-	0.57
8	Cow farming	NC	0.87	-	-	0.57
9	Cattle purchase	NC	17.39	5.00	1.67	12.57
10	Children's education	SC	28.26	18.33	23.33	25.71
11	Domestic purpose	SC	11.74	30.00	45.00	20.57
12	Clothes purchase	PC	0.43	-	-	0.29
13	TV purchase	PC	0.43	-	-	0.29
14	Built new house	PC	0.43	-	-	0.29
15	Business	FC	0.43	-	-	0.29
16	Sanitary bathroom	PC	0.43	-	-	0.29
17	Father's medical care	HC	0.43	-	-	0.29
18	Loan payback	FC	-	-	-	1.14
19	Wedding ceremony	SC	0.86	-	-	0.58
	Total proportion of extra-income spent		**97.33**	**88.34**	**98.34**	**96.03**
	Not earned extra income		**2.61**	**11.67**	**1.67**	**4.00**
	Total		**100.00**	**100.00**	**100.00**	**100.00**

1 HC = Human Capital, SC = Social Capital, PC = Physical Capital,
FC = Financial Capital, NC = Natural Capital

16. Source of information about plant clinic

To find out source of information that how farmers were informed about plant clinic operation, the study team collected relevant source of information from the responded 350 farmers at 18 plant clinics in Natore, Satkhira and Bogra districts. Overall, the highest number of respondents were informed about the plant clinic operation by community plant doctors-CPDs (30.29%) followed by teachers from educational institutions (24%), Agri-inputs dealers/ Shop keeper (15.71%), Local leaders/Public representatives (8%), Others-not specified (6.29%), Neighbor/fellow farmers (5.14%), Service provider's representatives (4.57%), meeting (4.29%), Group coordinators (1.43%) and Miking (0.29%).

Incase of AAS, highest number of respondents were informed about plant clinic operation from Teachers (36.09%) followed by Agri-inputs dealers-shopkeeper (18.26%), CPDs (15.65%), other-not specified (9.57%), Leader (8.70%), Service provider's representative of plant clinic network (6.96%), Neighbour (2.61%), Meeting (1.30%) and Miking/ Group coordinators (0.43%).

Increase of Shushilan, highest number of respondents were informed about plant clinic operation from CPDs (73.33%) followed by shopkeeper-Agri. inputs dealers (21.67%) and Teachers/Neighbour/Local leaders (1.67%).

Increase of RDA, highest number of respondents were informed about plant clinic operation from CPDs (43.33%) followed by meeting (20%), Neighbour (18.33%), Local leader (11.67%) and group coordinators (6.67%)

Source of information-wise number of respondents for AAS, Shushilan and RDA are provided in the following Table 31.

Table.31: Source of information about plant clinic operation in 3 regions with AAS, Shushilan and RDA

Source of information	Respondent (Nr.)							
	AAS		Shushilan		RDA		Total	%
	Nr.	%	Nr.	%	Nr.	%		
1. Meeting	3	1.30	-	-	12	20.00	15	4.29
2. Miking	1	0.43	-	-	-	-	1	0.29
3. CPD	36	15.65	44	73.33	26	43.33	106	30.29
4. Teacher	83	36.09	1	1.67	-	-	84	24.00
5. Shopkeeper	42	18.26	13	21.67	-	-	55	15.71
6. Group coordinator	1	0.43	-	-	4	6.67	5	1.43
7. Neighbour	6	2.61	1	1.67	11	18.33	18	5.14
8. Local leader	20	8.70	1	1.67	7	11.67	28	8.00
9. Service provider's representative	16	6.96	-	-	-	-	16	4.57
10. Others	22	9.57	-	-	-	-	22	6.29
Total	**230**	**100.00**	**60**	**100.00**	**60**	**100.00**	**350**	**100.00**

17. First and last used of recommendations

Overall, the highest number of respondents used for first and last the plant clinic recommendations during 2008-09 (43.71%) followed by 2007-2009 (38.29%), 2009-2009 (43.71%), 2007-2008 (4.29%), 2006-2009/2006-2008 (3.43%) and 2005-2008 (0.86%).

Incase of AAS, highest number of respondents used for first and last the plant clinic recommendations during 2007-2009 (55.22%) followed by 2008-2009 (30.43%), 2007-2008 (6.52%), 2006-2008 (5.22%) and 2005-2008/2006-2009 (1.30%).

Incase of RDA, highest number of respondents used for first and last the plant clinic recommendations during 2008-2009 (38.33%) followed by 2009-2009 (35%), 2006-2009 (15%) and 2007-2009 (11.67%).

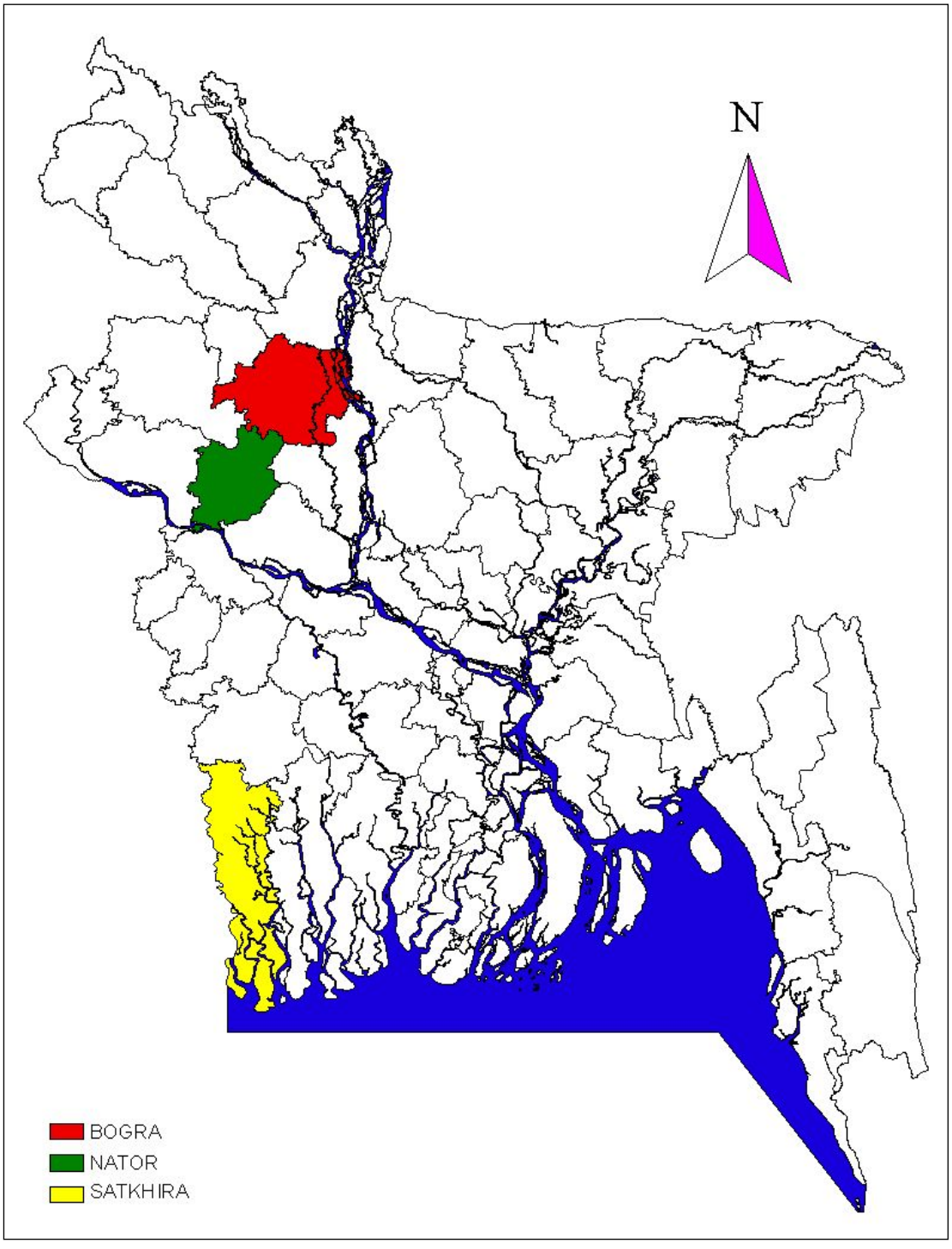
Incase of Shushilan, total responded 60 farmers (100%) used for first and last the plant clinic recommendations during 2008-2009.

First and last year of use-wise number of respondents of AAS, Shushilan and RDA are provided in the following Table 32.

Table.32: First and last year used of recommendations by respondents of 3 organizations

First & last year of use	Respondents (Nr.)							
	AAS		Shushilan		RDA		Total	%
	Nr.	%	Nr.	%	Nr.	%		
2005-2008	3	1.30	-	-	-	-	3	0.86
2006-2008	12	5.22	-	-	-	-	12	3.43
2006-2009	3	1.30	-	-	9	15.00	12	3.43
2007-2008	15	6.52	-	-	-	-	15	4.29
2007-2009	127	55.22	-	-	7	11.67	134	38.29
2008-2009	70	30.43	60	100	23	38.33	153	43.71
2009-2009	-	-	-	-	21	35.00	21	6.00
Total	**230**	**100.00**	**60**	**100.00**	**60**	**100.00**	**350**	**100.00**

Fig. 1: Location Map



Annex. I: Crop and organization-wise respondents received prescription from plant clinics of 3 organizations

SL #	Crop	Respondents (Nr.)				
		AAS	Shushilan	RDA	Total	%
1	Ash gourd	1	-	1	2	0.57
2	Banana	4	3	1	8	2.29
3	Betel leaf	6	-	-	6	1.71
4	Betel nut	1	-	-	1	0.29
5	Bitter gourd	-	-	3	3	0.86
6	Bottle gourd	2	3	4	9	3.43
7	Brinjal	15	7	9	31	8.86
8	Cabbage	-	-	2	2	0.57
9	Carambola	1	-	-	1	0.29
10	Cauliflower	-	2	-	2	0.57
11	Chilli	3	1	1	5	1.43
12	Coconut	5	4	-	9	2.57
13	Country bean	15	1	7	23	6.57
14	Cucumber	-	4	1	5	1.43
15	Custard apple	1	-	-	1	0.29
16	Garlic	15	-	-	15	4.29
17	Guava	1	1	3	5	1.43
18	Jackfruit	9	1	3	13	3.71
19	Jujube	5	-	-	5	1.43
20	Jute	1	-	-	1	0.29
21	Knolkhol	-	1	-	1	0.29
22	Litchi	12	-	1	13	3.71
23	Maize	2	-	-	2	0.57
24	Mango	30	9	1	40	11.43
25	Mung bean	8	-	-	8	2.29
26	Musk melon	1	-	-	1	0.29
27	Okra	6	1	2	9	2.57
28	Onion	-	1	-	1	0.29
29	Papaya	2	-	1	3	0.86
30	Pointed gourd	18	3	7	28	8.00
31	Pomegranate	2	-	2	4	1.14
32	Potato	-	2	-	2	0.57
33	Pummelo	1	--	-	1	0.29
34	Red amaranth	-	2	1	3	1.14
35	Rice	43	9	3	55	15.71
36	Sugarcane	15	-	-	15	4.29
37	Sweet gourd	3	-	-	3	0.86
38	Taro	-	1	-	1	0.29
39	Tomato	1	-	1	2	0.57
40	Turmeric	1	-	-	1	0.29
41	Yard long bean	-	4	6	10	2.86
Total		**230**	**60**	**60**	**350**	**100.00**
Total crops		**31**	**19**	**21**	**71**	**-**

Annex. II: Plant health problems of vegetables diagnosed by the plant doctors of 3 organizations

Vegetable		Problem diagnosed	Organization			
			AAS	Shushiln	RDA	Total
1.	Ash gourd	Fruit borer	1	0	1	2
2.	Bitter gourd	Fruit fly	0	0	1	1
		Fruit rot	0	0	1	1
		Leaf curl of bitter gourd	0	0	1	1
3.	Bottle gourd	Aphid Infestation	0	0	1	1
		Fruit fly	0	2	0	2
		Fruit rot	1	0	1	2
		Fungal infection	0	0	1	1
		Insect infestation	0	1	0	1
		Leaf curling	1	0	0	1
		Red pumpkin beetle	0	0	1	1
4.	Brinjal	Brinjal fruit & shoot borer (BSFB)	8	7	8	23
		Fruit rot	1	0	0	1
		Growth reduction	1	0	0	1
		Insect infestation	4	0	0	4
		Root rot	1	0	0	1
		Wilt	0	0	1	1
5.	Cabbage	Butter fly	0	0	1	1
		Cutworm	0	0	1	1
6.	Cauliflower	Aphid Infestation	0	1	0	1
		Insect infestation	0	1	0	1
7.	Country bean	Anthracnose	5	0	0	5
		Aphid Infestation	0	1	2	3
		Fungal infection	1	0	0	1
		Insect infestation	5	0	0	5
		Mite infestation	0	0	1	1
		Pod borer	4	0	4	8
8.	Cucumber	Aphid Infestation	0	2	0	2
		Fruit fly	0	0	1	1
		Insect infestation	0	1	0	1
		Virus	0	1	0	1
9.	Knolkhol	Reduced growth	0	1	0	1
10.	Okra	Beetle	1	0	0	1
		Cutworm	1	0	0	1
		Okra YVCMV	4	1	0	5
		Pod borer	0	0	2	2
11.	Pointed gourd	Foot rot	1	0	0	1
		Fruit fly	1	0	2	3
		Fruit reddening & dropping (FRD)	1	0	0	1
		Insect infestation	1	1	1	3
		Leaf curling	0	1	0	1
		Red mite	3	0	0	3
		Root knot	9	1	2	12
		Root rot	2	0	2	4
12.	Pointed gourd	Late blight	0	1	0	1
		Wilt of potato	0	1	0	1
13.	Red amaranth	Insect infestation	0	1	1	2
		Red mite	0	1	0	1
14.	Sweet gourd	Fruit fly	2	0	0	2
		Leaf deformation	1	0	0	1
15.	Taro	Insect infestation	0	1	0	1
16.	Tomato	Early blight	0	0	1	1
		Leaf curl	1	0	0	1
17.	Yard long bean	Aphid Infestation	0	1	0	1
		Caterpillar	0	1	1	2
		Fungal infection	0	0	1	1
		Leaf curling	0	1	0	1
		Pod borer	0	1	3	4
		Virus	0	0	1	1

Annex. III: Plant health problems of fruits diagnosed by the plant doctors of 3 organizations

Crop		Problem diagnosed	Organization			
			AAS	Shushilan	RDA	Total
1.	Banana	Beetle	1	0	1	2
		Foot rot	0	1	0	1
		Insect infestation	0	1	0	1
		Leaf yellowing	2	0	0	2
		Sigatoka	1	1	0	2
2.	Carambola	Fruit dropping & insect infestation	1	0	0	1
3.	Coconut	Anthracnose	1	0	0	1
		Boron deficiency	0	1	0	1
		Fruit dropping	4	3	0	7
4.	Custard apple	Fruit borer	1	0	0	1
5.	Guava	Mealy bug	1	0	0	1
		Powdery mildew	0	1	0	1
		White fly	0	0	2	2
		Whitefly	0	0	1	1
6.	Jackfruit	Ants	1	0	0	1
		Charcoal rot	1	0	0	1
		Fruit borer	1	0	0	1
		Fruit cracking	1	0	0	1
		Fruit dropping	3	0	0	3
		Fungus	0	0	1	1
		Insect infestation	2	0	0	2
		Rhizopus rot	0	1	0	1
		Virus	0	0	2	2
7.	Jujube	Die-back	1	0	0	1
		Flower dropping	1	0	0	1
		Flower dropping & fungus infection	1	0	0	1
		Insect infestation	1	0	0	1
		Leaf rust	1	0	0	1
8.	Litchi	BLB & Sulfur deficiency	1	0	0	1
		Die-back	4	0	0	4
		Insect infestation	4	0	0	4
		Leaf blight	1	0	0	1
		Leaf curling	1	0	0	1
		Mite infestation	1	0	0	1
		Red mite	0	0	1	1
9.	Mango	Anthracnose	1	0	0	1
		Die-back	16	0	0	16
		Flower dropping	2	0	0	2
		Flowering problem	1	0	0	1
		Fruit bearing problem	2	0	0	2
		Fruit rot	1	0	0	1
		Inflorescence discoloration	0	2	0	2
		Insect infestation	4	0	0	4
		Lack of vigour	0	1	0	1
		Leaf hopper	1	0	0	1
		Mango defoliator	0	1	0	1
		Mango fruit fly	0	1	0	1
		Mango hopper	1	4	0	5
		Nutrient deficiency	1	0	0	1
		Stem-end rot	0	0	1	1
10.	Musk melon	Leaf curling	1	0	0	1
11.	Papaya	Foot rot	1	0	0	1
		PRSV-p	0	0	1	1
		Virus	1	0	0	1
12.	Pomegranate	Flower & fruit dropping	0	0	1	1
		Fruit fly	0	0	1	1
		Fruit rot	1	0	0	1
		Insect infestation	1	0	0	1
13	Pummelo	Insect infestation	1	0	0	1

Annex. IV. Causal agents-wise plant health problem of vegetables diagnosed by plant doctors of 3 organizations

Causal agent	Problem diagnosed	Organization			
		AAS	Shushilan	RDA	Total
1. Bacteria	Root rot of brinjal	1	-	-	1
	Wilt of pointed gourd	-	-	1	1
2. Fungus	Anthracnose	5	-	-	5
	Early blight	-	-	1	1
	Foot rot	1	-	-	1
	Fruit rot	2	-	1	3
	Fungus	1	-	2	3
	Growth reduction	1	-	-	1
	Late blight	-	1	-	1
	Root rot	2	-	2	4
	Wilt of potato	-	1	-	1
3. Insect	Aphid Infestation	-	5	3	8
	Beetle	1	-	-	1
	Borer	1	-	-	1
	Brinjal fruit & shoot borer	6	7	8	21
	Butter fly	-	-	1	1
	Caterpillar	1	1	1	3
	Cutworm	1	-	1	2
	Fruit borer	1	-	1	2
	Fruit fly	3	1	4	8
	Fruit rot	-	-	1	1
	Insect infestation	9	6	2	17
	Pod borer	4	2	6	12
	Red pumpkin beetle	-	-	1	1
	Stem borer	1	-	3	4
4. Mites	Red mite	3	1	1	5
5. Nematode	Fruit reddening & dropping	1	-	-	1
	Root knot	9	1	2	12
6. Physiogenic	Leaf deformation	1	-	-	1
	Reduced growth	-	1	-	1
7. Virus	Leaf curl	1	-	-	1
	Leaf curling	1	2	-	3
	Leafcurl of bitter gourd	-	-	1	1
	Mosaic virus	1	-	-	1
	Okra leaf is yellowish colour and	2	-	-	2
	Okra yellow vein clearing mosaic	-	1	-	1
	Virus	1	1	1	3

Annex. V: Average cost for crop protection of 18 plant clinics of 3 organizations before and after adopting the plant clinic recommendations

Plant Clinic		Crop protection (Tk/farmer)		Pair difference		t-statistic	Sig.
		Before	After	Mean	SE		
1.	Ahmedpur	1170.00	992.00	-178.00	65.96	-2.699	0.013
2.	Ramagari	1519.44	1356.67	-162.78	63.66	-2.557	0.020
3.	Raynavorot	615.00	642.00	27.00	99.47	0.271	0.792
4.	Merigachhi	3488.89	3113.89	-375.00	76.40	-4.908	0.000
5.	Perbagdob	575.00	475.00	-100.00	14.91	-6.708	0.000
6.	Moukhara	4005.00	3192.50	-812.50	275.08	-2.954	0.008
7.	Tirail	1575.16	1458.39	-116.77	66.08	-1.767	0.087
8.	Chandi	1144.00	935.00	-209.00	171.97	-1.215	0.239
9.	Rajandropur	1477.78	1385.00	-92.78	80.20	-1.157	0.263
10.	Jonail	2512.50	2197.50	-315.00	259.81	-1.212	0.240
11.	Parcole	760.00	657.50	-102.50	28.67	-3.575	0.002
12.	Kachua	772.50	673.50	-99.00	46.97	-2.108	0.049
	AAS	**1698.30**	**1476.96**	**-221.35**	**41.12**	**-5.383**	**0.000**
13.	Kushulia	684.00	604.50	-79.50	30.56	-2.601	0.018
14.	Kalikapur	652.50	616.00	-36.50	23.66	-1.543	0.139
15.	Zirongachha	654.00	653.50	-0.50	42.54	-0.012	0.991
	Shushilan	**663.50**	**624.67**	**-38.83**	**19.29**	**-2.013**	**0.049**
16.	Maria	478.00	399.50	-78.50	32.94	-2.383	0.028
17.	Radhanagar	359.00	337.00	-22.00	30.04	-0.732	0.473
18.	Amrul	557.00	505.50	-51.50	38.85	-1.326	0.201
	RDA	**464.67**	**414.00**	**-50.67**	**19.60**	**-2.584**	**0.012**
	Total	**1309.43**	**1148.63**	**-160.80**	**27.77**	**-5.791**	**0.000**

Annex. VI: Average crop production (kg/farmer) of 18 plant clinics of 3 organizations before and after adopting the plant clinic recommendations

Plant Clinic		Crop production (kg/farmer)		Pair difference		t-statistic	Sig.
		Before	After	Mean	SE		
1.	Ahmedpur	2656.60	2935.20	278.60	107.26	2.597	0.016
2.	Ramagari	2276.67	2416.11	139.44	58.80	2.371	0.030
3.	Raynavorot	1123.00	1221.00	98.00	26.74	3.665	0.005
4.	Merigachhi	51797.22	53900.00	2102.78	800.52	2.627	0.018
5.	Perbagdob	2674.00	2781.00	107.00	87.59	1.222	0.253
6.	Moukhara	4285.50	5234.50	949.00	390.90	2.428	0.025
7.	Tirail	2349.77	3234.68	884.90	622.92	1.421	0.166
8.	Chandi	1750.50	2148.50	398.00	114.42	3.479	0.003
9.	Rajandropur	1562.50	1734.89	172.39	32.09	5.372	0.000
10.	Jonail	2484.25	3313.00	828.75	464.73	1.783	0.091
11.	Parcole	1274.00	1372.00	98.00	48.30	2.029	0.057
12.	Kachua	1881.00	1985.50	104.50	53.36	1.958	0.065
	AAS	**6139.95**	**6694.19**	**554.24**	**122.05**	**4.541**	**0.000**
13.	Kushulia	1222.75	1377.50	154.75	56.84	2.723	0.014
14.	Kalikapur	999.25	1126.10	126.85	33.28	3.812	0.001
15.	Zirongachha	780.25	895.00	114.75	23.83	4.814	0.000
	Shushilan	**1000.75**	**1132.87**	**132.12**	**23.05**	**5.731**	**0.000**
16.	Maria	654.00	851.75	197.75	57.54	3.437	0.003
17.	Radhanagar	592.50	642.00	49.50	9.25	5.353	0.000
18.	Amrul	957.75	1191.25	233.50	123.32	1.894	0.074
	RDA	**734.75**	**895.00**	**160.25**	**45.87**	**3.493**	**0.001**
	Total	**4332.34**	**4746.67**	**414.33**	**81.29**	**5.097**	**0.000**

Annex. VII: Purpose wise proportion of expenses on the extra income of the respondents of 3 organizations

Purpose of expenses		Respondents (%)			
		AAS	Shushilan	RDA	Total
1.	Agricultural work	1.30	-	25.00	5.14
2.	Bean cultivation	0.87	-	-	0.57
3.	Land purchase	11.74	6.67	-	8.86
4.	Cattle purchase	17.39	5.00	1.67	12.57
5.	TV purchase	0.43	-	-	0.29
6.	Clothes purchase	0.43	-	-	0.29
7.	Brinjal cultivation	1.30	-	1.67	1.14
8.	Built new house	0.43	-	-	0.29
9.	Business	0.43	-	-	0.29
10.	Children's education	28.26	18.33	23.33	25.71
11.	Country bean cultivation	0.87	-	-	0.57
12.	Pointed gourd cultivation	0.43	-	-	0.29
13.	Sanitary bathroom construction	0.43	-	-	0.29
14.	Domestic purpose	11.74	30.00	45.00	20.57
15.	Fruit orchard establishment	13.48	1.67	-	9.14
16.	Father's medical care	0.43	-	-	0.29
17.	Fish culture	0.43	10.00	-	2.00
18.	Garlic cultivation	0.43	-	-	0.29
19.	Land lease in	0.87	-	-	0.57
20.	Loan payback	-	6.67	-	1.14
21.	Okra cultivation	0.43	-	-	0.29
22.	Rice cultivation	3.48	8.33	1.67	4.00
23.	Shrimp culture	-	1.67	-	0.29
24.	Daughter's wedding	0.43	-	-	0.29
25.	Cow farming	0.87	-	-	0.57
26.	Sister's wedding	0.43	-	-	0.29
27.	None[1]	2.61	11.67	1.67	4.00
	Total	**100.00**	**100.00**	**100.00**	**100.00**

[1] Respondents not earned extra income from plant health services