

Chapter 7

Running a Plant Health Clinic (PHC)

This chapter covers the whole process of planning, conducting and reflecting on a plant health clinic.

What equipment do I need?


Stationery

- prescriptions forms
- Farmer Feedback Forms
- notebooks, marking pens, pens and pencils
- labels
- butchers or brown paper.

On phone or tablet

- camera
- KoboCollect app
- Pacific Pests, Pathogens & Weeds app
- social media app (see Chapter 4).

Equipment

- knife/scissors 
- hand lens
- bottles for insect capture
- water and bucket for washing roots
- plastic bags to keep samples fresh for discussion and reflection after the clinic
- newspapers for wrapping samples for identification
- cardboard (paper) box
- uniforms
- Isopropyl alcohol for preserving insects.

*Do not use a **Stanley knife blade or scalpel** — they are **dangerous and snap easily***

Other essentials

- tarpaulin
- table and chairs
- banner
- samples from the field
- samples brought in by farmers
- materials for wrapping and sending away 'unknowns':
 - newspaper
 - 70% alcohol or isopropyl alcohol
 - small glass tube
 - toilet or tissue paper
 - self-sealing plastic bags
 - dry silica gel or calcium chloride.

7.1 Introduction to running a plant health clinic (PHC)

There are a number of important points for plant health doctors to think about when preparing to run a PHC and to implement it successfully, as well as reviewing and reflecting on it afterwards.

If there is time, it is a good idea to run a practice clinic with extension staff (and research and biosecurity staff if resources allow), especially if there has not been a PHC in the area before.

Exercises 7.1, 7.2, 7.3 and 7.4 are designed to take your trainees through the whole process of running a clinic in class before the actual clinic takes place. These exercises cover the topics listed below.

1. What do we need for a successful plant health clinic?
2. How to use social media app as a plant doctor.
3. Filling out the Prescription Form.
4. The KoboToolbox and KoboCollect apps.
5. The Farmer Feedback Form.

Preparation needs to be done several days or weeks in advance of the clinic. Good awareness is essential! Without it, farmers will not come, or they will not bring samples.

Fig. 7.1 Clinics in action in Fiji (left) and Samoa (right). *Source: authors.*



Exercise 7.2: Social media apps — how to use them

Trainees should have already joined their country social plant health doctor media group as described in Chapter 4.

WhatsApp, Viber and Messenger groups are very useful for Unknowns or Confused samples seen during the clinic.

Trainees should take a picture of a pest, disease or nutrient deficiency and send it to their social media group.

It is important that trainees send photos that are in focus.

They should give their name, place of work and information about the crop and the problem.

Ask trainees:

- What do you think the problem is?
- If you received a reply, is it what you thought it was?
- If not, what is it?
- Was this helpful? Why or why not?
- Share your photos and any feedback from their plant health doctor social media group with the class.

Trainees should share their photos and any feedback from their social media group with the class.

Note: it may take time to get feedback from their local plant health doctor social media groups.

Exercise 7.3: Role play — filling out the Prescription Form

This exercise builds on Exercise 6.6 in Chapter 6.

Trainees should form pairs, where each pair is made up of one experienced plant health doctor and one with less experience (where possible).

Provide each group with a **sample** or ask the trainees to go outside and collect samples of:

- a pest
- a disease
- an unknown or confused problem
- a nutrient deficiency.

If they cannot find a good sample, trainees can use one of the photos in the manual or one from the Pacific Pests, Pathogens & Weeds app.

Provide each group with a **copy of the Prescription Form** to fill in and a **Farmer Feedback Form** (in appendix) (Exercise 7.5).

Modelling the process

To start with, you or someone who has experience with plant health clinics, should **model the process** of working with a farmer to show the trainees what to do.

You role-play the 'doctor' and choose a trainee to role-play the 'farmer'.

The '**doctor**' should **interview the 'farmer'** and the other trainees should observe. Clearly model all the steps of being a doctor.

Explain what you are doing as you work through the identification and diagnosis steps carefully (see Chapter 2).

1. Is it A, B or C? (Abiotic, Biotic or Confused).
2. What are the possible and probable causes?
3. Make a diagnosis.
4. Check with the Pacific Pests, Pathogens & Weeds app.
5. Decide on possible recommendations for treatment, both straight away and into the future.
6. Fill in the Prescription Form.

Now **ask your trainees to play the roles** of doctor and farmer.

After this, **swap roles and work through another sample** together. Continue until everyone has had a turn playing both doctor and farmer.

Exercise 7.3: continued...

Emphasise that doctors should not go straight to the Pacific Pests, Pathogens & Weeds app!

When you have finished, **ask trainees to discuss their experience** of the role play.

- How easy or difficult was the process of making the diagnosis?
- What was easy about filling in the form?
- What did they find difficult?
- Were they able to make a diagnosis and give a recommendation? Yes/No.
- If No, why not?

Now ask the person who played the farmer to complete the **Farmer Feedback Form** (see Exercise 7.5).

The **Farmer Feedback Form** will be used at a real clinic. After each interview, the person who played the role of the farmer should give feedback to the plant health doctor on the diagnosis process and their ideas on management.

Remember to tell trainees that handwriting must always be neat on prescription forms so that others can read it. If you know your handwriting is not neat, print carefully or better still use KoboCollect on a phone or tablet.

Exercise 7.4: Using the KoboCollect Prescription Form

KoboToolbox and KoboCollect are apps that can be used on smartphones or tablets instead of the Prescription Form to collect the farmers' data. The advantages have been explained in Chapter 4, but it's worth repeating them here. They are:

- the Prescription Form can be filled in off-line and sent later when there is a Wi-fi connection available
- the results of the interview can be entered straight away
- it is quick to fill in (after some practice)
- typing avoids handwriting by plant health doctors that may be difficult to read
- a single doctor can interview more farmers in a shorter period, when they get used to interviewing and taking notes at the same time
- allows interrogation of the data using specialist software.

Features of KoboToolbox and KoboCollect are:

- it incorporates multimedia – supports video, audio messages, images, GPS, and signature capture
- it creates an Excel spreadsheet automatically
- it has unlimited data storage – uses a secure cloud server
- it supports multiple languages.

Demonstrate to the class how the KoboCollect Prescription Form works.

Trainees should download the KoboCollect app to their smartphones or tablets, then fill in the form using, a sample of a pest or disease that you give them.

Note, farmers will still need a copy of the Prescription Form.

If the KoboCollect app is used at a 'real' PHC, there needs to be two plant health doctors for each farmer, one filling out the KoboCollect app, the other filling in the Prescription Form, so a copy can be given to each farmer.

Exercise 7.5: Filling in the Farmer Feedback Form

The Farmer Feedback Form (also in the appendix) is an important part of PHC improvement, as well as for monitoring and evaluation (M&E) purposes.

- it is used to obtain immediate feedback from farmers after they have seen the plant health doctor at the clinic
- the clinic manager or another person (especially someone who speaks the farmer's language) needs to interview each farmer and complete the form
- the manager needs to make sure that the interviewer understands exactly what information is to be collected, and how it will be used, and by whom.

After the clinic, the manager collects and collates all the feedback forms and presents the information during the reflection session after the clinic (see Exercise 7.7).

Farmer Feedback Form

1. Did the plant health doctor diagnose your problem? (please tick)

Yes No Not sure

Why?

2. Do you think you can carry out what the doctor said you should do?

Yes No Not sure

Why?

3. Was the clinic useful?

Yes No

Why?

4. Do you have any suggestions on how to improve the plant health clinic?

5. Would you recommend the clinic to other farmers?

Yes No

Why?

6. If there is another clinic in your area would you come again?

Yes No Maybe

Exercise 7.6: Preparing for many farmers attending the clinic with the same problem

It is important that all farmers see a plant health doctor, even if they have the same problem as other farmers.

Often, a number of farmers will bring the same problem to the clinic.

If there is time after the farmers have received their Prescription Form from the doctor, it would be very useful to gather them together and ask one of the doctors to give them a short talk about the problem.

This will give the farmers the opportunity to talk to each other about the problem and what they are doing about it.

Trainees should prepare by making sure they are aware of the major pests and diseases in their area (see Section 2.7 p. 92), although sometimes new problems can spring up quickly, especially when weather conditions change.

Other extension staff and experts should be contacted via the social media groups if necessary, to be told about the new problem, especially if it's likely to spread within the country, and if there are any recommendations on its management.

Trainees:

- either in a group or as a whole class, give your trainees the **names of pests, diseases or nutrient deficiencies that are likely to be a problem** in the area where the clinic is to be held
- if possible, **samples from the field** should be used
- the trainees should research these **using the Pacific Pests, Pathogens & Weeds app** to make sure they understand:
 - the symptoms
 - the diagnosis
 - recommendations for control now and in the future
- **trainees should discuss** how they will approach these problems with the farmers.

7.2 Checklists for running a plant health clinic (PHC)

Throughout Chapters 2-6, your trainees have explored how to identify, diagnose and manage plant pests, diseases or nutrient deficiencies. Now they are ready to apply their knowledge to run a real PHC with their local farmers. To do this properly requires careful planning so that the clinics will run well and be of real benefit to farmers.

An excellent way to make sure a clinic is well planned is to use a checklist for each aspect. This way, nothing is forgotten and the responsibility for planning a clinic can be shared within the plant health doctor team.

Use the checklist in Table 7.1 to check each aspect of planning before, during and after a PHC. Sections 7.2.1 to 7.2.6 provide additional detail for planning for each of the checkpoints in Table 7.1. Also, see the Plant Health Clinic Procedure Check List in Appendix 5.

Table 7.1 A checklist for before, during and after running a Plant Health Clinic. Tick off each task as they are completed.

Checklists for Plant Health Clinics	
Tick	Task
General preparation for PHCs	
	Clinic timing: <ul style="list-style-type: none"> ▪ how often should they be held? ▪ make a strategic PHC plan for your country ▪ always plan subsequent clinics in advance, so you can announce the next date at your current clinic
	Samples: <ul style="list-style-type: none"> ▪ clinics run best when farmers bring samples that are kept for reference — discuss with your team how you are going to collect, label, manage, store and follow up with any samples before planning a PHC
	Staff: <ul style="list-style-type: none"> ▪ are there enough staff appointed to the PHC team to effectively run clinics in the field and conduct the administration before and after them?
Before the clinic	
	Location — is it: <ul style="list-style-type: none"> ▪ accessible? ▪ visible? ▪ conveniently timed?
	Phone calls & text messages: <ul style="list-style-type: none"> ▪ radio ▪ TV ▪ phone calls ▪ emails ▪ encourage whole plant samples to be brought ▪ give farmers plenty of notice
	Budget: <ul style="list-style-type: none"> ▪ stationery ▪ advertisement ▪ other materials

Table 7.1 Continued...

Tick	Task
Before the clinic continued...	
	Staff: <ul style="list-style-type: none"> ▪ clinic manager ▪ data entry ▪ plant protection officers (extension, research, biosecurity) ▪ country's plant health doctor social media group on standby
At the clinic	
	Setting up: <ul style="list-style-type: none"> ▪ table, chairs, tarpaulin ▪ banner and pull-ups advertising the clinic ▪ access to Wi-fi, if possible ▪ a decision on what to do with 'unknowns'
	Plant health doctors — what is needed? <ul style="list-style-type: none"> ▪ materials for assessing samples, recording data, camera/phone for taking photos, providing prescriptions (see detailed list in Section 7.2.3)
Steps to ensure a successful PHC	
	Farmer registration and direction: <ul style="list-style-type: none"> ▪ make sure farmer's samples are processed appropriately ▪ ensure the farmers have completed a feedback interview and prescriptions are completed in a timely way and accurately ▪ have the farmers complete a feedback interview? ▪ provide farmers with factsheets, leaflets, other information sheets or resources
What to do with unknowns	
	<ul style="list-style-type: none"> ▪ tell the clinic manager if you have an unknown — he or she should ask other plant health doctors who might be able to identify it ▪ make sure unknowns are assessed by one or more plant health doctors ▪ ask the social media community for help ▪ make sure the clinic manager follows up with SPC, PestNet or other research/biosecurity divisions for identification ▪ do not forget about unknowns — if you tell farmers you will follow up after the clinic to help them, do not forget to get an answer for them — if there is no follow up, farmers will not come to future clinics
Immediately after the clinic	
	<ul style="list-style-type: none"> ▪ enter all the data from the Prescription Form into KoboCollect if you are not using the app to collect data at the clinic ▪ collate Farmer Feedback Forms (the clinic manager usually does this) ▪ follow up on any unknowns that have not been solved
	Review and reflection (Exercise 7.7): <ul style="list-style-type: none"> ▪ what went well? ▪ what could have been better? ▪ what changes will you make the next time?

7.2.1 General preparation for plant health clinics

How often should clinics be held?

How often you hold a clinic depends on your country's implementation plan, availability of staff, and resources. Ideally, a clinic should be run at least once a month. Always announce at the clinic when you will hold the next one and where it will be held.

Samples

Encourage farmers to bring samples of unhealthy plants, preferably with early symptoms. Farmers should try to bring the whole plant, including the roots.

Each sample should be given a code on a piece of card which is the same as the code in the top right-hand corner of the Prescription Form. If more than one sample is brought in, the letter A, B, etc., should be added to the code on both the card and the form.

After the clinic, the plants should be put into a bag with the correct sample code and be discussed in the reflection time after the clinic. Then they should be disposed of safely to avoid spreading pests and diseases.

Check that the sample has a card with the correct code that matches the Prescription Form when it is put in the bag.

Recording plant clinic data

Clinic data will be entered into Excel spreadsheets (either copied from the prescription forms or entered automatically from KoboCollect using KoboToolbox). The data can supply information on clinic use, such as the ratio of men to women attending, and the number of each pest and disease. It also checks on the quality of advice given by extension staff. Staff who need further training or information can be identified by looking at the data. This is an important element in the M&E part of the plant health system. It means that, over time, a set of data regarding plant health clinics can be built up and used for monitoring and research. If possible, avoid the need to add data manually, and instead use the KoboCollect app which fills an Excel spreadsheet automatically and so avoids mistakes (see Exercise 7.4).

7.2.2 Before the clinic

Location

Clinics should be held in accessible places such as markets and other places that farmers visit regularly, and held at times that are convenient to farmers. Extension offices in agriculture department buildings are not good venues; they are busy places and often too far for farmers to reach easily. The clinic site should be made clearly visible, using banners.

Awareness

Good awareness is essential. Plan awareness and announcements through radio, banners, TV, phone calls, texts, social media, email, word of mouth and other means. Decide when to start, and how many times to repeat the message. Farmers should be reminded to bring samples of unhealthy plants, and also insects that are damaging their crops. They should bring as much plant material as possible including roots. Just bringing part of a small leaf is not useful for a satisfactory diagnosis.

Budget

Check that the estimated budget is sufficient to cover all expenses (stationery, materials, travel etc.) for the clinic.

Staff

Appoint a clinic manager who is in charge of setting up, running, closing the clinic and collating and presenting the farmer feedback data. Where possible there should be at least two plant health doctors to process queries efficiently and share their thoughts on diagnosis and to give advice on management.

Invite staff from other agriculture divisions who directly work in plant protection. They do not need to attend the clinic, but make sure that they are standing by on the day to give advice if needed.

Ensure that the plant doctors are members of their country social media group (Chapter 4). Alert the social media community that there is a clinic taking place and ask them to stand by so they can help in sample identification.

7.2.3 At the clinics – steps to ensure success

Farmer registration and direction¹

1. At the registration table, greet the farmer.
2. Direct farmers to the waiting area where they can have some refreshments (if provided) and look at useful material, such as:
 - fact sheets
 - posters
 - leaflets
 - newspapers
 - nutrition information
 - video on safe use of pesticides from Papua New Guinea.
3. Take a photo of the farmer's samples.
4. Direct the farmer to the doctor's table when the previous farmer has finished.

¹ The clinic manager may prefer not to have a separate registration desk and let the plant health doctors complete the full form as well as photograph the samples. If so, make sure labelling is carefully done to match: (i) the sample; (ii) photos; and (iii) the Prescription Form

TIP: The manager or another extension officer could give the farmers a short tour and talk about the information on the posters.

Giving the farmer advice

1. When the farmer comes to the doctor's table, welcome him or her and ask the questions on the Prescription Form.
2. Fill in the first part of the Prescription Form, if not already completed
3. Examine the sample (if the farmer has brought one), discuss the problem, ask the farmer relevant questions, and try to diagnose it using the diagnosis process you have practised.
4. Suggest recommendations to the farmer, and check if he/she understands them and is able to carry them out.
5. Fill in the rest of the Prescription Form and give the top copy to the farmer.
6. Ask the farmer to go to the person who is doing the farmer feedback interview.
7. Label the farmer's samples and any photos taken of the samples with the same code as that on the Prescription Form.
8. Put the samples in a bag. Make sure this is done and the samples are taken back to the extension office for the reflection after the clinic.

REMEMBER: If a lot of farmers come with the same problem, let the manager know. He or she can arrange to gather them together and talk to them in a group (Exercise 7.6).

If needed, trainers should translate the prescription and Farmer Feedback Forms into the national local language but a copy in English is needed for data entry.

7.2.4 What to do with unknowns

Sometimes a plant doctor will find it very difficult to make a diagnosis for the farmer. Before the clinic, the plant health doctors should make sure they know what to do if they have an unknown problem, or if they are confused. Read Chapter 4 again for online help. If a doctor cannot diagnose a sample and cannot make a recommendation, then they need to tell the farmer, not make up an answer. It is worse to give farmers the wrong information than to tell them, "I don't know, but I will find out and get back to you."

Plant health doctors should record the word 'unknown' on the Prescription Form and take the farmer's phone number to follow-up.

What to do if plant doctors have an unknown sample at a clinic:

- tell the clinic manager if there is an unknown — he/she can ask if any of the other doctors can make a diagnosis — it may have already been brought in and diagnosed by another doctor
- if it is still unknown, send a photo via social media to the experts who will be standing by while the clinic is in progress
- the clinic team may need to arrange a visit to the farm
- in the section on the Prescription Form: ‘WHAT DO YOU THINK CAUSES THE PROBLEM?’, write ‘Unknown’ and tell the farmer the team will find out what the problem is — do not leave it blank — remember, never write a diagnosis if unsure of the problem — it is always best for a doctor to say if they don’t know
- after the clinic, the manager may decide to send the sample to the research/biosecurity division for identification — the process for this is described in Exercise 7.8
- make sure the advice is followed up with the farmer when there is a positive diagnosis. **Never promise you will help the farmer and then do nothing about it!**

IMPORTANT REMINDERS for plant health doctors:

- fill out the form neatly and clearly, print if necessary, or use the KoboCollect app
- tell the clinic manager immediately if there is an unknown
- tell the farmer if you don’t know, rather than guess
- if there is no solution at the clinic, tell the farmer it will be followed up and get back to him or her as soon as possible.

7.2.5 After the clinic

Data entry

Good quality accurate data allows the plant health team to draw conclusions from the clinics, update a country’s information about pests and diseases, and make improvements. The clinic manager or another extension officer is responsible for entering the data from the prescription forms into KoboCollect, if it is not being used at the clinic.

Follow-up with farmers

The clinic manager is responsible for making sure the clinic team follows up on unknowns, i.e., letting the farmers know the results of diagnoses made by experts from biosecurity or elsewhere. The results must be added to the spreadsheet.

In addition, recommendations that were not given to the farmer at the time, but which were identified in discussions during the reflection with other plant health doctors, should be given to farmers over the phone. These, too, should be added to the spreadsheet.

The clinic manager is responsible for making sure that follow-up data are entered into the system to fill in the gaps. For example: If a sample that was sent away for diagnosis comes back from the laboratory, the officer responsible needs to add it to a spreadsheet, as well as communicating with the farmer.

NOTE: if the KoboCollect app is used, the information entered can be automatically entered into an Excel spreadsheet which you can access.

Review and reflection

After the clinic, plant doctors need to come together as well as follow up with the farmers, and collect data that will show how successful the clinic was. This is a very important part of the whole PHC process. It is where the plant health doctors share their experiences of the clinic held that day, think about what went well, what was learned and what needs to be improved or changed next time.

Exercises 7.7-7.12 allow trainees to reflect on what they have learned during their training and their experience at the clinic. It will help identify any areas that require additional training so that they are confident in their ability to run successful PHCs into the future.

It is also very important to make a summary for the clinic. It does not take much time but is necessary for record keeping, and for sending to senior officers, the media and others who are interested in these clinics. To make it easier for you, there is a photosheet² summary that can be used as a model (Fig. 7.2). Trainees can practise this in Exercise 7.12.

² The photo sheet concept was suggested by Dr Eric Boa, University of Aberdeen.

Fig. 7.2 An example of a plant health clinic photosheet summary to be used as a model for future Plant Health Clinics. *Source: Ministry of Agriculture & Fisheries. Samoa.*

SAMUSU - ALEIPATA, SAMOA
Ministry of Agriculture & Fisheries
 4th October 2018



This Plant Health Clinic was held at Samusu – Aleipata, a village towards the far east of Apia, in conjunction with the regional team to test the training manual. |

It started at 10am and concluded at 1pm.

About 18 farmers attended; a third were women. Farmers came from Samusu, Lalomanu, and Salani.

All the farmers brought samples and many brought more than one sample from different crops; there were 40 problems diagnosed.

The problems included bacterial wilt on tomato and capsicum; root-knot nematode on tomato and cabbage; LCM on cabbage; possibly Pythium rot on taro; white flies and sooty-mould on broccoli; root rot (possibly nematodes) on banana; fruit piercing moth on tomato fruits; fruit fly and rot on cucumber.

Plant doctors from MAF were Christian T, Faalelei T, Mu V, Kuini T, Tamoe T, Aleni U, Latatuli L, Tommy T and Leafa G; from the regional team; Ratu Toloi V (Fiji) Tevita T and Emeline A (Tonga), Rosemary A (Solomon Islands), Mani M (Pacific Community) under the supervision of Dr. Grahame Jackson (PestNet) and Dr. Caroline Smith (University of Tasmania). Sailo Pao was the clinic manager.

Prepared and reported by the Ministry of Agriculture and Fisheries.

For more information, contact Sailo Pao, Crops Division, Nu'u Research Station. Mob: 7230442 Email: sailop.pao@maf.gov.ws; Plant Health Clinics are held as part of a sub-regional ICM/IPDM project (HORT/2016/185) - *Responding to emerging pest and disease threats to horticulture in the Pacific islands*, with support from the Australian Centre for International Agricultural Research, Canberra.

Exercise 7.7: Reflection on the clinic process

On butchers paper or brown paper, trainees should discuss:

- what went well and
- what did not go well.

Encourage them to share all their experiences, not just their successes.

This is how they will learn.

Trainees should record their discussion using this table and share with the class.

An example is provided.

What went well?	What didn't go so well?	What training is still needed?	What improvements will be made at the next clinic
A lot of farmers came	Only a few women came	Diagnosis	Make sure awareness targets women in particular. Check the time was convenient for them. More diagnostic practice before next clinic

Exercise 7.8: Farmer feedback data

The clinic manager will collate all the Farmer Feedback Forms and present the results.

This will let the team know what the farmers thought about the clinic, which will also help to plan for the future.

Discuss the results:

1. What do the results tell your trainees about how well they ran the clinic?
2. What should be done to improve next time?
3. Does the feedback form provide enough information about the farmers' experience at the clinic?
4. Does the form need improving? If so, how?

Exercise 7.9: Reflection on diagnosis and recommendations

This exercise is one of the most important to do after the clinic. In a safe learning environment, your trainees will come together with farmers' samples and copies of the completed Prescription Forms to discuss their descriptions, diagnoses and recommendations.

Trainees should form groups of two or three and go through samples from the clinic. They should discuss:

- **their diagnoses of a pest, a disease or a nutrient deficiency** and a 'confused' sample brought by farmers to the clinic
- **any differences** of opinion
- what they told the farmers to do in
 - i) the short term and
 - ii) the long term
- any samples that could not be identified ('unknowns')
- how they informed (or will inform) the farmers about the unknowns

Each group should select one sample and report their findings to the class using the template below, either as a PowerPoint or on paper.

The discussion afterwards should **focus on the process of the diagnosis** and the recommendations.

Any changes should be **discussed with reasons**.

Farmer and location:		Insert photo if available
Crop:		
Symptoms:		
Diagnosis:		
What farmer can do NOW	e.g. cultural control	e.g.chemical control
What farmer can do in the future	e.g. cultural control	e.g.chemical control

Exercise 7.10: Sending samples for identification

This exercise shows trainees how to send unknown samples to experts for identification.

If no one is able to identify their sample, it will need to be sent to an expert for examination, either locally or overseas.

Samples of pests and diseases should be placed on three tables labelled 1-3:

1. A fungal or bacterial disease.
2. A pest.
3. A virus.

Trainees can work through the procedure for each type of pest and disease, then move to the next table, so that they have experience preparing samples for different types of pests and diseases.

Details of the methods can also be found on the PestNet website: www.pestnet.org

You will need the following for this exercise:

- | | |
|---|---|
| <input type="checkbox"/> paper for labels | <input type="checkbox"/> alcohol (if not ethanol, then isopropyl alcohol) |
| <input type="checkbox"/> pencils | <input type="checkbox"/> small bottles |
| <input type="checkbox"/> plastic bags | <input type="checkbox"/> envelopes |
| <input type="checkbox"/> newspaper | <input type="checkbox"/> camera for taking photographs of samples |
| <input type="checkbox"/> sticky tape | <input type="checkbox"/> silica gel and calcium chloride (if available). |

Before going to a table, each group should write:

- i. a note (a label) to put inside the parcel containing all the information below and
- ii. a label with the name and address of the person in research or biosecurity to whom the parcel is to be sent:
 - crop/plant name
 - code given at the clinic
 - doctor's name and address
 - code, same as on the Prescription Form
 - date and location of the clinic
 - farmer's name and phone number
 - farmer's village
 - a short description of the problem and any other useful information they thought to be useful.

Table 1: Processing damaged or diseased plant samples

1. Collect the samples showing a full range of symptoms.
2. Take a photo of the samples.
3. Make a parcel of the specimens with newspaper.
4. Attach the second label to the front of the parcel. If possible, seal the label with sticky tape to protect it.

Exercise 7.10: continued...

Table 2: Processing insects and mites

1. Take a photo of the samples.
2. For small insects – thrips, aphids, hoppers as well as mites, preserve in alcohol — 70% alcohol is best, but probably not easy to find — so, use isopropyl alcohol which should be available at the local chemist.
3. Place a small amount of alcohol in a bottle.
4. Carefully pick up the insect, or cut out a piece of the plant that contains the insects or mites, and place it in the bottle with alcohol.
5. Add a label (as detailed above) to the bottle. It is important that all labels are written in pencil, as ethanol removes ink.
6. Make sure that the tube/bottle does not leak.
7. Place in plastic bag, and tie the opening.
8. For larger specimens, wrap them carefully in paper envelopes and place them in a secure box so that they are not crushed — use this method for Lepidoptera (butterflies and moths): do not put them in alcohol.

If you are sending a scale insect or mealybug do not attempt to remove it from the leaf or twig on which it is feeding. Do not put butterflies and moths into alcohol as the scales will fall off. Instead, fold in paper envelopes.

Table 3: Processing samples caused by viruses

Trainees are unlikely to process samples infected by viruses as special equipment is needed. However, you might wish to explain how it is done for their interest.

1. Take a photo of the samples.
2. Cut out the area of the leaf that shows symptoms of virus.
3. Place this on a clean wooden board, or a tile or thick paper and cut out strips 10 mm wide, using a clean scalpel or a clean sharp knife (wipe it first with alcohol or bleach).
4. Cut across the leaf pieces, making strips 1 x 10 mm wide
5. Place these, loosely packed, in a screw-capped tube (about 30 ml) half-filled with silica gel (blue) or calcium chloride (if you do not have either, then dry the samples in an air-conditioned room).
6. If the samples are not dry after 24 hours, transfer them to a new tube of drying agent.
7. When dry, fix the second label with clear tape on the outside of the tube.

Note: if the silica gel is pink, it needs to be re-dried at 150°C for 3–4 hours until it is blue. Be careful to wait until the silica gel is cool as it retains heat for some time.

Exercise 7.11: Plant health doctor self-evaluation form

Now it is time for your trainees to evaluate themselves as plant health doctors. This is anonymous, but it will help the extension service to monitor how well the program is running and what further training may be needed.

On a sheet of A4 or brown paper, trainees should give their answers to the questions below. In questions 1, 2 and 3, **1 is the lowest level of confidence** and **5 is the highest**. They should **circle the number** that they think best fits their level of confidence.

1. How confident are you in your abilities to make correct disease diagnoses?

1 2 3 4 5

2. How confident are you in your ability to correctly diagnose pest problems?

1 2 3 4 5

3. How confident are you in your ability to make correct recommendations?

1 2 3 4 5

4. Do you feel you need more training?

Yes No

5. If 'Yes' what training is needed? Please specify (e.g. IT, diagnosis, filling out the prescription forms, interviewing farmers, etc.)

Collate and report the results from the class.

Discuss:

- What does this say about your trainees' level of confidence and ability to conduct a plant health clinic?
- How can you and your trainees continue to improve?

Exercise 7.12: Making a plant health clinic photosheet summary

It is very important to make a clinic summary. It does not take much time but is necessary for record keeping, and for sending to senior officers, the media and others who are interested in these clinics. Use the template below.

This can be done in Word or Acrobat Pro. **Following the template**, provide the location and date, the number of farmers, the number of men and women, where they came from, the problems they brought to the clinic, the diagnoses made, and the names of the plant health doctors. **Contact details of the organisation** hosting the clinic should also be added. See the example in Fig. 7.2.

..... COUNTRY
 [major administrative area]
 [place of organisation] PLANT CLINIC
 [organisation] | DATE

Insert Photo 1	Insert Photo 1
Insert Photo 1	Insert Photo 1
Insert Photo 1	Insert Photo 1

This plant clinic was held at and organised by
 The (clinic) is located km N/S/E/W from town.
 [add number] farmers participated at the clinic; there were [add number] men and [add number] women).
 [add number] samples were received.
 Some of the key problems presented were
 The plant doctors were
 [Other information]: You could add if any specimens were sent for identification.
 Prepared and reported by , Organisation.
 For more information contact (person, phone number, email, etc.).
 Photos by (if a different person).
 Plant clinics are held as part of the ACIAR project: *Responding to emerging pest and disease threats to horticulture in the Pacific islands*.

CHAPTER 7 QUIZ: Test your knowledge

Multiple choice. Pick one answer only...

1. Plant health clinics are important parts of:

- A. a country's food security
- B. a country's plant health system
- C. the agricultural extension system
- D. all of the above

2. The best place to hold a clinic is:

- A. where many farmers gather, e.g. a market
- B. at the research station
- C. on a farm
- D. at the university

3. Important advice for farmers when raising awareness about a forthcoming clinic is:

- A. to bring the whole plant, including roots
- B. to bring a few leaves
- C. to bring a soil sample
- D. to bring your phone

4. If you do not know what the problem is, you should:

- A. leave that part of the prescription form blank
- B. tell the farmer something, even if you are not sure
- C. ask if anyone else knows what the problem is
- D. send the farmer away

5. Look at the steps below for identifying a disease sample. They are in the wrong order.

1. make a parcel for the specimens with newspaper
2. write a label and put the specimen in a plastic bag with a few drops of water and seal the bag, leave overnight
3. collect samples showing a full range of symptoms

The correct order to do these steps in is:

- A. 1, 2, 3
- B. 3, 2, 1
- C. 2, 1, 3
- D. 1, 3, 2

6. Insect samples to be sent away for identification are best preserved in:

- A. methanol
- B. isopropyl alcohol
- C. 70% alcohol
- D. beer

7. A plant doctor suspects a farmer's sample has a bacterial wilt. She can test this by:

- A. smelling it to see if it smells rotten
- B. cutting the stem and dipping the end in water and looking for milky streaming
- C. finding the bacteria under a microscope
- D. looking for spots on the leaves

CHAPTER 7 QUIZ: Test your knowledge continued...

Multiple choice. Pick one answer only...

8. The most important items to take to a clinic are:

- A. chairs
- B. kava
- C. uniforms
- D. Prescription Forms

9. After a clinic, a plant health doctor must always:

- A. follow up with a farmer if the farmer has been told that will happen
- B. reflect on and review the clinic data and plan to improve next time
- C. collect all the samples for looking at later with the other plant health doctors
- D. do all of the above

10. A farmer brings yams that have died and gone black. The farmer tells the plant health doctor they have been damaged by lightning. The doctor thinks the problem is anthracnose. The doctor should help the farmer straight away by:

- A. agreeing that lightning might be the cause but also offering other ideas of the cause, and suggesting what the farmer could do
- B. offering to visit the farm
- C. telling the farmer he or she cannot be helped at the clinic
- D. asking the farmer to bring in more samples.

7.4 The Big Quiz

Now that your trainees have completed all the plant health clinic training in Chapters 2-7 they can test their knowledge with one final test, The Big Quiz!

You can also make up your own questions.

When they have all finished, go through the answers.

You do not need to ask what marks the trainees got; they will have learned the correct answers by going through the test as a class.

Make sure you discuss any answers they are not sure about.

Then explain that if there is anything they are still not sure about, they should read the manual again and/or ask for help.

THE BIG QUIZ

Multiple choice. Pick one answer only...

1. A plant health system should include:

- A. plant health clinics, extension staff, research staff, ministries of agriculture staff
- B. biosecurity staff, research staff, hospital staff, quarantine staff
- C. plant health doctors, vets, extension staff, research staff
- D. media, tourism, agriculture, horticulture

2. Which of the following are all insecticides?

- A. Manzate, milk, baking soda, Taratek
- B. Sundomil, Attack, Multiguard, Confidor
- C. Glyphosate, neem, Blitzem, pyrethrum
- D. Confidor, Orthene, Bt, Taratek

3. A sprayer nozzle suitable for fungicide should:

- A. be an anvil type and the spray should form a light rain
- B. be a flat type and the spray should form a light rain
- C. be a hollow cone type and the spray should form a mist
- D. be a flat type and the spray should form a cloud

4. A pesticide label says that it should be made up at a concentration of 1 ml pesticide to 10 L water. The concentration of the pesticide is:

- A. 10%
- B. 1%
- C. 0.1%
- D. 0.01%

5. A farmer has 10 ha of a crop to be sprayed. The pesticide label tells her that the spray should be 30 ml pesticide per 20 L water and the crop should receive 500 L per ha. How many ml of the pesticide should she use to make up the spray to cover the whole crop properly?

- A. 3000 ml
- B. 4000 ml
- C. 6000 ml
- D. 7500 ml

6. Build-up of pesticide resistance in a pest can be prevented by:

- A. alternating the spraying between an insecticide and a fungicide
- B. spraying early in the morning
- C. using the correct type of nozzle for spraying
- D. making sure the same type of pesticide is not used all the time

7. Which action should you NOT do if you accidentally spill some pesticide?

- A. cover the area with sand
- B. make sure you wash yourself and your clothes thoroughly
- C. keep children away from the spill
- D. leave it to evaporate away

8. Pesticide resistance in insects is caused by:

- A. a genetic mutation that is passed on to new generations of the insect
- B. using the wrong crop rotation.
- C. a herbicide being used by mistake.
- D. a virus getting into the insect

THE BIG QUIZ continued...

Multiple choice. Pick one answer only...

9. Which of the following information is NOT usually found on a pesticide label?

- A. the type of product
- B. which pests are resistant to it
- C. what it contains
- D. what crops it may be used on

10. A wettable powder:

- A. is the same as an emulsifiable concentrate
- B. is incompatible with all other pesticides
- C. can be mixed with water
- D. forms a milky liquid when mixed with water

11. A pesticide withholding period:

- A. is the period before it is safe to enter the crop after spraying
- B. is the period when animals are not allowed to graze on the crop at any time
- C. is the number of days between the last application of a pesticide and crop harvest
- D. is the period before a pesticide is allowed into a country from overseas

12. In IPDM, pesticides should be used:

- A. always, as a prevention
- B. never
- C. as a last resort
- D. only if the farmer can afford them

13. The adult insect in the picture below is most likely to be:

- A. a beetle
- B. a wasp
- C. a lacewing
- D. a fly



14. In order, a companion plant, a biological insecticide and a beneficial organism are:

- A. taro, DBM, Trichoderma
- B. Chinese cabbage, kocide, ladybird
- C. coconut, pyrethrum, trichogramma
- D. marigold, metarhizium, spider

15. An example of a good crop rotation would be:

- A. lettuce, cabbage, broccoli, bean
- B. cucumber, squash, potato, cassava
- C. potato, tomato, eggplant, capsicum
- D. bean, cabbage, cucumber, cassava

THE BIG QUIZ continued...

Multiple choice. Pick one answer only...

16. A plant health doctor is faced with an unknown pest or disease at the clinic. What should s/he do first?

- A. send a picture to social media group
- B. make up something; it's better than the farmer thinking they don't know
- C. see if anyone else in the clinic knows
- D. tell the farmer to go away

17. In IPDM, monitoring involves:

- A. deciding whether the problem is caused by a pest or a disease
- B. using the best pesticide for the pest
- C. checking the level of damage and looking for bugs and eggs
- D. identifying the pest or disease

18. The correct sequence for applying IPDM is:

- A. monitoring, identification of pest or disease, decide amount of damage acceptable, making a plan
- B. evaluation, monitoring, identification of pest or disease, making a plan
- C. making a plan, identification of pest or disease, monitoring, evaluation
- D. identification of pest or disease, monitor, decide amount of damage acceptable, make a plan and action

19. Which plants are all in the same plant family?

- A. cabbage, bok choy, broccoli, chilli
- B. potato, cassava, taro, sweet potato
- C. bitter melon, pumpkin, cucumber, pineapple
- D. capsicum, chilli, eggplant, potato

20. The best way to control a soil borne bacterial infection is:

- A. use a resistant variety if it can be obtained
- B. spray with a pesticide
- C. use a virus that attacks the bacteria
- D. add compost to the soil

21. Which of the following is NOT thought to be associated with companion planting:

- A. companion plants can provide food for parasitoids
- B. companion plants may have a smell that repels pests
- C. companion plants always add large amounts of potassium to the soil
- D. companion plants may repel root knot nematodes

22. In order, abiotic and biotic factors that cause damage on plants are:

- A. fungi and mites
- B. birds and drought
- C. potassium deficiency and bacteria
- D. phytoplasmas and poor soil

23. Typical symptoms on plants caused by bacteria are:

- A. leaf spots, angular or round, with or without haloes
- B. wilt and yellowing at the edges of leaves
- C. rusty spots and mosaics
- D. dieback and the leaves go purple

THE BIG QUIZ continued...

Multiple choice. Pick one answer only...

24. A common disease of tomatoes in the Pacific region is:

- A. witches' broom
- B. tobacco mosaic
- C. early blight
- D. ring spot

25. The smallest of these pathogens is:

- A. a virus
- B. phytoplasma
- C. a bacterium
- D. a fungal spore

26. A plant doctor finds a plant with symptoms of wilt. The most unlikely cause would be:

- A. bacteria in the soil
- B. rust fungus
- C. nematodes
- D. stalk borers

27. Pests with eight legs are not:

- A. mites
- B. insects
- C. scorpions
- D. spiders

28. Which of these diseases is caused by a fungus?

- A. bunchy top on banana
- B. blossom end rot on tomato
- C. scale on sweet potato
- D. damping off on cabbage seedlings

29. A plant doctor finds a cabbage with a lot of holes in the leaves. Which are not likely causes?

- A. diamondback moth
- B. large cabbage moth
- C. leaf spot
- D. snails

30. A virus can be spread by:

- A. bacteria
- B. fertiliser
- C. rhinoceros beetles' larvae
- D. aphids

31. Two insects with simple life cycles are:

- A. aphids and katydids
- B. butterflies and bugs
- C. grasshoppers and ants
- D. bees and moths

32. Plant health clinics are important parts of:

- A. a country's food security
- B. a country's plant health system
- C. the agricultural extension system
- D. all of the above

33. The best place to hold a clinic is:

- A. where many farmers gather, e.g. a market
- B. at the research station
- C. on a farm
- D. at the university

THE BIG QUIZ continued...

Multiple choice. Pick one answer only...

34. Important advice for farmers when you are raising awareness about a forthcoming clinic is:

- A. to bring a whole sample if possible
- B. to bring a few leaves
- C. to bring a soil sample
- D. to bring your phone

35. If you do not know what the problem is, it is best to:

- A. leave that part of the prescription form blank
- B. tell the farmer something, even if you are not sure
- C. end the farmer away
- D. ask if anyone else knows what the problem is

36. Look at the steps below for identifying a disease sample.

1. make a parcel for the specimens with newspaper
2. write a label and put the specimen in a plastic bag with a water and seal the bag
3. collect samples showing a full range of symptoms

The correct order to do these steps in is:

- A. 1, 2, 3,
- B. 3, 2, 1
- C. 2, 1, 3
- D. 1, 3, 2

37. Insect samples to be sent away for identification are best preserved in:

- A. beer
- B. methanol
- C. isopropyl alcohol
- D. 70% alcohol

38. A plant doctor suspects a farmer's sample has a bacterial wilt. She can test this by:

- A. smelling it to see if it smells rotten
- B. looking for spots on the leaves
- C. placing the end of the stem under water and looking for milky streams
- D. finding the bacteria under a microscope

39. The most important items to take to a clinic are:

- A. chairs
- B. kava
- C. uniforms
- D. prescription forms

40. After a clinic, a plant health doctor must always:

- A. follow up with a farmer if the farmer has been told that will happen
- B. reflect on and review the clinic data and plan to improve for the next clinic
- C. collect all the samples for looking at later with the other plant health doctors
- D. do all of the above

THE BIG QUIZ continued...

Multiple choice. Pick one answer only...

41. A farmer tells the plant health doctor he thinks his crops have been damaged by an evil spirit. The doctor should help the farmer by:

- A. agreeing this might be the case and offering other ideas of what the farmer could do
- B. sending the farmer to a priest
- C. telling the farmer he cannot be helped at a plant health clinic
- D. asking the farmer to bring in more samples

42. Which Pacific countries are now thought to have the Guam strain of the rhinoceros beetle?

- A. Samoa
- B. Guam, Palau, Hawaii, Vanuatu
- C. Fiji
- D. Guam, Palau, Papua New Guinea, Solomon Islands

43. Good soil is likely to have a pH of around:

- A. 1
- B. 3
- C. 7
- D. 9

44. Which of these home-made pesticides is particularly harmful to fish?

- A. chilli
- B. gliricidia
- C. neem
- D. derris

45. What are the pests in this photo?

- A. rhinoceros beetles on mango
- B. green vegetable bugs on tomato
- C. black ticks on pumpkin
- D. aphids on guava

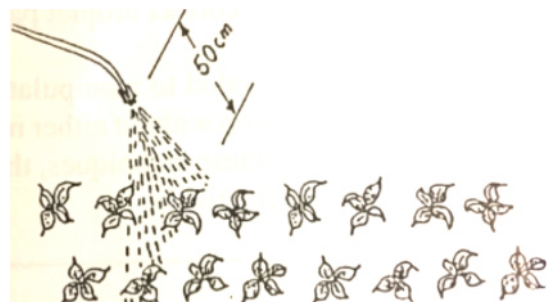


46. What is the difference between a parasite and a parasitoid?

- A. there isn't one: they are the same
- B. a parasite does not kill its hosts; a parasitoid does
- C. a parasitoid can't be seen with the naked eye; parasites can
- D. parasites have complex life cycles whereas those of parasitoids are simple

47. The picture below shows you how:

- A. A. to spray low-growing crops
- B. B. far apart crops should be
- C. C. to use a mist sprayer
- D. D. to water your plants in a drought



THE BIG QUIZ continued...

Multiple choice. Pick one answer only...

48. A farmer brings a plant with large irregular spots on the leaves. It is most likely to be:

- A. a wilt
- B. a deficiency disease
- C. a fungal disease
- D. something I know nothing about

49. You want to teach your trainees to think about how plant diseases relate to people going hungry. The best teaching strategy is probably:

- A. a cause and effects diagram
- B. a picture of a hungry child
- C. a role play
- D. a concept map

50. Which symptoms are often confused?

- A. a powdery mildew and a leaf spot
- B. a virus and a deficiency disease
- C. a bacterial leaf spot and a bacterial wilt
- D. overwatering and copper deficiency.

51. Organic matter in soil is found in:

- A. the bedrock
- B. humus
- C. clay
- D. water

52. Which of these are NOT ways in which nitrogen can be made available to plants:

- A. nitrogen fixing bacteria
- B. using leguminous cover crops
- C. drawing in nitrogen from the atmosphere
- D. applying fertiliser

53. The plant's rhizosphere includes:

- A. roots, root exudates and microbes
- B. rhizomes
- C. flowers and leaves
- D. compost

54. 'One Health' refers to:

- A. the health of people in the Pacific
- B. the idea that the health of all life forms is interconnected
- C. how bacteria affect plant roots
- D. the health of soil

55. Which of these are NOT normally found in the soil microbiome:

- A. archaea
- B. bacteria
- C. worms
- D. fungi

---- End of Quiz ----

Congratulations to the trainer and the trainees in completing the plant health doctor training!

Now – practise, practise, practise!!