# ()) CABI plantwise



## Delivering messages from plant clinics

The influence of communication on farmer's perception and uptake of advice: Malawi

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**KNOWLEDGE FOR LIFE** 

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Farmer Vasco Mkandawire listens intently to Nimon Hunga, plant doctor in Kafukule

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## Summary

A study was carried out in Malawi in September 2016 in order to investigate the following questions: How do plant doctors and their client farmers communicate? How does this communication shape the farmers' response to the advice? The study team visited three plant clinics (Ndaula, Kafukule and Mitundu), listened to consultations at the clinic, conducted exit interviews, reviewed clinic records and visited 12 farmers who had taken queries to these plant clinics to hear about their experiences following the clinic visit. Focus group discussions with farmers on plant health rallies were held at two sites: Ndaula and Msundwe,

The plant doctors have few written materials at their disposal, although they do derive much support from a field guide (Major Pests and Diseases of Important Crops in Malawi). The Plantwise Fact Sheet App was not seen in use. The study team did not observe plant doctors sending samples to the lab, but they actively seek peer counsel from each other, from experts within Malawi, and from CABI staff who are on the WhatsApp group.

Plant doctors often recommend several technologies at once, which is consistent with integrated pest management (IPM), although farmers often take this as a menu of options to choose from. Of the 12 farmers visited, 11 said that they had used all or some of the advice. They appear to choose creatively from the options the plant doctors give them, almost always finding something they can try on their own farms. Only one farmer reported to have rejected all the advice.

Most of the cultural controls that farmers tried are similar to what they already do (e.g. rotating and weeding their crops); the plant doctor's advice may have reinforced an existing behaviour, which is often a valuable contribution to the farming system, but is not adoption *per se*. The farmers avoid some of the more tedious advice, like hand-picking insect pests. Chemical control seems to be farmers' preferred option. In contrast, the plant doctors tend to over-recommend roguing.

Written records are not always complete, which is not surprising given that plant doctors may serve 20 farmers in two or three hours and therefore have limited time to fill the prescription form. It is likely that farmers are given verbal advice which did not enter the written record. Sometimes a farmer may forget a recommendation, or recall advice that was not on the prescription form, making it somewhat difficult to put a numerical value on how much of the technology was adopted.

The study revealed no clear cases where technical advice was rejected only because of failed communication. The communication between farmers and plant doctors is generally clear, especially in speech. E.g. the extension agents speak the local languages fluently. Yet, some plant doctors communicate better than others. Some tell farmers the diagnosis; others seem less inclined to do so. Some tell farmers the dilution rate, while others also write it on the prescription form. Few plant doctors tell the farmers the background reason: why the technology works. The farmers bring good samples of unhealthy plants, which help communication with the plant doctors who ask questions and in general engage in a friendly, business-like, horizontal communication with farmers. The plant doctors have made a useful innovation, writing the recommendations in the local language on the back of the prescription form (which is long and not very farmer-friendly).

Overall, the local communities are satisfied with the plant clinics, as are the individual farmers who see the plant clinic as an unbiased source of advice.

## 1. Introduction

Adoption of agricultural technology is influenced by many factors, among these the type and quality of communication between the extension agents and the farmers and how the messages are understood and perceived. Plant clinics give some of the most individualised technical recommendations of any agricultural extension method. In a plant clinic each farmer receives a message tailored to his or her problem—and gets a written prescription just for her or him. The plant doctors have to know how to diagnose the pests and diseases of their area, recommend an appropriate management strategy, and how to communicate this to a local audience of female and male smallholders.

The quality of communication between plant doctors and farmers is crucial for the delivery of a good plant clinic service. Much of Plantwise's extension training curriculum focuses on communication and human relations to enable effective transmission of sometimes complex messages. Messages about pests and diseases and specific control measures can be complex to some farmers who have minimal education. The format, language and vocabulary used by the extension agents as well as his/her attitude will inevitably affect how messages are transmitted. Therefore, the quality of these exchanges will depend on characteristics of both the extension agent the farmer as well at the message itself, whether written, visual or verbal.

CABI-Plantwise<sup>1</sup> commissioned a study with the purpose to assess how the delivery method and communication between plant doctors and male and female farmers affect the adoption of advice given at the plant clinics. Specifically, the objectives were to:

- describe the nature and quality of communication between plant doctors and plant clinic users of both genders, including questions such as: Are plant doctors using the right words to convey the technical message? Are plant doctors interacting appropriately and respectfully with farmers (e.g. listening enough)? Are plant doctors making good use of written materials such as fact sheets and other visual aids?
- assess how language, quality of communication and type of delivery method (verbal only vs verbal plus written) influence farmers' understanding and perception of the messages given and the adoption of advice.

The study was carried out in three countries in 2016: Malawi, Nepal and Costa Rica. This report presents the findings from Malawi.

## 2. Plantwise in Malawi

Plantwise started in Malawi in 2013 with the establishment of plant clinics in two districts, Mzimba South and Lilongwe, to tackle crop health problems in order to reduce crop losses, increase food security and improve rural livelihoods. The Malawian partners are the Department of Agricultural Extension Services, of the Ministry of Agriculture, Irrigation, and Water Development (MoAIWD), Self Help Africa (SHA) (since 2014), and Concern Universal (since 2016), all of whom are implementing plant clinics. However, there other partners, such as Department Agricultural Research Services, Department of Crop Development (DCD), Pesticide Control Board, Lilongwe University of Agriculture and Natural Resources (LUANAR) who provide technical support to Plantwise Malawi. The director of DCD is the chair of the Plantwise steering committee, and his district staff, crop protection officers are cluster coordinators of Plantwise. The initiative now works in 13 of Malawi's 28 districts: Mzimba North, Mzimba South, Chitipa,

<sup>&</sup>lt;sup>1</sup> Plantwise is a global programme, led by CABI, to increase food security and improve rural livelihoods by reducing crop losses.

Lilongwe East, Lilongwe West, Salima, Ntcheu, Dowa, Dedza, Nkhotakota, Nsanje, Balaka, Mulanje, Thyolo and Zomba. Malawi has about 120 plant clinics.

The plant doctors and other staff are from the Ministry. Self Help Africa (an international NGO working in several African countries on agriculture) has sponsored training of plant doctors, establishing plant clinics (uniforms, tables, chairs, umbrellas), allowances, fuel and other support for conducting plant health rallies and the clinics. Nineteen plant doctor courses have been conducted (modules 1 and 2) for 284 participants (including 88 women), as well as a training session on data management for 22 participants (including 5 women) and a training on development of extension materials (green and yellow lists and factsheets for 15 people (including four women).

## 3. Study design

For this qualitative study, three study areas were chosen in consultation with CABI and with the Ministry staff (Figure 1). Originally the study was to include a district in each of the three regions (North, Central and South), but during the study, Thyolo district (South) was replaced with another site in Lilongwe West for logistical concerns and to visit a clinic which was open during regularly scheduled operating hours.

In each of the three districts visited, the study team observed a plant clinic in operation, during regularly scheduled hours. The clinic visits also included discussions with plant doctors, review of the plant clinic records and exit-interviews with visiting farmers immediately after being advised by the plant doctor.

Focus group discussions (FGDs) were held in two communities which had received plant health rallies. Farmers to visit were chosen opportunistically from the clinic register, to include women, especially those who had attended a plant clinic in 2015 or earlier (so they would be able to describe the results of their visit, e.g. if they had used the recommendation and if their plant health problem was resolved). Table 1 summaries study areas and methods used.

The fieldwork was conducted from September 2<sup>nd</sup> to 10<sup>th</sup> 2016. A review meeting (debriefing) was held with select staff on October 3<sup>rd</sup> 2016.

**Table 1.** Summary of study areas, methods andtargets (F=female; M=male).



Fig. 1. Selected study sites (arrows) in Malawi

Method	Lilongwe West District	Mzimba North District	Total	
FGD	Ndaula, 11 M		2 (8 F, 14 M)	
100	Msundwe, 8 F, 3 M			
Diant alinia abaanvation	Ndaula plant clinic,	Kofukulo plont olinio	2	
Flant clinic observation	Mitundu plant clinic	Kalukule plant clinic	3	
Review of clinic records	21 records	6 records	27	
Exit interviewe	2 (1 F, 1 M)	$9(4 \equiv 4 M)$	24 (11 E 22 M)	
EXILIMENTEWS	24 (6 F, 18 M)	0 (4 F, 4 WI)	34 (TTF, 23 IVI)	
Visit to formore	Phiri La Njuzi, 4 F,	Kofukulo 2 E 1 M	$10(11 \pm 1 M)$	
VISIT IO TAITHETS	Mitundu, 5 F	Kalukule, Z F, T IVI	12 (11 F, 1 IVI)	

## 4. Results

This results section reports on: plant health rallies, plant clinic visits, plant clinic records and visits to farmers. Plant health rallies are described based on focus group discussions with farmers who attended them. Plant clinic visits report observations of plant clinics that were advising farmers on the day the study team visited them. Plant clinic records were reviewed at the clinics and later, from the POMS records. Farmers who had attended the plant clinics earlier were visited to learn what the farmers recalled from the advice received at the clinic and how farmers had used the information.

#### 4.1 Plant health rallies

During a focus group discussion (FGD) in Ndaula, Lilongwe West District, farmers described a plant health rally, held in May of 2016. A local farmers' cooperative and traditional leaders had invited people to attend the rally. Many people came, 2000 by one generous estimate.

At the rally, a person spoke to the gathering on a loudspeaker. Some people were interviewed and given a fact sheet. One farmer present at the FGD recalled receiving a fact sheet. The rally was held in Chichewa, which is the local language in this area.

The topic of the rally was maize streak virus. The speakers at the rally recommended *planting densities* of one seed every 25 cm, instead of three seeds every 75 cm. This planting density recommendation has been shared during other government extension efforts as well, but the rally reinforced it.

The rally stressed *crop rotation*, as the following three quotes from farmers illustrate:

"They said that if we repeat seed for three times, the crops become diseased, so we should practice crop rotation. We were told to replace crops. This year if we have a crop, next year it should be a different one. Different pests and diseases are attracted to different crops. So if we plant a different crop, it will be free of disease."

"If you grow legumes like groundnuts or soya, the next year you should grow a new one. The cereals benefit from the nitrogen from the legumes."

"If we plant a crop this year, it has its pests and diseases. The pests that attack legumes cannot attack maize."

At the rally, farmers were advised to *plant resistant maize varieties* "like the Hybrid 719" (which is available at local agro-input shops). Diseases include *chikanga*, (maize streak virus), and head smut.

Farmers were shown photographs of various maize varieties, including some that resist drought, and some early and some late varieties. There were no displays or demonstrations, but there were some photographs on display.

The rally team used the opportunity to emphasise the importance of attending the clinic. As one farmer explained "They told us, 'in



Plant with symptoms of maize streak virus

the past when a person is sick, they are taken to the hospital'. They said that 'if a plant is sick, it should go to the plant clinic.'" The rally taught that plant health cannot be managed with chemicals alone.

A FGD held in Msundwe, Lilongwe West District, discussed two plant health rallies held by Ministry staff in Msundwe trading centre. Recommendations given to farmers at a rally held in May of 2016 included:

- *Maize streak virus (MSV)*: resistant varieties, uprooting (The maize hybrid 403 used to be resistant to maize streak virus, but then it became susceptible. Unlike farmers in Ndaula, the FDG in Msundwe did not mention Hybrid 719, which is now recommended for MSV).
- White grubs: use of treated, certified maize seed
- Cassava mosaic: crop rotation, clean planting material, uprooting, resistant varieties.

An earlier plant health rally in 2014 addressed the following topics and recommendations:

- Witch weed (Striga): crop rotation, manure
- Groundnut rosette virus: crop rotation, resistant varieties, certified seed, rogueing of affected plants
- *Maize stalk borer*: insecticide, early planting, and local practices such as putting ash in the maize whorl.

Covering several topics at the rallies seems to have diluted the effects of the messages. People had a hard time recalling what they had learned, but they did remember some details. Sometimes it seems that only one person in the group remembered something about a given topic, and discussing it together helped remind the others. People remembered:

*Maize stalk borer*. uproot and burn (which is actually not what was recommended, and probably not effective).

*MSV*: uproot and burn (also not effective). And plant resistant varieties (although at least some varieties that once were resistant no longer are).

Striga: uproot before seed sets, and apply manure (both good recommendations).

The FGD participants also remembered *termites*, although that was not a topic of the rally, so the farmers may have been confusing the rally with other events.

With *groundnuts*, the topic was rosette, but the farmers remember leaf spot and aflatoxin, which they may have learned elsewhere. They do recall uprooting rosette when it is just starting, which is part of the recommended package. They didn't remember what they were taught about *cassava*.

The farmers have adopted a few of the practices. Individuals remember applying manure for Striga, and crop rotation, and adopting resistant maize varieties.

Four people got a fact sheet in Chichewa at the rally, but some gave their fact sheet away. They can't remember much about the content of the fact sheets. (The program in Malawi has written 15 fact sheets, of which two have been translated to Chichewa).



The plant health rally in Ndaula seems

to have been fairly effective, focussed on one problem (maize streak virus) with practical recommendations such as planting densities, crop rotation and resistant varieties. The rallies in Msundwe mentioned several topics at once and farmers found it difficult to remember them all. Uprooting (roguing), probably not the most effective solution, was recommended too frequently.

#### 4.2 Plant clinic visits

All three of the plant clinics are staffed by sympathetic plant doctors who speak the local language. The plant doctors all write prescriptions but have no other written material to give farmers. The plant doctors write the recommendation in the local language on the back of the prescription forms. The book, *Major Pests and Diseases of Important Crops in Malawi*, is an invaluable reference work for the plant doctors.

**Prescription books.** Farmer queries, including recommendations, are written on prescription forms in triplicate. The plant doctors give the second blue copy to the farmer and keep the third, yellow copy for the plant doctor's records. The different districts are using different systems to refer the clinic data to the cluster coordinators. In some clinics, the plant doctors send the top sheets (the original) to the cluster coordinator, for entering the data into Excel. In Kafukule, the plant doctors send the whole prescription book to the cluster coordinator, who enters the data and sends the book back. While the book is at district HQ, the plant doctors switch to another book. This way the plant doctors have the original white sheets, which are easier for them to read when they refer back to earlier queries. However, there is an advantage in ripping out the white pages: the queries are in chronological order, and do not switch back and forth between two or more books.

*Clinic materials.* The plant clinics operate with few materials: a table, some chairs, a magnifying glass which the plant doctors use as an aid in communication, helping farmers to see the problems better (discovery learning). The plant doctors all bring their own cell phone to the clinic.

**Printed materials.** The plant clinics have some reference books. All (or almost all) of the plant doctors have a 15-year-old, worn-out copy of the illustrated book *Major Pests and Diseases of Important Crops in Malawi*, which they consult often. In an instant, they can flip the book open to the right page, to double check a scientific name or a symptom. They also have a guide to pesticides which they use less, but no other visual aids or reference materials, such as photos and posters.

The staff says that sometimes they give away fact sheets (although they did not have any to give during the visits). Plantwise has developed a fact sheet app, which plant doctors can browse by crop. Yet, the study team did not observe any of the plant doctors using it.



Mr. Bito with his sample of tomato (bacterial wilt). Good samples are a sign of good communication

Generally, few fact sheets are distributed in Malawi. According to the Plantwise Online Management System (POMS), of 9,329 queries registered at the clinics in Malawi, only 135 received a fact sheet, and that may be an over-estimate, because some of the new plant doctors were confused and marked that they had given a fact sheet when in fact they had merely given the farmer a prescription form.

*WhatsApp*. Three fourths of the plant doctors are on a Whatsapp group called "Malawi Plant Doctors", where they ask each other questions as a kind of peer counselling. Plant health experts (specialists) are also member of the group.

It is similar to the smaller Whatsapp group that recently emerged in Santa Cruz, Bolivia (Bentley and Franco 2016) and other places. Some farmers have phones and can ring up the plant doctors, but don't very often, because of problems with networks, electrical blackouts and the cost of airtime.

#### The plant clinic at Ndaula



Peer counselling through Whatsapp

Within the Extension Planning Area (EPA) of Ming'ongo, the team visited the plant clinic at the Ndaula "trading centre," as small market towns are called in Malawi. Friday is market day, and the clinic was managed by Efraim Khendulo, EPA coordinator and Nathan Millie and Jeremiah Phiri, plant doctors.

The clinic is advertised by a large banner that reads: "Notice that we have established a plant clinic in Malingude, Ndaula and in Phiri La Njuzi." The plant clinic opened at 9 AM. By 11.38 AM most of the farmers had gone.

#### Plant health consultations

The plant doctors engaged with farmers, e.g. asking them what other crops they grow before recommending crop rotation. The plant doctors seem to get their point across to farmers. They write the recommendation in Chichewa on the back of the form. This is a Malawian innovation in communication.

The farmers who attended the clinic all brought good, fresh samples of the whole plant (sometimes with soil still clinging to the roots) with representative symptoms (at more or less early stages of the disease, when symptoms are more diagnostic, not a completely necrotic plant). Malawian farmers usually do bring samples to the plant clinic. Of the 9,329 queries in the POMS (2013 to 2016), 8,645 were accompanied by a sample.

Mr Bito brought a tomato sample to the clinic. Plant doctor Nathan diagnosed the problem as bacterial wilt. Nathan asked what else Mr Bito grows. He said beans, cabbage, rape and tomato. So Nathan recommended crop rotation, but Mr Bito said that it is difficult because he has a small piece of land. He has been growing tomato for three years on this one small piece. It may be difficult for farmers to grow less tomato if it is more profitable that the other crops they grow in smaller amounts.

Nebo Patrick brought in a head of cabbage with aphids and was advised to rogue it ("uproot infected plant and bury"), avoid planting cabbage in hot weather, plant resistant varieties and apply insecticide (Dimethoate). This is a case where the recommendation could be more helpful: roguing relatively healthy plants is simply wasteful, in the authors' opinion. The insecticide should mention the dilution rate.

The last client also had a cabbage problem. The cabbage had stunted growth, even in the roots. The plant doctor diagnosed the problem as water stress (not enough water), and recommends deep ploughing, explaining that this will allow the roots to go deeper. A second recommendation, apply manure, is intended to make the soil loose. Both of these recommendations seem to be accurately communicated.

The plant doctors seem to have a few favourite recommendations that they make repeatedly, especially roguing, e.g. "uproot and burn or bury far from the crop." Roguing



Nebo Patrick is advised to uproot and destroy her young cabbage plant to manage aphids

may be an appropriate recommendation for a causal agent that lives in the plant and its residues, especially if there are only a few plants affected. But for mobile pests like insects and for a disease that has already attacked the whole crop, roguing is tedious work that offers few benefits to the farmers. The plant doctors make few recommendations for fungicides or insecticides.

#### The plant clinic at Kafukule

The Kafukule trading center (i.e. small market town), is part of Njuyu EPA, near Mzuzu, in the Northern Region. The plant clinic is held every Monday, and is run by Rogers Silindu, who is based in Njuzu, 8 km away, where the EPA is, and Nimon Hunga, of Kafukule section.

The plant doctors speak the local language, which is not Chichewa here, but another Bantu language, Tumbuka. They write the recommendation in Tumbuka on the back of the form. The farmers can read the local languages and are usually able to read the recommendations.

#### **Exit-interviews**

The exit-interviews addressed four main questions:

- 1. Why did you come to the plant clinic, what motivated you?
- 2. What advice were you given?
- 3. Are you satisfied or not with the advice given, why or why not?
- 4. Is there anything you did not understand about the diagnosis and advice?

The key points from the eight exit-interviews are summarised in Table 2.

Farmers responded in different ways to the advice they received. Sofina's case is interesting because, she got a recommendation, applied it badly and it didn't work, but then she applied a wrong recommendation from another farmer, and claims that that it works, even though it shouldn't have. Even so, she was satisfied with the recommendation.



Monika Gondwe shows her sample of pigeon pea to plant doctor Nimon Hunga

In Fyda's case, uprooting is a poor recommendation for an insect. But all eight farmers were all satisfied with their advice. It was clear, easy to understand and delivered by sympathetic plant doctors. The farmers all said that they understood what they heard at the clinic.

Donex Zambo wasn't entirely confident about the recommendation he got to compost his animal manure before applying it because the fresh manure was burning the rape plants. So he tried composted manure on a small area, 5 m x 15 m, so that he could compare with his normal practice. That is a common tactic in farmer experiments, where farmers tend to make sizes smaller for treatments they do not think will "work" (Bentley and Baker 2002). But the composted manure did work, and now he recommends it to his friends and neighbours. Donex also comes to the clinic most weeks even when he doesn't have a sample, just to listen to what the other people are discussing with the plant doctors. In this way he feels that he is learning a lot about pests and diseases.

The farmers generally know how to bring in proper samples, which is a result of communication, knowing how to prepare for the visit to the plant clinic. One farmer, Monica Gondwe, brought a whole pigeon pea plant to the clinic in Kafulule, with four adult blister beetles carefully wrapped in a plastic bag so they would not escape. Another farmer brought a whole tomato plant, complete with fruit. In the past, some plant clinics (e.g. in Bolivia) have struggled to get farmers into the habit of bringing samples (Bentley et al. 2009), but in Malawi the farmers have learned the importance of it.

**Table 2:** Results of exit interviews carried out at Kafukule plant clinic.

Reason for coming	Advice received	Satisfied?	Understanding
<b>Albert Gondwe</b> . Because of problems in his farming, and was told he could get help at the clinic	Plant resistant varieties for Fusarium wilt in pigeon peas	He feels satisfied because he was able to see the use of magnifying glass and he was able to see the problems better	He understood everything
<i>Levison Mhango</i> . He had a problem with maize which had black spots and powder in the cob. Maize smut, <i>Ustilago</i>	Crop rotation, certified seed, uproot and burn infected plants	He was very satisfied, he used all the advice and is still using it. The problem was common, but is gone	He understood all aspects of diagnosis and advice. He even shared the advice with relatives and other farmers
<i>Monica Gondwe</i> . Insects were eating her pigeon peas	Plant with early rains, spray cypermethrin, and intercrop with maize	She is satisfied with the advice because she agrees that she planted late. This is advice she can use next time	She understood very well
<i>Tobias Mtegha</i> . Came because his tomato had early blight	Advised to use Dithane M45 and rotate	Satisfied so far but will see if the advice works	He understood well
<b>Sofina Tembo</b> . She previously brought tomato which had red insects inside the fruit resulting in black colouration outside and some parts inside (see photo above)	Apply cypermethrin. Also advised to apply soap and tobacco mixture. The plant doctor told her to dilute; she thought it would work better if it was not diluted, but it burned the plant.	By the time of the interview, she had not been attended to by the plant doctor today	N.A.
<i>Mylet Mhone</i> . Rotting of the maize tassle	Spray Tephrosia	Yes	She understood well.
<i>Donex Zgambo</i> . Vegetable rape withering after germination	Apply compost manure	Was not sure at first so he did his own experiment	The diagnosis was clear, only he wanted to prove what he was told
<i>Fyda Gondwe</i> . Rotting of rape vegetables and small <i>vibungu</i> : caterpillars, borers	Uproot and burn the infected vegetables, Spray with cypermethrin	Yes	She understood well.

Source:exit-interviews conducted by Noah Phiri and by Yakosa C. Tegha

The plant doctors do listen to the farmers, but as Mwiza said, the farmers also expect a lot of the plant doctors. The farmers expect to drop their sample on the table, give no explanation, and get a diagnosis. It is important for the plant doctors to tell the farmers that an explanation of the crop history is also important information for making the diagnosis.

The Malawi plant doctors may be doing a better job at communication than at diagnosis and recommendations. It's not clear if the farmers are getting enough background information to understand why a recommendation will work. There is much emphasis on roguing, and the dilution rates are not always explained. Yet, farmers are happy with the experience. The plant doctors are undoubtedly telling farmers many useful things which are not written down. Farmers are reasonably satisfied with the attention at the plant clinics, because of the verbal advice, even if some of the details may not be included in the written records (e.g. prescription forms, POMS).

Previous studies have shown that farmers are often satisfied with the results of the plant clinics, even if the information given is not always accurate. For example, the 2013 SDC external evaluation of Plantwise noted that farmers were highly satisfied with the plant clinics, while calling for greater accuracy in diagnoses (Scheidegger and Graf 2013). In Uganda, farmers are generally satisfied



Some farmers respond creatively to new ideas from the plant clinic, as Donex Zambo (rt) tells Yakosa Tegha

with their experience at the plant clinics (Mur et al. 2015) although a study of plant clinics in Uganda found that only 44% of plant doctors' diagnoses could be completely or partially validated by researchers (Danielsen et al 2013). It may be that partially accurate advice still gives the farmers something to work with, or that the sympathetic communication between plant doctors and clients at least offers some comfort or background information to the farmers, or helps them discard to mistaken ideas.

As a sign of appreciation, community members invested their own time and local materials to make a shelter to house the clinic.



The Kafukule community built this shelter for the plant clinic

#### The plant clinic in Mitundu

This clinic has operated since 2013. Violet (AEDC Violet Lekadala is the plant doctor. She is an agriculture extension development coordinator (AEDC) and gets some help from Sikanadze Chiotha (the other AEDC). At first the clinic was in the market, but it was noisy, and some men drinking local beer would say silly things like "look, they are giving away free pesticides" so in 2015 the plant doctors moved the clinic to their office. Fifteen to 20 people come every week. They all bring a sample.

The extension agents have a monthly review meeting, where sometimes as many as 200 farmers attend. At these meetings the extension agents advise the farmers to come to the plant clinics. Advertising is an important part of communication, and in Malawi they are getting the word out to farmers, so that the clinics are well attended.

#### Prescriptions

The clinic's prescription forms are neatly filled out, with the English and the Chichewa versions of the recommendation both on the front side, instead of writing the local language version on the back. This plant clinic also writes down the dilution rate (how much pesticide to apply) on the prescriptions.

The lexicon of Chichewa is capable of meeting the demands of discussing plant health. Violet tells some farmers that their vegetables have aphids, using the English word, but she also uses Chichewa words that people understand, such as *tizirombo*, which means "bug, or worm"<sup>2</sup>.

As communication devices, the prescription forms have some room for improvement. The farmer gets the carbon copy, which is less legible than the originals. The farmers can read Chichewa, but little English. The diagnosis is written in English, only. The farmers generally understand the recommendation, but most say that they were not told a diagnosis, and (unlike the recommendation) it is not written in Chichewa. The written Chichewa version of the recommendation, on the back of the form, is clear and easy to read.

#### Plant health consultations

FER MAR 2012 APRIL 20124/41 MAY 2017 215/17/30 UNE 2017 6/6 Extension agents plan many meetings with

Extension agents plan many meetings with farmers, and use them to promote plant clinics

The farmers sit on benches, in a cue, waiting their turn. They are purposely kept at some distance so they don't disturb the plant doctor while she talks to the client. Privacy no doubt has its advantages, but the audience does not get to listen in and learn from the conversations.

<sup>&</sup>lt;sup>2</sup> It is normal for a language to have a word that means "bug or worm," so much so that Cecil Brown (1979) coined a word for it, "wug"



The farmers seem to know where to find their extension agent. While the study team is visiting the plant doctors, a local farmer named Joseph Kabembe brings in bean plants that are turning yellow. He has come from 7 km away, and like other farmers we have seen, he has brought a good sample—two whole plants, with roots and even a bit of soil. Mr. Kabembe says that he didn't know about the plant clinic. He was just coming to bring his samples to the extension agent, when they told him that there was a plant doctor. Some farmers seem to realize on their own that they should bring samples.

Mr. Kabembe talks to Violet for some time, in Chichewa. She learns that one part of the field is fine and one part has problems. This is the second year he has seen the problem.

When asked if there was any anything he did not understand, Mr. Kabembe "I understood everything!" He laughs, as if to say: of course we understand each other. At the end, Violet and Mr. Kabembe exchange phone numbers, so they can stay in touch. He left, pleased with his recommendation.

Three farmers from three different areas each brought in a sample of papaya, with odd bumps on the skin. Violet wasn't sure



Violet (rt) spends a long time listening, and explaining her recommendation to the farmer, Joseph Kabembe

what it was, so Yakosa took a picture with her phone and posted it on the Malawi Plant Doctors' Whatsapp group. A reply soon came from Australia, where Eric Harman, the former Plantwise data manager, is getting his M.Sc. Eric suggested that the problem is boron deficiency, which the farmers can solve by applying manure. One of the farmers had already tried that, but he says he will apply it again.

With manure it might be a good idea to tell people how much to apply and where (e.g. at the base of the trunk or in a ring 50 cm away). Of course, Violet can explain more information verbally than she can do in writing, especially because she has to write it twice, once in English and once in Chichewa. She does a neat, quick job of it.

It often only takes the plant clinic a few minutes to help each farmer, which is important if they are going to help everyone in the queue. The farmers said that the plant doctor is respectful and they understand everything she says. Several clients expressed gratitude for the service, saying that now they knew what to do. A lot of the clients were first timers. Repeat visits are some objective measure of client satisfaction.

#### **Exit-interviews**

The farmer feedback collected through exit-interviews is summarised in Table 3. The plant doctor was able to diagnose a wide range of plant health problems, and prescribe advice (chemical and cultural controls). When recommending chemicals, she tended to use farmer-friendly dilution rates (e.g. one bottle top of product in enough water for a sprayer). Overall, the farmers seemed satisfied with the advice, and they found this soft-spoken, knowledgeable plant doctor easy to understand.

Reason for coming	Advice received	Satisfied?	Understanding
<i>Elesiton Ndima.</i> Guava leaf spot Maize streak virus and stemborer Banana bunchy top	Guava problem is from insects in the weeds. Clear weeds from around tree and apply manure Uproot diseased maize and apply ash and sand to tip of maize Uproot and burn banana plants	He seems satisfied, especially because he had not noticed the stemborer before he brought his sample to the clinic. The plant doctor was able to diagnose all his problems. The plant doctor was polite and "even jovial." However, he did want chemical solutions	He "understood everything"
<i>Roland Ryson.</i> Tomato bacterial wilt	Crop rotation, uproot plant, apply manure. Stop applying tobacco remains to crop	He is satisfied because "That is what is happening in my garden." However he adds "I wish there was a chemical solution."	He says that the information from the plant doctor was clear
Samuel Kamwana. Tomato worms	Do not plant tomato so close to maize, because the worms come from maize. In the flowering stage spray cypermethrin, 12 ml in 20 l water	Yes. He says "I am very happy I came because I will improve my farming skills."	He understood everything.
<i>Elena Maliseni.</i> Small insects on vegetable rape	Apply insecticide, demethoate	Yes	She understood
Ingram Chimphote. Diseased crops	Lack of soil nutrients, apply manure	Yes	He understood
<i>Jessica Michael.</i> Chinese mustard with stunted growth (insects suck leaves)	Manure and insecticide	Yes, she thinks the recommendation will be helpful	She understood "everything the plant doctor said."
<b>Sikanadze Kamadeya.</b> Pawpaw with bumps	Plant doctor identified nutrient deficiency, recommended manure	Partially satisfied, he says he already applied manure, but will continue doing so	He understood
<i>Lunjikani Dache.</i> Same pawpaw (papaya problem as above)	Same as above	Partially satisfied. He says "I was told to apply manure. It may be that what is deficient will be made available."	He understood
Yohane Panambe. Same as above	Manure and irrigation	Satisfied. He says "I was told to continue with the manure	He says "Everything was easy to understand."

Table 3: Results of exit interviews carried out at Mitundu plant clinic.

Reason for coming	Advice received	Satisfied?	Understanding
		and to apply more water, not for the current fruit, but for the ones that are coming."	
<b>Regina Mandalazi.</b> Maize stunting	Uproot and bury. Change the variety, and plant Panner seeds.	Yes	She says she understood the plant doctor well.
<i>Phatso Saraze.</i> Aphids on vegetables	Dimethoate: 8 ml in 10 l water.	Yes, she plans to buy the chemical and borrow a sprayer	She understood everything
<i>Govati Sampson</i> . Mites in vegetable	Continue applying cypermethrin, but 12 ml in 20 I water, instead of 5 ml.	Yes	Yes, but he didn't remember the dilution rate, until he read his prescription form
<b>Natiele Mugawe.</b> Mustard leaf with white patches	Apply manure (probably for nutrient deficiency)	Yes	He understood
<i>Leonard Ndiche.</i> Insects on roots of mustard plant	Put maize husks around the plant so the insects will be busy with them and not get on the crop	Yes	He understood
<i>Nalis Doctor.</i> Vegetable rape, and the leaves are shrinking	Apply 1 bottle top of Dimethoate in 10 I water and do a lot of watering	Yes, she was happy with the advice	She understood
<i>Alafas Kalanji.</i> Insect on vegetable	Apply manure	He says his is satisfied with the advice	He understood
Yohane Bisimone. Wilting potato	Rotate crops and uproot	Yes. He said "I am happy, because I have been told that there is no chemical."	He understood
Anod Kaziputa. Tomato, red spider mite	One bottle top of product per 10 I water	Yes. He said "Everything is OK there."	He understood
<b>Nkhani Maston.</b> Pawpaw with nutrient deficiency	Apply manure	Yes	He understood
<i>Kacheka Paul</i> . Bean beetle larvae on roots	Apply the leaves of a tree	Yes	Yes, but he forgot most of the information until he re- read his prescription
<i>Charles Nelson.</i> Beans drying up	Uproot plants that have dried up and plant as soon as the soil is wet enough	Yes	He understood
<i>Chrissie Chingagwe.</i> Bean anthracnose	Uproot the plants and throw them away.	Yes, she says she is going to uproot, because it is just a few plants	She understood

#### 4.3 Plant clinic records

The study team reviewed 21 prescription forms from recent weeks during the visits to the Ndaula clinic. These are summarised in Table 4 with comments from the plant doctors. One recommendation on

Ascochyta blight of beans (#8) may have been mis-written. It was probably explained clearly to the farmer, verbally, during the clinic; the writing may not always reflect exactly what was said.

Case #3 records caterpillars, although while discussing it with the plant doctors, it became clear that the pest was really aphid. It is a good sample, if insect pests are still present on the plants. The plant doctors agree, "We get good samples. We sensitized the farmers through the plant clinic rally to bring in good samples. We compare it to a human clinic. You don't go to the hospital without your sick daughter; you take her with you."

The plant doctors frequently recommend roguing (Table 4), which may not always be appropriate. They prefer recommending other cultural practices like crop rotation, but do recommend chemicals some times. The plant doctors are well-versed in local names for symptoms and pests, which helps communicate with farmers. The plant doctors seem to find writing tedious, and they occasionally make mistakes while filling out the prescription form. The plant doctors can easily expand verbally on the cases, so not all that is said is written down. The farmers are bringing good samples, which aids in communicating and in making accurate diagnoses.

#	Crop	Diagnosis	Recommendations	Verbal comments from plant doctors
1	Mustard	Diamond back moth	Crop rotation. Rogue. Cypermethrine at 25 g per 15 I water sprayer	We recommend roguing to encourage cultural methods, to practice crop hygiene
2	Cabbage	Black rot bacteria	Uproot, grow seedlings in sterilized mulch. Grow resistant varieties like Hercules	Farmers burn the seedbed before planting. They plough, and take maize stover, place it a meter high and burn it. Tobacco farmers use this one
3	Beans	Aphids	Neem spray. Intercrop maize with beans	The description said "caterpillars" but that was a mistake. The traditional practice of intercropping was one row of maize and one of beans
4	Maize	Maize stem borer	Uproot all infected plants. Rotate, plant with the first rains	
5	Maize	White grubs	Hand pick and kill. Apply manure, rotate with legumes	Rotation is a major topic. Plant doctors teach crop association, which is encouraged as part of conservation agriculture
6	Maize	Leaf roller	The chemical Sumithon, and resistant varieties, certified	The symptom looks like a cigarette, which is called <i>nduglu</i> in Chichewa. So they call the pest <i>nduglu</i> . They use maize husks here to roll cigarettes
7	Tomato	Tomato fruit worm (Agrotis)	Hand pick the caterpillars. Stake tomatoes so they don't touch the ground	Some farmers don't stake tomatoes, especially when planting local varieties
8	Beans	Ascochyta blight	Rogue. Interplant with "non-host plants such as Napilira"	Napilira is actually a variety of bean, so this is a mis-written recommendation. (It should have said: non-host plants such as cereals)

Table 4: Selected queries documented in the prescription forms at Ndaula plant clinic

#	Crop	Diagnosis	Recommendations	Verbal comments from plant doctors
9	Potato	Root knot nematodes	Roguing and long fallow. Crop rotation. Resistant varieties such as Holland	Meloidogyne nematode. The prescription mentions galls on the tuber surface, also shown in the book
10	Maize	Maize leaf roller	Same as earlier case	
11	Maize	Maize stalk borer	Rogue, observe closed season for <i>dimba</i> maize. Intercrop with legumes like soya. Plant recommended varieties like SD 403 (Sidico) and DK 8033 (Dekalb)	<i>Dimba</i> is a garden in the <i>dambo</i> (lowland). Farmers plant maize there in the dry season for grain, because they haven't harvested enough
12	Tomato	Bacterial wilt	Rogue, crop rotation, certified seed	
13	Maize	Maize stalk borer	Rogue, rotate with legumes. Plant with the first rains	If you plant early, the pests haven't multiplied yet
14	Bean	Bean aphids	Neem. Plant resistant varieties like Napilira, nanyati	
15	Rape	Diamond back moth	Rogue, rotate	
16	Maize	Stem borer	Rogue, rotate crops. Plant with the first rains	
17	Mustard for vegetable	Diamond back moth	Rogue, burn crop residues, crop rotation	They saw the insect on the leaf of the sample (good samples)
18		Witch weed	Uproot, intercrop with legumes, apply decomposed manure. Avoid using manure from grazing animals that have been in an area with witch weed	
19	Maize	Maize streak virus	Remove, bury. Rotate crops. Plant early. Resistant varieties	Local name <i>chikanga chachimanga.</i> Chikanga is streak. <i>Chimanga</i> is maize
20	Bean	Bean stem maggot	Uproot, manure, rebuild ridges	
21	Bean	Angular spot	Certified seed, rogue, manure. Apply the fungicide Doconil	It is a fungus, <i>Phaeoisariopsis</i> <i>griseola,</i> according to Coyne & Hoeschle-Zeledón (1995)

#### Review of records from the Kafukule plant clinic.

The plant doctors do know how to communicate key concepts. For example, when they recommend crop rotation, they use the local words, *kasinthasintha* (changing changing), which is used all over the country. Knowing the local words helps to communicate with farmers.

There was that a general observation from the records and from direct observation that dilution rates were not always well explained (Table 5). Dr Phiri observes that when recommending a chemical, plant doctors should mention the dilution rate. The plant doctors should also tell farmers how to measure 10 g, using devices that are common in the villages. For example, the plant doctors should find out how much a bottle cap holds or how much a matchbox holds, e.g. about 12 g and use that to help recommend amounts.

Most of the written recommendations are short, basically just a couple of words, more like a title than a synopsis. Written recommendations usually omit details about how much of a product or a substance to apply.

In general, the written recommendations were lacking in detail. The plant doctors may not always write down everything they tell the farmers. But the plant doctors should place more emphasis on writing down the dilution rates and including more details on how to control the problem. Even if the verbal explanation is more complete, farmers can use the written prescription to refresh their memory. Also some abbreviations may hamper communication, e.g. all farmers may not know that "I" means "litre."

A review of POMS data suggest that roguing is frequently recommended, often for insect pests which will not respond to this strategy (Table 6). Roguing is often one of several suggestions made by plant doctors, and is seldom the only recommendation, suggesting that plant doctors recommend roguing to round out other types of



Farmers can read the local languages. A grain buyer's sign in Chichewa advises farmers that he is looking for maize and beans

recommendations, e.g. to be able to include a cultural control.

#	Crop	Diagnosis	Recommendations	Observation
1	Tomato	Blossom end rot	Calcium fertilizer	The recommendation should say how much fertilizer to apply
2	Papaya	Boron deficiency	Apply manure or boron	The recommendation does not say how much of these to apply
3	Citrus	Green mould	Fungicide solution of Benomyl or thiobenzoate	The recommendation does not say how much of these to apply
4	Tobacco	Black shank	Plant resistant varieties and control nematodes in the soil	The recommendation should name the resistant varieties and explain how to control the nematodes
5	Citrus	Sooty mould	Follow the spacing and planting" Apply demethoate at 15 ml per tree undiluted with a brush	The recommendation should say what spacing (the proper distance). The second recommendation is more complete
6	Mustard	Bagrada bug	Apply cypermethrin, at "1 m per I of water"	The writer probably meant "one ml" not "one m".

**Table 5:** Selected queries documented in the prescription forms at Kafukule plant clinic

#### Table 6: Frequency of roguing in POMS data, from two clinics

Kafukule	Ndaula

	Kafukule	Ndaula
Frequency roguing is mentioned	8 of 24 queries	15 of 21 queries
Recommended for arthropods (roguing not effective)	6 times = Tuta (1), maize stalk borer (1), rape aphids (1), red spider mite in tomato (3)	8 times = bean stem maggot (1), diamond black moth in mustard/rape (3), maize stalk borer (4)
Recommended for diseases (roguing possibly effective)	2 times = tomato early blight (1), tobacco black rot (1)	6 times = angular spot (1), Ascochyta blight (1), cabbage black rot (1), maize streak virus (1) potato root knot nematode (1) tomato bacterial wilt (1)
Recommended for a weed. The advice probably referred to the weed, not the crop. Uprooting striga is sound advice		1 time = Striga
Roguing is the sole recommendation	1	
Roguing is 1 of 2 recommendations	5	8
Roguing is 1 of 3 recommendations	11	10
Roguing is 1 of 4 recommendations	3	3
Roguing is 1 of 5 recommendations	2	

#### 4.4 Visit to farmers

The visits to farmers in their homes (Table 7), gardens and fields showed that in 11 of 12 cases (all except for #8), farmers used at least some of the advice on farm. This can be seen as quite a high rate of acceptance (92%). However, in at least 50% of the cases (#1, 5, 6, 7, 10, 12) farmers adopted some of the recommendations and not others. This study revealed no cases where farmers rejected or botched a recommendation because of poor communication.

**Table 7:** Farmers visited. Queries taken to clinic, diagnoses, recommendations, and farmers' responses

Farmer, place	Crop, diagnosis, date of query	Recommendation	Farmer's response	Analysis
1. Female Shuga, Phiri La Njuzi, Lilongwe West District	Groundnut, Rosette virus 24 March 2016	Rogue, crop rotation, plant improved variety closer together,	She plans to rotate her crop, & sow the plants closer together. Will plant farm-saved seed	Will use 2 of the recommendations, including rotation, and a new planting density
2. Female Kanyama, Phiri La Njuzi, Lilongwe W.	Tomato <sup>a</sup> , Red spider mite 20 May 2015	Botanical insecticide ( <i>Tephrosia</i> ) with onions & laundry detergent	Used botanical pesticide for 2 seasons. Observed large yield increase	High acceptance of pesticides, including botanical ones
3. Female Shati, Phiri La Njuzi, Lilongwe W.	Mustard <sup> a</sup> , Red spider mite April 2014	Botanical insecticide, <i>Tephrosia</i> & soap in water	Applied as recommended & was pleased with high yields	High acceptance of botanical insecticides

Farmer, place	Crop, diagnosis, date of query	Recommendation	Farmer's response	Analysis
4. Female Shati, Phiri La Njuzi, Lilongwe W.	Tomato ª, Bacterial wilt April 2014	Rogue (possibly also advised to rotate crops)	Rogued infested plants, & planted potatoes. Applied <i>Tephrosia</i> & rotated the crop with maize	Farmer's action goes beyond Rx, possibly based on info from other sources. <i>Tephrosia</i> does nothing for wilt
5. Female Kafukule, Mzimba North District	Tomato, Fruit worm 9 Sep 2015	Hand pick caterpillars, spray cypermethrin (told to apply a bottle cap in 10 liters water)	She applied the cypermethrin, but in 15 liters of water. Controlled the pest	The farmer ignored the tedious Rx to hand pick insects. Applied a lower dose than recommended
6. Female Kafukule, Mzimba North District	Tomato, Spider mite & white fly 28 Dec 2015	Keep field weed- free. Remove old leaves. Apply insecticide. Intercrop with garlic or onion	The garden is weed- free. Applied cypermethrin several times: controlled mites but not whitefly	Farmer & her husband only recall the chemical control. They bought another chemical at the shop to control whitefly
7. Male Kafukule, Mzimba North District	Tomato, Fruit worm 9 Sep 2015	Spray cypermethrin. Handpick caterpillars & destroy	Applied cypermethrin. Solved the pest problem, repeated application in 2016	Farmer is satisfied with insecticide, avoids hand-picking
8. Female Matiasi, Mitundu, Lilongwe West	Beans, stem maggot 30 Aug 2014	Dimethoate. Apply 3 to 7 days after crop emergence	Did not apply	Did not apply Rx, in 2014 because it was too late & in 2015 because the crop died suddenly
9. Female Chithonje Mitundu, Lilongwe West	Tomato, Bacterial wilt 30 Aug 2014	Crop rotation (prob. roguing too)	She reluctantly uprooted diseased plants. The rest stayed healthy	She still asked for chemical control
10. Female Mitumba, Mitundu, Lilongwe West	Beans, Aphids 30 Aug 2014	Cypermethrin	Did not buy the chemical in 2014, & lost the crop. She did use the chemical in 2015	Lacked money to buy the Rx in 2014, but it worked well in 2015 & she used it again in 2016
11. Female Bowa, Mitundu, Lilongwe West	Maize, Striga 6 Feb 2016	Crop rotation, more manure	The household did apply the Rx, & buried the crop residue as well	Adopted the Rx even though they remembered it poorly
12. Female Zondawako, Mitundu, Lilongwe West	Maize, Termites 6 Feb 2016	Confidor at the start of flowering. Verbally advised to bury crop residues	She buried the maize stalks & was pleased with her large harvest	A rare case where the farmer followed cultural controls <sup>b</sup> rather than chemical

<sup>a</sup> Diagnosis and recommendation based on farmer's memory. Could not be found in register

b "Cultural controls" are changes in cropping practices, e.g. weeding or planting styles

#### Farm visit 1. Happy groundnuts

Ms. Alefa Kajawo, Shuga village. Prescription received from the plant clinic:

Date clinic visit: 24 March 2016 Crop: groundnuts, chalimbana variety First noticed the problem: in 2009, wilted, little leaves Diagnosis: groundnut rosette virus Recommendations: rogue, crop rotation, plant CG-7 (Chitezi) improved variety at 10 cm and local variety at 15 cm

At Alefa's home she explained that she went to the clinic with a problem of groundnut rosette to receive advice from the plant doctor. The plant doctors told Alefa that rosette virus is encouraged if the crop is planted with too much space between plants, so they advised her to plant groundnut closer together. (The virus is vectored by aphids which prefer isolated plants—Moses et al. 2016). Farmers call rosette virus *kafumbata* (like being folded in your hands).

Alefa hadn't yet applied the recommendation, which was for the following season's crop, which she has not planted yet. (It is near the end of the dry season when the study team visits her, and she will plant after the rains start). She plans on using the recommendation and expects to harvest more this year.

She will rotate crops, and plans on moving the groundnut to her other field. She rents in several fields, and rotates groundnuts with maize. Alefa says that crop rotation helps her to reduce the disease. If she plants in the same field, the second time, the crop "doesn't look happy," she explains. So crop rotation is helping her to harvest more. (In Malawi, as in many countries, crop rotation is a traditional practice, a "good agricultural practice," and is frequently recommended at the plant clinic). She is also going to plant seed that she saved from her last harvest.

At the plant clinic, Alefa got a prescription sheet, but not a fact sheet. She went home and read it and kept it. "I can read Chichewa very well."

**Discussion**. Alefa is planning on applying part of the recommendation, including spacing (which suggests that she did understand the recommendation from the clinic) and crop rotation (which Alefa noticed on her own, her crops are "not happy" when planted for the second time in the same field). But she is not planning on adopting the certified seed. She didn't mention roguing. She read the back of the prescription form, in Chichewa, after getting home. So the farmers are getting benefit from these recommendations written in the local language.



Alefa's plans on using some of the advice from the clinic when the rains come, and she can plant her groundnuts

#### Farm visit 2. Was that wilt or mite?

Ms. Mary Harold, Kanyama village. Prescription received from the plant clinic:

Date clinic visit: 4 Jun 2015 Crop: Tomato Symptoms: Sudden plant wilting without leaf yellowing and stem centre becomes water soaked and later turns brown Diagnosis: Bacterial wilt Recommendation: Rotate with beans or other crops for three or four years, uproot (rogue)

Mary explains that she went to the plant clinic because she was growing tomato, and she saw some unhealthy plants. She was happy with the advice from the clinic. The plant doctors observed white patches on the leaves. They told Mary that her tomato had red spider mite. The plant doctors told Mary to mix powdered laundry detergent with a bitter plant, *Tephrosia vogeli*. She crushed *Tephrosia* and onions and sprayed the mix on the tomato. *Tephrosia vogeli* is a source of rotenone, a known fish

poison, with insecticidal properties (Gaskins 1972).

That is not the recommendation that is in the clinic register, so the study team wonders if Mary has confused the recommendation, or if she went to the clinic more than once. The team asks Mary when she went to the clinic.

"20 May 2015." That is a precise date, and just before the visit about bacterial wilt, but Mary is certain that she went that day "I remember because it was an interesting day. Very interesting." She had a sick child that day, and the date was memorable because she took a tomato to the plant clinic on the same day that she took her baby to the hospital.



Mary Harold is satisfied with her recommendation for tomatoes

After visiting the plant clinic, Mary went back home and sprayed. The red mite was reduced, so she harvested something. On the next crop she started using this botanical insecticide earlier.

In 2015, Mary harvested 25 big baskets of tomatoes over four weeks. Each basket sold 30,000 Kwacha, in total 750,000 Kwacha, or about \$1,000, which is a lot of money in rural Malawi. During the previous season, before she solved her problem, she only harvested 10 baskets. So Mary estimates that she got 15 extra baskets by following the advice (an additional 450,000 Kwacha, or about \$600).

Mary got a fact sheet (on groundnut rosette virus) and a prescription form at the plant clinic. But in the ensuing drama at the hospital, she lost the form and the fact sheet.

*Discussion*. Mary did rotate her crops, just like the plant doctors recommended. Her tomato garden has now been planted in off-season potatoes, hand-watered in her *dimba* (garden in a wetland). Mary says she is going to sell seed potato to other farmers who plant potato with the summer rains in December. There is great demand for seed potato in Malawi and many of the producers are women (Mudege and Demo 2016). Rotating a popular crop like tomatoes may be more appealing when farmers have a profitable alternative, like seed potatoes.

#### Farm visit 3. Faulty household communication

Mr. Joseph Mainala, Chibudu village. Prescription received from the plant clinic:

Date clinic visit: 7 Jan 2016

*Crop*: Sweet potato *Notes*: First noticed in 2014; the leaves are bored, stunted growth *Diagnosis*: caterpillars *Recommendations*: Rogue, use clean planting material, intercrop with onion

Joseph wasn't home, but we met his wife, Judith. Joseph had told Judith that he went to the clinic with a diseased sweet potato plant and received advice. He didn't say what they told him to do. The potato grew heavy (i.e. he was pleased with the good yield). Joseph told Judith about the prescription sheet, but she never saw it.

Discussion. Visitors to the plant clinic do not always communicate with household members.

#### Farm visit 4. The house that tomatoes built

Ms. Singoni Feke, Shati village. Prescription received from the plant clinic:

Date clinic visit: 9 Oct 2014 Crop: Beans Description: The leaves were attacked by ants and seen on the leaves Diagnosis: Ants Recommendation: apply ash on leaves, and cypermethrin 50 g per 10 litres. Uproot and burn. Apply manure

Singoni did not mention beans, but said instead that she took mustard and tomato to the clinic. She went "to learn how they can grow healthy." The tomato was attacked by bacterial wilt and the mustard leaf by red spider mites.

She received advice to spray the plant with Tephrosia and soap in water. The plant doctor told her to crush or grind the Tephrosia and apply the water onto the mustard leaves. The tomato recommendation was to uproot and bury.

Singoni sprayed the mustard with water and Tephrosia, and she saw a change and was able to harvest some mustard and sell some. Singoni thinks that she would not have harvested any mustard without the clinic's recommendation. She got three baskets of mustard and sold each one for 700 kwacha, so that recommendation was worth 2100 kwacha to her (about \$2.80).

For tomato, Singoni uprooted the infected plants and planted Irish potato. She came to the clinic in April 2014. (This is not the date mentioned on the prescription form, so she must have visited the plant clinic more than once). After roguing, the remaining tomatoes did better. Singoni harvested tomatoes for four weeks, gathering 1, 2, 6, and a few tomatoes, which sold for 300 kwacha each (a total of about \$4). She planted maize in that field in 2015. She still grows tomatoes. Singoni boasts that she has used the money from gardening to build a house, which she proudly shows to the study team.

She got a prescription form but no fact sheet at the clinic. After she got home she went through the written recommendations on the back. She was able to read it because it was written in Chichewa.

Singoni also applies Tephrosia on her tomatoes (which may not be effective, unless she also has an arthropod pest, because bacterial wilt is not vectored by insects). Singoni is however rotating tomatoes and maize, plus the field is isolated, so she has a tomato garden free of bacterial wilt.



Agriculture can improve the lives of women and their children. Singoni built a house with the income from her crops

Singoni says she learned crop rotation from the plant clinic. That's not what the records say, but maybe she learned it listening to someone else's conversation at the clinic, or she may have visited the clinic on multiple occasions. Maybe Alexandre, the extension agent and plant doctor, explained it to her on another occasion. However, whatever the source of the recommendations, Singoni seems pleased with the results. Singoni did claim to get some relief by roguing her tomatoes.

**Discussion.** The farmers like to use some technologies, such as crop rotation (because it aligns with traditional practice) and spraying something, which meets farmers' demands for a technology (Bentley and Baker 2002:42). In their interaction, the plant doctors are respectful and gracious with the farmers. Keeping records can be difficult for them. The farmers discuss advice and visits that are not found in the records. The farmers' descriptions of these visits with the plant doctors do seem like true accounts, and the plant doctor does not bother to contradict them.

#### Farm visit 5: Sophina comes often to the clinic

Ms. Sophina Tembo, Kafukule. Prescription received from the plant clinic:

Date clinic visit: 29 Mar 2016 Crop: Tomato Diagnosis: Blossom end rot Recommendation: Apply calcium fertilizer CAN (calcium ammonia nitrate) at flowering stage. Avoid water stress (i.e. irrigate more often)

Sophina is one of the farmers interviewed at the clinic in Kafukule (see Table 2). Sophina said that she has taken tomato, maize and paprika to the clinic. With tomato, she was concerned that there was something black on the bottom of the fruit, even though it was not touching the ground. When the fruit was cut open there was a live worm inside.

She says that she was told that her crop had the problem because she was not rotating, and the cabbage problem also attacked the tomato. (That may be an error, because cabbage and tomato are not in the same biological family. It is possible that she had Plutella in cabbage and Tuta in tomato, and was confusing the pests). Sophina says she was told to apply cypermethrin or Sevin (a brand name of

carbaryl); both of these products are insecticides. She has gone to the clinic seven times; one of her prescription forms advises applying cypermethrin, but the form does not mention a dilution rate.

The plant doctors told Sophina to apply a bottle cap full of cypermethrin in a 10 litre sprayer of water. This means that in the verbal recommendations, the plant doctors are explaining the amounts of products in terms that the farmers easily understand. It also means that plant doctors explain information verbally that is not always included on the written form.

Sophina gets a prescription for each time she comes to the clinic, but she has not received a fact sheet.

Sophina modified the recommendation a bit. She applied a bottle top full of Sevin in

DIAGNOSIS (Start a new sheet for each new problem)	
Practices used	
ECOMMENDATIONS FOR MANAGEMENT	
- Handpick and destroy - Spris Cypt heller	© © mecadate [ Jacadase ] Hernedoon [ Herricone
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15 litres of water, twice. Sophina is happy with the advice. She says that before visiting the clinic she was harvesting 10,000 Kwacha (about \$14) worth of tomatoes, but she got 50,000 Kwacha worth after visiting the clinic. The recommendation was a bargain because the Sevin only cost 1300 kwacha (\$1.80).

**Discussion**. Sophina is a serious farmer. She is trying to farm as a business, and she is selling the vegetables she grows. The day the team met Sophina, she was coming back from selling a basin full of vegetable rape. She has to walk about 7 km to reach the clinic. But she also uses the same trip to do some shopping. A person would not come to the clinic that many times unless she was satisfied with the advice and the way it was communicated. The results from this visit suggest that the plant doctors in Kafukule do give farmers the rates of dilution verbally, if not in writing (see Table 5).

#### Farm visit 6: You can't just sit at home

Ms. Veronica Wande, Kafukule. Prescription received from the plant clinic:

Date clinic visit: 28 Dec 2015 Crop: Tomato Diagnosis: Calcium deficiency Recommendation: Apply CAN (calcium ammonium nitrate) at recommended rate. Avoid using urea. Apply manure before planting.

Although the team met with Veronica to discuss calcium deficiency, she wanted to talk about arthropod pests. She has been to the clinic several times, and some recommendations were more memorable to her than others.

Veronica farms vegetables in the *dimba*, with her husband Kennedy Jere. The tomato plants are fresh, green, and nicely mulched with straw. They systematically plant a small seedbed every week so that they will always have tomatoes to sell.

Veronica took a sample to the clinic because the tomatoes were infested by white flies, and the flowers were drying up. The plant doctors diagnosed calcium deficiency, whitefly and red spider mite (so they got three prescription forms). The plant doctors explained how to apply the pesticides.

Veronica says that the plant doctors did tell her how much of the chemical to apply, and that when she got home she told her husband, and he did the actual work. So in some households, people do communicate. Veronica and Kennedy work well together, collaborating full-time on the farm, delegating tasks to each other.



mulched, with scheduled planting

Veronica and Kennedy bought three 250 ml bottles of cypermethrin. They sprayed the tomatoes every week until the three bottles were all gone. Kennedy says that the cypermethrin helped a bit with the red spider mite, but not with the whitefly.

Kennedy went to check with the plant doctor, after finding out that the cypermethrin didn't work, but he didn't find him so he went to see an agro-dealer. This year they are controlling whitefly with Asataf (acephate, a broad spectrum insecticide).

Even though the recommendations did not always work, the couple did not lose confidence entirely in the plant clinic. They went back with maize samples and other problems. "We went back because you can't just stay at home," they say.

They keep old pesticide containers, and when we asked for more information on the chemicals, they went back into the house and returned with a wrapper for Asataf (and one for mancozeb). They couldn't find all of their prescription forms.

They apply insecticide every week on their tomatoes. This is a bit unsettling, especially since they use a product recommended by the agrodealer.

Discussion. The couple practices some of the recommendations,



such as weeding and crop rotation, although they were probably doing this before visiting the clinic. They were given dilution rates verbally at the clinic, though not in writing. They did not lose confidence in the plant doctors, even after one recommended pesticide did not work for them. When the plant clinic is not available, the farmers seek advice from agrochemical dealers.

#### Farm visit 7: A prescription with everything to do

Mr. Longs Nkhata, Kafukule. Prescription received from the plant clinic:

Visit to clinic: 9 Sep 2015

*Crop*: Tomato *Diagnosis*: Tomato fruit worm *Recommendation*: spray cypermethrin. Handpick the caterpillars and destroy

Longs Nkhata is a busy man. When the team first saw him, he was climbing down into his well with heavy cans of water to drench the vegetables in his large *dimba*. After 20 years in South Africa, he is determined to make a living from farming.

Longs says he took tomato, maize and vegetable rape to the plant clinic, just one time. The plant doctors said to buy something, but he doesn't remember the name. Nevertheless, he sprayed the product three times during two weeks, and "then my plants did nicely." Longs remembers buying one litre of product. He put one bottle top in 10 litres of water. It killed the bug, and the tomato was harvested, so he was pleased with the results.



Insects turn the inside of the fruit black

Longs did not get a fact sheet at the clinic, but "There was a prescription with everything to do, everything. I kept it.

Do this, do that, buy this. I sat down to read it and learned from it." He didn't notice the back of the form, written in Tumbuka; he only read the front in English.

Longs rotates all his crops, explaining that "Nothing is planted where it was planted before. He also grows sugar cane, cabbage, onions, vegetable rape, lettuce, and Chinese cabbage. Having many crops makes rotation easier. He is also carrying out an experiment; he sprays one part of his tomato crop and does not spray the other part of his tomato. There was clearly more red spider mite in the unsprayed portion.

Longs has not gone to the clinic in 2016. He got the same problem again with fruit worms, but this year he knew how to solve it, even though he complains that the chemicals are far away, and expensive. He has to go all the way to Mzuzu to buy the chemicals.

The interaction between the plant doctors and the farmers on these visits is respectful. Sophina cuts sugarcane to give to her visitors; the last two farmers give groundnuts to the study team. Giving gifts is a sign that people want to reciprocate, a sign that they feel that they have received a worthwhile service (Williams 1995). The plant doctors are polite with the farmers, never raising their voices. The plant doctors call the farmers *adada* (father) or *mama* (mother). The plant doctors no doubt communicate more via spoken language than in writing.

**Discussion**. Longs received a recommendation for chemical control for tomato fruit worm, which worked to his satisfaction. He continues to use the advice in following seasons. He clearly understands the value of crop rotation, and practices it consistently. He would no doubt use alternatives to chemicals if they were available; his experiment with red spider mite on tomato shows that he would rather avoid insecticides.

#### Farm visit 8: A leading woman

Ms. Matiasi, headwoman of Matiasi village. Prescription received from the plant clinic:

Visit to clinic: 30 Aug 2014

Crop: Beans

*Diagnosis*: Beans wilting and drying. It had bean stem maggot. *Recommendation*: Dimethoate at 75 ml per 100 l water or 7.5 g in 10 l water. Apply 3 to 7 days after crop emergence.

Matiasi remembers that her beans were drying out, so she took some to the plant clinic. She was advised to spray (she can't remember the

name of the product) when the beans germinate.

She kept the prescription form, but didn't buy the recommended product, because the crop had already sprouted. She planted beans the following year, but it was dry and the crop dried up quickly.

Matiasi says that she understood the recommendation well, but this year she is planning on planting a new garden, and will go ask the plant doctor for more advice. She added that the plant doctors were very good. This is an expression of satisfaction,



Matiasi (centre) understood the recommendation, but didn't apply it, as she explains to Yakosa (rt) and a neighbour

even though the person did not adopt the recommendation.

**Discussion**. Matiasi realized that it was too late in the season to adopt the recommendation, but she seems to have been pleased to have somewhere to take her plant problems.

#### Farm visit 9: The best advice is not always satisfying

Ms. Nasilina Bilion, Village of Chithonje. Prescription received from the plant clinic:

Visit to clinic: 30 Aug 2014 Crop: Tomato Diagnosis: Tomato wilting rapidly with yellowing. Bacterial wilt Recommendation: Crop rotation. Planting different crops from planting of tomato for 2 years. (Violet explains that when she gives a recommendation like this to the farmer, verbally, in Chichewa, the plant doctor gives the farmer specific examples of solanaceous crops to avoid in the next rotation). Nasilina went to the plant clinic with tomato, because it was drying up. At first, Nasilina seems not to remember what they told her at the clinic. She says "They told me something, but I have forgotten. The plant doctor explained the chemicals I should buy, but they are too expensive." Nasilina is probably misremembering. The plant doctors did not actually recommend a pesticide, but as she speaks, she begins to recall the visit more clearly.

Nasilina goes on to explain "I uprooted the infected areas. So the infestation would not go to other plants. I uprooted from here to that brick (she points to a brick a few meters away), several plants, but those that remained were able to bear fruit."

In her garden of one quarter acre, Nasilina harvested several times, picking a total of 20 baskets.

Nasilina is happy for the advice. She says "If I hadn't uprooted I would have harvested nothing, because the disease was spreading. A basket is worth 1000 Kwacha. It was cheap then because there were a lot of tomatoes." In other words, she harvested 20,000 Kwacha (about \$27) worth of tomatoes after applying the recommendation. She says if she had not adopted the recommendation, she would have harvested nothing. The written prescription did not mention uprooting, but there is little doubt that that was the main verbal recommendation. Nasilina remembers it vividly,



Nasilina wants chemical control of bacterial wilt in tomato

and the plant doctors, who are present at the interview, do not contradict her.

At the end of the interview, Nasilina asked her visitors what product could be applied to manage bacterial wilt. Dr Phiri explained that there is no remedy for bacterial wilt, once the plants are ill. He added that uprooting and rotation with non solanaceous plants would help in managing the diseases. When he said that, Nasilina sadly recalled that Violet (the plant doctor) had told her the same thing.

**Discussion**. It is profoundly unsatisfying for farmers to be told that a plant disease has no cure, but that is sometimes the truth. It requires some effort to be convincing about bacterial wilt. Nasilina did apply the recommendation, roguing, so the advice from the clinic was useful, even if the farmer was not totally satisfied. The written prescription forms, even from the best plant doctors, do not always include all of the main recommendations given verbally to the farmer

#### Farm visit 10: Experimenting with a recommendation

Ms. Lidia Mkano, Village of Mitumba. Prescription received from the plant clinic:

Visit to clinic: 30 Aug 2014 Crop: Beans Diagnosis: Bean aphids, black and green on the underside of the leaves. Recommendation: cypermethrin at 2.5 to 5 ml per 20 l of water. Apply full cover spray and observe a seven day harvest interval. Lidia said that she went to the plant clinic because the bean crop was drying up, when it was just flowering. When she uprooted the bean plant, she found that it was rotten. Lidia remembers being advised to buy two types of chemicals at the shop, but she has forgotten the names. (Actually, she was only told about one chemical). Lidia says "I was told if I applied that chemical I would have to apply it after it germinated and before it sprouted."

She took her prescription from the clinic and showed it to an agro-dealer. She was going to buy the chemical, but she didn't have enough money. Her beans dried up, and she didn't harvest anything.

The following year Lidia planted beans again, and this time she did apply the chemical. She says "I applied it and harvested something. So this year I planted it again."

But this year Lidia thought there were insects in the soil. So she devised an experiment of her own. She

decided to burn dried vegetation on the soil, in part of the field. She explains that "After I burned, I tilled the ash into the soil, and applied the chemical (twice) and the beans did well. Where I only sprayed, it did not do well. It only did well where I burned and sprayed."

These beans were planted in a *dimba*, a moist, lowland garden, which lets farmers grow a crop in the dry season. The beans are just getting ripe, and while Lidia is going to get a harvest, she complains that the beans still have aphids.

*Discussion*. In this case, even though the farmer could not act on the advice immediately, she was able to use it in later years, and even combine it with a creative experiment of her own.



The beans are greener where Lidia experimented with applying burned dry vegetation

#### Farm visit 11: A plant clinic?

Ms. Mtsano Chalindo, village of Bowa, Prescription received from the plant clinic:

Visit to clinic: 6 Feb 2016 Crop: Local maize Diagnosis: stunted and wilting, with witch weed (Striga) Recommendation: Crop rotation, more manure.

The plant doctors held a mobile clinic here, but the elderly Mrs. Chalindo didn't remember it. There was a field day and the plant doctor moved around and found witch weed in her garden. (Mrs. Chalindo's daughter does remember the visit).

The household received a prescription, but discarded it. They did however incorporate the crop residues and add manure to the field, as suggested. Later that day, the study team visited the household's field,

and saw that they did bury the maize stalks between the rows. This is an appropriate practice for Striga, but it was not mentioned on the form. This advice may have been mentioned verbally, or on another occasion.

**Discussion**. A house call from the plant doctor may not be as memorable as a visit to the plant clinic. A farmer who takes the initiative to visit a plant clinic is expressing demand more clearly that once who receives a surprise visit from plant doctors at her home.

#### Farm visit 12: Defeating termites: an extra ton of maize

Ms. Alinet Mavato, village of Zondawako. Prescription received from the plant clinic:

Visit to clinic: 6 Feb 2016 Crop: Local maize Diagnosis: The stalk was eaten by termites Recommendation. Confidor at 20 g per 15 I water at the start of flowering

Alinet was also visited by a mobile clinic. She doesn't remember the date, but does recall that the plant doctors talked about termites. The plant doctor said that instead of heaping soil around the maize, the farmers should bring the soil down from the top of the ridge to the furrow to bury the crop residues, so the termites will not go up to the top of the ridge, to the maize. The termites would only eat the dry weeds instead. She says that the plant doctors gave her this recommendation verbally, even though it is not mentioned in the written prescription

"They gave me a paper (prescription), and I don't remember where I placed it, but I did what they told me to do. My maize was rescued by that, rescued from the termites, and I harvested a lot, two ox carts full." Alinet thinks that she would have only harvested one ox-cartful, if she had not controlled the termites. One ox-cart holds about a ton of maize ears, at 7 bags per ox cart, worth 12,000 Kwacha (\$16) for the ton.

**Discussion**. Alinet's written recommendation mentions an insecticide to control the termites, but she remembers a cultural control method not on the written prescription, i.e. burying the stubble in the bottom of the furrow. A visit to the farmers' field is a good way to reconfirm that the recommended practice has been understood and carried out.

#### 4.5 Summary of farmers' response to plant clinic advice

There is a clear logic to how farmers respond to recommendations (Table 8). Most of the cultural controls that farmers tried are similar to what they already do (e.g. rotating and weeding their crops); the plant doctor's advice may have reinforced an existing behaviour, which is often a valuable contribution to the farming system, but is not adoption. The farmers avoid some of the more tedious advice, like handpicking insect pests. Even though farmers do not like to rogue, two of them did uproot some of their tomato crop, to manage bacterial wilt. However, both farmers would have preferred a chemical control for this disease. One of them was also applying a botanical remedy (which was probably a placebo at best) while the other pointedly asked the study team to recommend a chemical fungicide that she could use instead of roguing.



Alinet (left) with neighbour Rose Bowa, in a field where she managed termites

The farmers clearly like chemical control, even (or especially) inputs they can make at home from plants, soap and other easily accessible ingredients. When farmers did avoid chemicals, they did so for clear agronomic reasons, e.g. because the crop had already been lost. The farmer from case 10 (Table 7) did not buy the insecticide because she did not have the money. After losing her crop, she did buy insecticide for her beans the following year. By the third year, she hypothesised that she might harvest more beans if she burned all the insects to death before planting. She burned the crop stubble on half of her field and not on the other half, but applied insecticide to all of the beans. (She observed fewer aphid pests in the burned part).

Farmer response	Cultural and biological controls and pheromone traps	Chemical controls
Used the advice	Crop rotation (cases 1, 4, 11)	Biological insecticide (cases 2, 3, 4)
	Roguing (cases 4, 9)	Insecticide (cases 5, 6, 7)
	Control weeds (case 6)	
	Apply more manure (case 11)	
	Bury maize stalks (12)	
Rejected the advice	Roguing (case 1)	Insecticide (cases 8, 10, 12)
	Seed of improved variety (case 1)	
	Handpick caterpillar (5, 7)	
	Remove old leaves (case 6)	
	Intercrop with garlic or onion (case 6)	

Table 8: Farmers' technical responses by type of technology, Malawi a

<sup>a</sup> The case numbers refer to Table 7

A second analysis (Table 9) compares the adoption of recommendations by type of plant health problem (e.g. disease or arthropod pest—including insects and mites). Total rejection of all recommendations is rare. Most farmers try some of the ideas, whether they are to manage a disease or a pest.

Farmer response	Disease (fungi, virus, bacteria)	Arthropod (insects, mites …)	Weed
Used all or most of advice (5 times)	Cases 4, 9	Cases 2, 3	Case 11
Used some of advice (6 times)	Case 1	Cases 5, 6, 7, 10, 12	
Used none of advice (1 time)		Case 8	

Table 9: Farmer's technical responses by type of problem, farm visits, Malawi a

<sup>a</sup> The case numbers refer to Table 7

## 5. Conclusions and recommendations

*Language and attitude*. The plant doctors are perfectly fluent in the local languages. The plant doctors are understandable. Their talk and writing are jargon free. They are respectful with clients, and are good listeners

*Creating awareness* (promotion) is largely done by word of mouth, from extension agents to farmers at meetings and possibly from farmer-to-farmer. They also use banners. Many farmers come to clinic.

**Samples**. Farmers bring good samples. All of the farmers' queries were accompanied by proper samples, even farmers who were only coming for the first time. This suggests that the plant doctors are doing a good job communicating the importance of bringing samples to the clinic, or that farmers intuitively know that they should bring samples.

**Community support**. Local people appreciate their interaction so much that they support them, e.g. by caring for their furniture between clinic days in Ndaula, or building them a shade in Kafukule.



**Prescription forms**. For several years, the plant doctors have written their recommendations on the front of the form in English and in the local language, for the farmer, on the back of the second page. This is an innovation on how to communicate via written material. The plant doctors in Malawi have done this since the first clinics that they established. The plant doctors should continue with this practice and seek ways to encourage farmers to read their recommendation again. Many of the farmers are literate in the local languages, and a few read English.

While the plant doctors' verbal recommendations are naturally longer and more complete that the written ones, a paper is a useful aide de memoire which reminds the farmer what to use, how much,

when and how. The prescription form (in the recommendation section) includes the names of unfamiliar products, which helps farmers to remember them, and to buy them at the shop. The forms are neatly filled out, with clear handwriting. Yet, many of the farmers do not go back and use the prescription forms again.

The prescription forms could be more farmer friendly. Some farmers may be having a hard time finding the recommendation on the form.

**Diagnosis**. Some farmers were not aware of the diagnosis (i.e. the plant doctor's identification of the problem). The plant doctors always give a recommendation, but do not always give a diagnosis (although they make a diagnosis, written in English on the prescription). Plant doctors need to make sure they always tell the farmers the diagnosis, not just the recommendation. The plant doctor could write the diagnosis in Chichewa and instead of writing the recommendation twice, could write it once, on the front of the form. The cluster coordinator could then translate it to English while typing it into the electronic register.

**Recommendation and dilution rate**. Some of the clinics do give a more complete recommendation with dosage. Others fail to indicate the dilution rate with the written recommendation. Be careful with abbreviations of amounts of products and water.

*Fact sheets*. Few farmers receive fact sheets. The Malawi program did make fact sheets in Chichewa. Fact sheets could be printed and arranged into a binder and given to plant doctors as reference guides. The plant

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Most forms are neat, with good handwriting

doctor get a lot of good out of the reference material that they do have, especially the illustrated book *Major Pests and Diseases of Important Crops in Malawi*, which they consult often.

**Books** can be a powerful form of communication from author to reader. Plantwise reprinted the book by Coyne and Hoeschle-Zeledón (1995), and the plant doctors bring these to the clinic, thumbing through the book until the covers fall off. Some plant doctors spend their own money to have the book rebound, and keep using it. The plant doctors also have a *Handbook on Chemical Products* by the Business Innovation Facility and the *Plantwise Diagnostic Field Guide*, which are consulted less frequently. Reprint, or rebind individual copies of *Major Pests and Diseases of Important Crops in Malawi*.

Whatsapp. The plant doctors actively share information with each other.

*Customers satisfied*. People don't have to get a 100% useful recommendation to be satisfied. A farmer can get some good out of a partially useful diagnosis and recommendation, even out of one or two ideas.

Getting the message right. Extension agents in some countries have fashionable recommendations, e.g. in Nicaragua at one time extension agents were recommending clean weeding for many plant health problems. In Malawi roguing appears to be a fashionable recommendation at the moment. Just the word "uproot" is mentioned 2993 times in the electronic register (POMS). Over-recommending a cultural practice may not be a communication problem in the strict sense, but if the message is not right, then communicating it can be counter-productive. In Malawi, plant doctors over-recommend roguing.

*The plant health rallies* probably try to cover too many themes at once, and do not use enough



Plant doctors consult the pest and disease handbook so often they are wearing it out

different media to get the point across. In the future there may be better results if the plant health rally focusses on just one or at the most two themes. These can be repeated as people come and go, or they can be reinforced in several different ways (e.g. besides talks and photographs, plant health rallies could include, posters, demonstrations, songs, fact sheets, videos).

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## Annex A. Study tools

#### 1. Farm visits

#### Selecting farmers

Ask the plant doctors to see the clinic register. Select farmers from the register. You may have criteria, e.g. you may be interested in a certain place, or people who have brought in certain crops. It is best not to ask the plant doctors to select the farmers to visit, as the plant doctors may select people who are not representative. They may choose farmers who live nearby, or who are friendly and articulate, or people who come to the clinic often.

Choosing people from the register is one way to ensure that you speak with female farmers, and that you get a range of plant health problems (not only tomato, for instance). You can also select farmers who visited a year or two previously, who have had time to use the recommendation in their farming.

Of the farmers from the log that you are going to visit, note the diagnosis and recommendations that each one was given. Compare this to the answers that farmers give in the field.

Pragmatics often limits how many farmers you can visit and where. For example, in this study there was not enough time to visit more than 10 farmers. The regions were chosen in consultation with local staff, with three or four farmers to interview in each region. In future studies, with more time, researchers can make more of an effort to interview a more or less random sample of farmers from all areas where clinics operate.

#### Meeting the farmers

Explain to the farmers who you are, your names, and that you work with the plant clinics and that you want to visit some of the farmers who attended the clinic.

#### Main questions asked on farm visits

These questions in this semi-structured interview are intended to build a narrative as to what happened: the farmer had a plant health problem, sought help from the clinic, received advice and then responded to this advice (e.g. used it in some way). The researchers can ask other questions as well, to clarify answers, to bring farmers back to the point, or to delve deeper into interesting areas. Try to get an idea of what the farmers learned at the clinic, how much they remember, and how this perception influenced the decision the farmer took to protect her crop.

- 1. What problem did you have?
- 2. What was the advice?
- 3. What did you do?
- 4. What were the results, what happened to your crop after you tried the advice?
- 5. Did you receive written material from the clinic? If so, what did you do with it?

#### 2. Focus group discussions for plant health rallies

#### Getting ready

When organizing the focus group discussion (FGD), explain to the local people who are helping you that you want to meet with some people who attended the clinic. Explain who you would like to attend e.g. people who were present at the rally; if people were not at the rally they will have little to contribute to the discussion. Ask your contact to invite women and youth as well as senior men, and explain how many people you would like to attend. You may want about a dozen people. Thirty people may be too many.

Set a time to start, and be on time. The venue should have benches or someplace to sit. If the rally was some months or years ago, local people may need help remembering which event you are talking about. A local facilitator may help to jog their memory, by reminding them when and where the plant health rally was. Warn the facilitator not to summarize the content of the rally, as you want the farmers to discuss that.

#### Questions to ask about plant health rallies at FGD

A focus group discussion (FGD) is a meeting where the researcher talks to a small group (a dozen people or so) who are from the same community or share a certain interest. It is like a semi-structured interview, but with several people. The different people give each other moral support and as a group they are able to add information to each other's answers and reach some sort of a consensus (Marshall and Rossman 1999).

In the case of the plant health rallies, start by asking how many people here attended the rally? (Just to confirm that some may not have attended, so you can direct your questions to the ones who did go to the rally).

What did you learn at the rally? (What do you remember?)

Which people in the group got a fact sheet?

What did the fact sheet say (or what did they do with the fact sheet)? (Remind them that the small papers they received at the rally were the fact sheet).

Did you do something new after going to the plant health rally? (Make sure that they understand that the question is about what they did with what they learned. Be open to farmer experiments and not just adoption. Try to distinguish what people did as a result of the rally from what they did in response to other interventions. Local people may start to confuse information from a different source, such as their extension agent, with information from the rally.)

How did the new practice work out?

What do you remember from the fact sheet you got at the rally? What did you do with it? (e.g. keep it, re-read it, throw it away).

#### Facilitating the FGD

Ask several people to speak in turn, or one or two people (usually senior men) will do most of the talking. Try to encourage the timid ones to speak up.

Never interrupt the farmers while they are answering.

You can ask several people in turn to respond to a question.

Be cautious about attributing behavioural change to a rally, especially if there has not been enough time to make the change. For example if a farmer says she adopted a 3 year crop rotation after attending last year's plant health rally, she may be expressing an intention, or be reinterpreting a behaviour she has always practiced.

If people mention a new practice, ask them how long they have been doing that (to see if they started using the innovation after the rally or before).

Be patient. You may need translation. That easily doubles the time you need, and makes it harder to ask clarifying questions. At the same time, rural people are busy and an hour is probably long enough for the meeting. It may be appropriate to give them a small reward for attending, e.g. a fact sheet or showing them a video they are interested in watching.



Rewarding the focus group by showing them a short farmer learning video in Chichewa

#### 3. Using a monitoring visit to study communication at a plant clinic

You can sit next to the plant doctor and play the role of assistant, offering advice when asked, but mainly observing. This method works best if you understand the language spoken at the clinic, and you can listen to the conversations. If you don't speak the language, you may still get some results from this method if you have a confident plant doctor who is able to give you an aside explanation from time to time, or if it a slow day, and the plant doctor can explain the cases to you between visits.

But if it is a busy day with many clients waiting and you need interpretation from a third person, and you have a timid plant doctor, you may give him the jitters and disturb the work you have come to visit.

As an alternative, you can hold exit interviews with farmers, just as they are leaving the clinic. Chat with the farmers and ask:

- 1. Why did you come to the clinic, what motivated you to come to the clinic?
- 2. What was the diagnosis you were given?
- 3. What advice were you given?
- 4. Are you satisfied or not with the advice given, why or why not?

You may ask other questions, depending on your topic, or to clarify an answer. E.g. you may ask "Was there anything you did not understand? Why or why not?

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