Delivering messages from plant clinics:

The influence of communication on farmer's perception and uptake of advice: Summary of results from Malawi, Nepal and Costa Rica

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Ms Pun, a Nepalese farmer, has received a "cupon" at the plant clinic with her name, the crop and the date. This pre-registration is a way of saving the plant doctor's time.

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Summary

In late 2016, a study was carried out in Malawi, Nepal and Costa Rica 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 attended three plant clinics in Malawi and four in Nepal. In Costa Rica three extension agencies were visited and an extension event (a talk) was attended. A total of 36 farmers (clients of plant clinics) were visited in their homes (12 in Malawi, 14 in Nepal and 10 in Costa Rica) and plant clinic records were reviewed.

Overall, the plant doctors are good listeners, respectful and attentive with their clients. They communicate reasonably well with farmers who are able to understand the language spoken at the clinic. Written communication could be improved, e.g. always including a diagnosis of the problem, and the dilution rate of pesticides. Fact sheets are seldom used at any of the clinics, even though they are written for farmers. Plant doctors make good use of the reference materials (e.g. illustrated guides to pests and diseases) and they are increasingly organising themselves for peer consulting, via social media, such as Facebook and WhatsApp.

Communication *per se* was rarely the reason farmers failed to adopt technologies. Farmers who failed to use recommendations often had logical, material reasons for doing so, e.g. it was too late in the season to apply the recommendation. Farmers often adopted even complex ideas like bait and kill pheromone traps. In a few cases farmers did not apply a recommendation because they did not understand all of the background information (why the recommendation will solve the problem).

When farmers are presented with a menu of technologies, they often opt for the chemical control. Farmers need little encouragement or background information to try pesticides. Even organic farmers like organic pesticides. Some farmers in Malawi and Nepal did not understand the dilution rate and applied the wrong dosage of the chemical. Chemical control seems to be farmers' preferred option.

Adoption of advice is often partial, especially when farmers receive several recommendations for a single problem. Seventeen of the farmers (47%) said they had used all or most of the advice, while 13 (36%) followed some of it and only 4 (11%) rejected all of the recommendations. Two farmers received wrong advice (6%). This means that the vast majority of the farmers (83%) found something of value at the clinic, advice they could use on their farm. Farmers may treat the ideas like a menu, adopting some and not others. Some also adapt the advice to their conditions and innovate, based on their own ideas and sometimes also based on reading or on information from third parties. In Costa Rica, almost all farmers declared that they had adopted all the recommendations. Overall,

The results suggest that 'adoption of advice' from plant clinics cannot always be measured with a simple scale: adopted – partially adopted – rejected. In cases where farmers are already using some of the recommended practices before visiting the clinic, such as crop rotation, counting the use of that practice as 'adoption of advice' could be misleading, unless the advice leads to improved crop rotation practices (e.g. more suitable alternative crops). The fact that plant doctors mostly give farmers multiple recommendations enhances the odds that some of the advice will be followed, yet such a menu of options may also obscure the most important practice since plant doctors rarely distinguish between optional and vital parts of the advice, at least not in writing. Thus, 'partial adoption' is likely to translate into a wide array of results in farmers' field, ranging from minor to major effects. Future studies should ask more nuanced questions about technology adoption, and consider establishing more categories of farmer response.

1. Study background

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[1] 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 conducted in three countries: Malawi, Costa Rica and Nepal, representing three of the regions (Africa, Latin America and South Asia) where Plantwise supports plant clinics.

The Malawi plant clinics started in 2013 and there are now about 120 plant clinics in 13 of Malawi's 28 districts. The Costa Rican plant clinics started in 2014, in two regions, Central West and Central East. The plant clinics began operating in Nepal in 2008 with World Vision and Secard (Society for Environmental Conservation and Agricultural Research and Development Nepal). The Plant Protection Directorate joined the effort in 2011 and now operates plant clinics in 45 of the 75 districts of Nepal. The plant doctors in Malawi, Costa Rica and Nepal, trained by Plantwise, are extension workers from the Ministry of Agriculture. In Nepal, FFS graduates are now being trained and are starting to work as plant doctors as well.

This report summarises the key findings from all three countries. The full country details are available in individual country reports.

[1] Plantwise is a global programme, led by CABI, to increase food security and improve rural livelihoods by reducing crop losses.

2. Study design

A qualitative study was carried out in Nepal, Malawi and Costa Rica from September to November 2016. In each country, the study team visited three sites (four in Nepal) (Table 1, Figure 1). The visits included observation of a plant clinic in operation (Malawi and Nepal) to observe the interaction between plant doctors and farmers. The clinic visits also included semi-structured interviews with plant doctors, review of the plant clinic records and two focus group discussions (FGDs) in Malawi.

A total of 36 farmers (26 women and 10 men), all former plant clinic visitors, were interviewed at their farms to assess how the recommendations given at the plant clinics had been perceived and used after the clinic visit and if their plant health problem had been resolved. In Nepal and Malawi these farmers were selected from the clinic register (records taken from the prescription forms), while in Costa Rica the plant doctors chose the farmers from among the regular farmers they visited. The study sample is summarized in Table 1.

The team observed if plant doctors spoke respectfully to farmers, and if plant doctors asked about farm management (e.g. “What have you applied to this crop?”) in order to make an accurate diagnosis. We observed if plant doctors gave a diagnosis and a recommendation and if the plant doctors explained why the recommendation would work.

The clinic visits were also an opportunity to review some of the plant clinic records and to ask plant doctors how they had explained these ideas during the consultation with farmers, e.g. how scientific terms or abbreviations had been explained verbally at the clinic. The team also asked about the use of fact sheets and other written communication.

Table 1. Summary of study sample in the three countries

	Malawi	**Costa Rica**	**Nepal**
Study sites, (community, district)	1. Ndaula, Lilongwe West 2. Kafukule, Mzimba North 3. Mitundu, Lilongwe West	1. Naranjo, Alajuela 2. San Ramón, Alajuela 3. Tucurrique, Cartago	1. Arye Bhanjyang, Palpa 2. Gokarna, Kathmandu 3. Hemja, Kaski 4. Bhalwari, Rupandehi,
Plant clinic visits	3	1 extension event held by plant doctors	4
Visits to farmers	12 (11 women, 1 man)	10 (5 women, 5 men)	14 (10 women, 4 men)

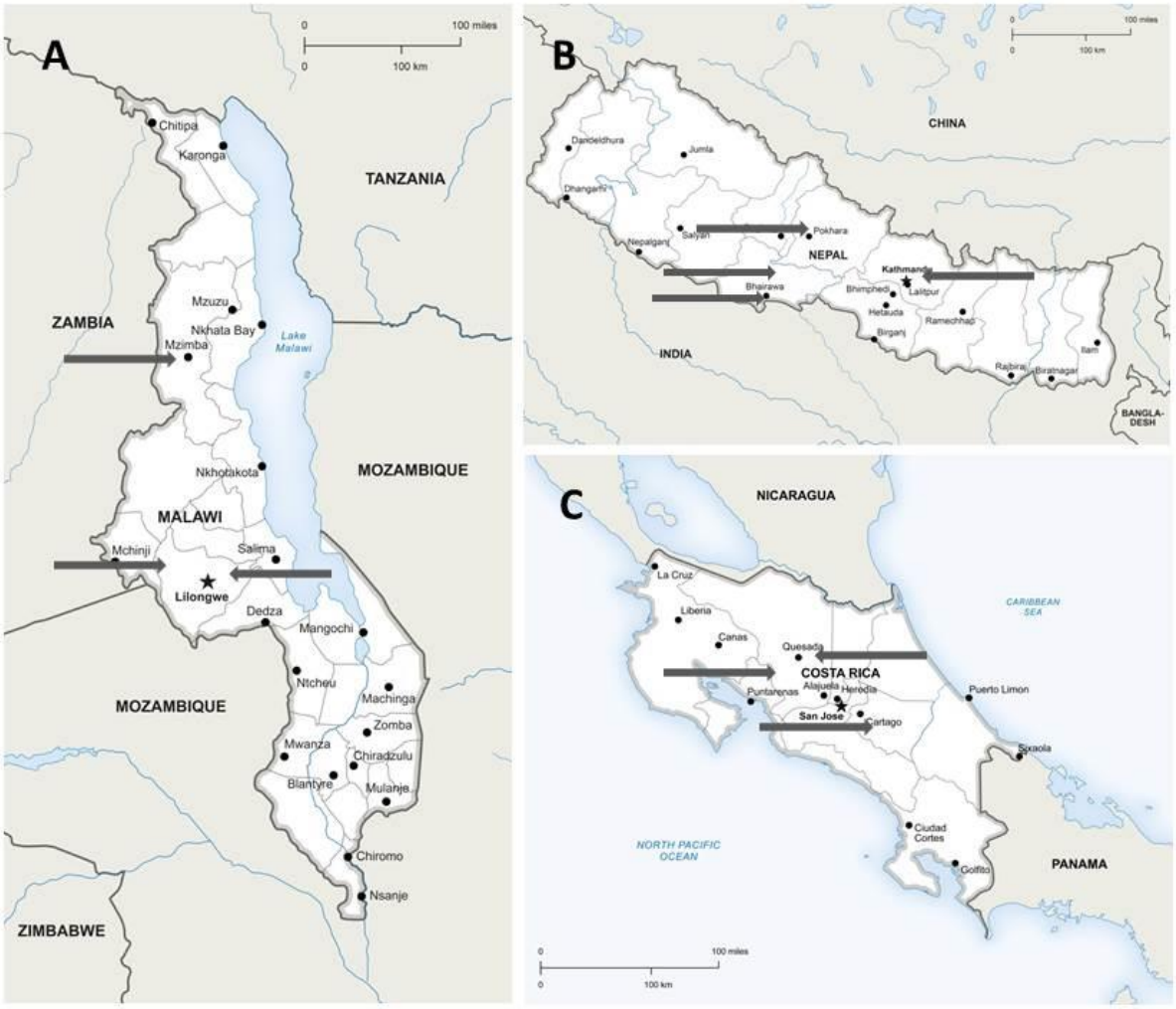

Fig. 1. Selected study sites (arrows) in Malawi (A), Nepal (B) and Costa Rica (C).

3. Results and discussion

3.1. Communication

The communication was clear and open at the plant clinics. The plant doctors are good listeners, respectful and attentive with their clients. In Malawi, the plant doctors are fluent in the local languages. In Costa Rica the plant doctors and their clients all speak Spanish. In Nepal, the plant doctors speak Nepali, which the farmers understand well, even the ones who also speak a minority language.

Few farmers receive fact sheets or other written material (besides prescription forms, which all or nearly all do receive). Fact sheets are designed to be read by farmers (Bentley and Boa 2013; Cameron et al. 2016), yet the cost of printing is a limitation for wider dissemination. In Malawi, the programme has written 15 fact sheets, of which two have been translated to Chichewa. No fact sheets have been written in Costa Rica (in Plantwise format), and although many fact sheets have been written in Spanish from other countries, these are not being used. The Nepali programme has written some fact sheets in Nepali, including some (not in the Plantwise format) printed on inexpensive paper, without illustrations, which can be given to farmers.

In Nepal plant doctors often made recommendations in terms of one or two grams of product per one litre of water, which farmers found difficult to understand. It is easier for farmers to understand volume measures which can be measured with a spoon, in a large enough dosage for a whole sprayer. In Malawi, plant doctors made more realistic recommendations (so many ml of product per 20 litres of water), but sometimes the written instructions included abbreviations that farmers find difficult to grasp.

The plant doctors in Malawi actively share information with each other on Whatsapp. Their Whatsapp group includes the plant doctors (most, but not all have smart phones) and other experts. Plant doctors can send photos of unhealthy plants to the group, for peer advice and diagnoses of plant health problems. In Costa Rica the plant doctors have formed several Whatapp groups with farmers and with extension agents. These groups serve both to invite farmers to extension events, and to consult with experts about plant health problems.

The plant doctors in Costa Rica made an effort to get experts in the Ministry to help them identify unfamiliar plant health problems. Plant doctors in Malawi sought these identifications through peers, and through experts at CABI's diagnostic service in the UK, through the Malawi Plant Doctors' WhatsApp group. Plant doctors in Nepal have a Facebook group for making diagnoses. The effort the plant doctor made to seek accurate diagnoses no doubt influenced the quality of communication with farmers.

3.2. Type of advice given

Plant doctors tend to give several recommendations for a single problem (Table 2). This is consistent with IPM principles. Yet even if the advice is intended to be comprehensive, farmers may treat it more like a menu, choosing the recommendations they prefer, rather than those that are essential for effective control. The more recommendations a farmer receives, the more likely it is that some of the advice will be ignored.

Table 2. Percentage prescriptions with 1 to 6 recommendations for the ten most commonly presented crops at plant clinics in Malawi [a] and Nepal [b] and all crops in Costa Rica [c].

# recommendations / prescription	Malawi (n=359)	Nepal (n=316)	Costa Rica (n=92)
1 recommendation	11%	7%	60%
2 recommendations	27%	19%	22%
3 recommendations	38%	32%	13%
4 recommendations	16%	28%	4%
5 recommendations	8%	10%	1%
6 recommendations	1%	3%	-
Av. per prescription	*2.9*	*3.3*	*1.7*

Source: Plant clinic data from Plantwise Online Management Systems. Downloaded 20.02.2017

[a] Maize, tomato, cassava, mustard, rape, banana, Chinese cabbage, potato, cabbage, orange (data from 6 months)

[b] Tomato, cucumber, bean, gourd, citrus, mango, pumpkin, cauliflower, cabbage, rice (data from one year)

[c] Chili, tomato, citrus, coffee, lettuce, celery, cucumber, pumpkin, basil and 14 minor crops (data from one year)

3.3. Farmer responses to advice

Advice from a plant clinic can be followed partially, e.g. if a biological fungicide cures the disease, the farmer will not need to buy a chemical. Farmers may experiment with the advice, making small adjustments or adding new components. Advice may be followed sequentially, e.g. a farmer may spray insecticide one year, but manage the pest the following year by crop rotation. This is what some of the farmers did, with advice from the clinics: trying some of it at first and occasionally trying other options in later seasons. In the following, a few examples of farmer responses are highlighted from each country.

Malawi

Table A in the Annex shows farmers visited in Malawi, advice given to them and their response. For example, Alefa Kajawo's groundnuts (Case 1) had rosette virus transmitted by an aphid which prefers isolated plants. Planting groundnut closer together can help discourage the insect vector (Moses et al. 2016). The recommendation could be counter-intuitive without background information. The farmer accepted the idea, so the plant doctors may have told her about the insect vector.

In general, farmers adopted the recommendations, especially the chemical ones, but when any advice was rejected it was for rational reasons, e.g. for lack of money or because of the phenological stage of the crop (Cases 8 and 10). There were no clear cases where farmers rejected technology because of poor communication.

Costa Rica

Several of the cases from Costa Rica (e.g. the first three, Table B in the Annex) involved difficult diagnoses, which the plant doctors were able to make with the help of experts. Farmers readily accept the chemical recommendations and seldom need much background scientific information before accepting a recommended pesticide. Even farmers who want to use fewer chemicals are happy to use homemade or organic pesticides.

The Costa Rican plant doctors who work hand-in-hand with farmers, visiting their farms several times a year, are able to communicate well and induce some significant changes, including José Ramírez (Case 10), who moved his vegetable production to a higher, cooler climate as a result of the plant doctor's advice. When farmers fail to use advice it is often because they are unable to (e.g. Susana Rodríguez, Case 6).

Nepal

In two cases in Arye Bhanjyang (Cases 9 and 10, Table C in the Annex), the prescription form helped farmers to buy the recommended product at the shop. Without the advice in writing, many farmers would find it hard to recall some of the chemical names.

In one case from Nepal the farmer (Gita Bhandari, Case 2) did not get enough background information (e.g. that the causal agent is in the soil) to manage the problem (late blight). All four of the farmers visited in Hemja had been visited by a mobile clinic. That is, instead of going to the clinic, the clinic came to them. Three of these farmers were simply uninterested in the advice. There were two cases of misdiagnosis (Sabita and Boram, Cases 4 and 13) and one failure to communicate the dilution rate (Laxshmi, Case 14), but in general the farmers do understand the recommendations.

Overall

Combining the cases from all three countries (Table 3) shows that farmers accepted advice to spray pesticides (e.g. insecticides and fungicides) in 23 cases, and only rejected such recommendations eight times (an acceptance rate of 74%). Plant doctors were sympathetic to farmers who did not want to use chemicals, and sometimes recommended biological pesticides as an alternative. Most farmers who avoided chemicals did so for clear agronomic reasons, e.g. because the crop had already been lost.

Farmers seem less likely to accept advice for cultural or biological control (or for pheromone traps). Such advice was accepted on 14 occasions and rejected on 12 (accepted 54% of the time) (Table 3). There is a clear logic to how farmers respond to recommendations. Most of the cultural controls that farmers tried are similar to what farmers are already doing (e.g. rotating and weeding their crops), although sometimes plant doctors do help to refine the concept of crop rotation for farmers, e.g. explaining not to follow tomatoes with potatoes because they are of the same family and share some of the same diseases. With some cultural controls, plant doctors' advice may have reinforced an existing behaviour, but may not count as adoption *per se,* hence the 54% acceptance rate for cultural controls etc. is probably an over-estimate.

Table 3. Farmers' technical responses by type of technology, all countries

Farmer response	Cultural and biological controls and pheromone traps	Chemical controls
Used the advice		
Malawi [a]	Crop rotation (cases 1, 4, 11) Roguing (cases 4, 9) Control weeds (case 6) Apply more manure (case 11) Bury maize stalks (12)	Biological insecticide (cases 2, 3, 4) Insecticide (cases 5, 6, 7)
Costa Rica [a]	Entomopathogenic fungi (cases 1, 3) Move vegetables to cooler place (case 10)	Insecticide (cases 1, 4, 5, 7, 8, 9) Fungicide (cases 2, 6)
Nepal [a]	Crop rotation (case 7) Pheromone trap (cases 3, 8)	Insecticide (cases 1, 12,14) Fungicide (cases 4, 9, 10, 13) Insecticide & fungicide (case 2)
Rejected the advice		
Malawi	Roguing (case 1) Seed of improved variety (case 1) Remove old leaves (case 6) Intercrop with garlic or onion (case 6)	Insecticide (cases 8, 10, 12)
Costa Rica	Reduce the amount of irrigation water (case 6)	
Nepal	Pheromone trap (cases 1, 6) Crop rotation (case 2—partially adopted) Test soil for pH (case 2) Bury diseased pumpkin fruit and wrap growing fruit in newspaper (case 6) Bury damaged fruit (case 8) Field monitoring (case 14)	Insecticide and fungicide (case 5) Chemicals (case 7) Fungicide (case 11) Ash and soapy water (case 12) Biological insecticide i.e. cow urine (case 14)

[a] The case numbers refer to Tables in Annex, Table A (Malawi), Table B (Costa Rica) and Table C (Nepal)

A second analysis (Table 4) compares the adoption of recommendations by type of plant health problem (e.g. disease or arthropod pest—including insects and mites). Seventeen of the farmers (47%) used all or most of the advice, while 13 (36%) followed some of it and only 4 (11%) rejected all of the recommendations. I.e. almost all of the farmers find something of value at the clinic, advice they can use on their farm. Advice for insect pests vs diseases is accepted in similar proportions (20 arthropod cases and 13 for disease).

Table 4. Farmer's technical responses by type of problem, all countries [a]

Farmer response b	Disease (fungi, virus, bacteria)	Arthropod (insects, mites …)	Weed	Mixed diagnosis
Malawi				
Used all or most of advice (5)	Cases 4, 9	Cases 2, 3	Case 11	
Used some of advice (6)	Case 1	Cases 5, 6, 7, 10, 12		
Used none of advice (1)		Case 8		
Costa Rica				
Used all or most of advice (9)	Cases 2, 3, 10	Cases 1, 4, 5, 7, 8, 9		
Used some of advice (1)	Case 6			
Nepal				
Used all or most of advice (3)	Cases 9, 10	Case 3		
Used some of advice (7)	Cases 8, 11	Cases 1, 11, 12, 14		Case 2
Used none of advice (3)	Case 7	Case 6		Case 5
Unhelpful advice c (2)	Case 13	Case 4		

[a] The case numbers refer to Tables in Annex, Table A (Malawi), Table B (Costa Rica) and Table C (Nepal)
[b] The numbers in brackets are the total number of cases
[c] Unhelpful recommendation: problem was mis-diagnosed and farmer followed advice to no avail

In Costa Rica, farmers were more likely to adopt advice from their plant doctors than were farmers in Malawi or Nepal. This may be because the Costa Rican plant doctors spend more time with fewer clients, so they can communicate more complex and subtle information, but it may also be because most of the recommendations in this Central American country are for chemical pesticides (8 of 12 cases), which farmers are usually keen to try. Total rejection of all recommendations was rare (Table 4): 47% of the farmers used all or most of the advice, while 36% followed some of it and only 11% rejected all of the recommendations. Nearly all farmers tried at least some of the advice from the clinic.

3.4. Some challenges of measuring adoption of advice

The study suggests that 'adoption of advice' from plant clinics cannot always be measured with a simple scale: adopted – partially adopted – rejected. In cases where farmers are already using some of the recommended practices before visiting the clinic, such as crop rotation, counting the use of that practice as 'adoption of advice' could be misleading, unless the advice leads to improved crop rotation practices (e.g. more suitable alternative crops). The fact that plant doctors mostly give farmers multiple recommendations enhances the odds that some of the advice will be followed, yet such a menu of options may also obscure the most important practice since plant doctors rarely distinguish between optional and vital parts of the advice, at least not in writing. Thus, 'partial adoption' is likely to translate into a wide array of results in farmers' field, ranging from minor to major effects. Future studies should ask more nuanced questions about technology adoption, and consider establishing more categories of farmer response.

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Annex. Summary tables of farmers visited

Table A. Farmers visited, Malawi. Queries taken to the plant clinic and farmers' responses

Farmer	Crop, diagnosis, date of query	Recommendation	Farmer's response	Analysis
1 Alefa Kajawo *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 Mary Harold *Female* Kanyama, Phiri La Njuzi, Lilongwe West	**Tomato*** *Red spider mite* 20 May 2015	Botanical insecticide (*Tephrosia*) with onions & laundry detergent	Used botanical pesticide for 2 seasons. Observed large yield increase	High acceptance of pesticides, including botanical ones
3 Singoni Feke *Female* Shati, Phiri La Njuzi, Lilongwe West	**Mustard*** *Red spider mite* April 2014	Botanical insecticide, *Tephrosia* & soap in water	Applied as recommended & was pleased with high yields	High acceptance of botanical insecticides
4 Singoni Feke *Female* Shati, Phiri La Njuzi, Lilongwe W	**Tomato*** *Bacterial wilt* April 2014	Rogue (pos. also advised to rotate crops)	Rogued infested plants, & planted potatoes. Applied Tephrosia & rotated the crop with maize	Farmer's action goes beyond Rx, pos. based on info from other sources. Tephrosia does nothing for wilt
5 Sophina Tembo *Female* Kafukule, Mzimba North District	**Tomato** *Fruit worm* 9 Sep 2015	Hand pick caterpillars, spray cypermethrin (told to apply a bottle cap in 10 litres water)	She applied the cypermethrin, but in 15 litres of water. Controlled the pest	The farmer ignored the tedious Rx to hand pick insects. Applied a lower dose than recommended
6 Veronica Wande *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 Longs Nkhata *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 Matiasi *Female* Matiasi, Mitundu, Lilongwe East	**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 Nasilina Bilion *Female* Chithonje Mitundu, Lilongwe East	**Tomato** *Bacterial wilt* 30 Aug 2014	Crop rotation (prob. roguing too)	She reluctantly uprooted diseased plants. Remaining ones stayed healthy	She still asked for chemical control
10 Lidia Mkano *Female* Mitumba, Mitundu, Lilongwe East	**Beans** *Aphids* 30 Aug 2014	Cypermethrin	Did not buy the chemical in 2014, & lost the crop. She bought 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 Mtsano Chalindo *Female* Bowa, Mitundu, Lilongwe East	**Maize** *Witch weed* 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 Alinet Mavato *Female* Zondawako, Mitundu, Lilongwe E	**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 rather than chemical

Source: Prescription forms from the plant clinics (columns 1- 3) and farmer visits (column 4).
*Diagnosis and recommendation based on farmer's memory. Could not be found in register

Table B. Farmers visited, Costa Rica. Queries taken to the plant clinic and farmers' responses

Farmer	Crop, diagnosis, date of clinic visit	Recommendation	Farmer's response	Analysis
1 Osvaldo Araya *Male* Tucurrique, Jiménez, Cartago	**Peach palm** *Weevils* 2015	Clear leaf litter & drench soil with *Beauveria* & *Trichoderma* to kill pupae. Trap adults with pheromones & apply insecticide in palm canopy as the plant flowers	Recommendation fully understood & adopted. Solved the pest problem	He learned the technique & background info in a special course organised by extension in response to the weevil diagnosis
2 Sonia Granados *Female* Tucurrique, Jiménez, Cartago	**Coffee** *Colletotrichum* Ca. 2014	Apply a copper-based fungicide	Applied the fungicide. Solved the problem	The diagnosis was difficult, but the extensionists did not give up easily
3 Juan Carlos Molina *Male* Tucurrique	**Lettuce** *Fusarium* 2015	Spray bicarbonate of soda in water, followed in 3 days by *Trichoderma*	Applied the Rx as advised & problem was solved	Another difficult diagnosis, aided by other experts
4 Ana Cecilia Araya Chacón *Female* Naranjo, Alajuela	**Violet** *Thrips* 2013	Insecticide	Applied as advised, problem solved	Farmers accept chemical control
5 Elizabeth Fonseca *Female* Naranjo, Alajuela	**Anthurium** *Mealy bugs & mites* 5 May 2016 & earlier	Insecticide (unspecified) mixed with oil	Applied organic pesticides before recently turning to 2 chemical insecticides which seem to have solved her problem	She also received info from other sources
6 Susana Rodríguez *Female* Naranjo, Alajuela	**Ornamental plants** *Fungus* September 2016 & earlier	Use less irrigation water in greenhouse, apply fungicide	She tried the fungicide but could not adjust the water flow	Electronic irrigation system was too difficult to use
7 Jesús Valverde *Male* Naranjo, Alajuela	**Celery** *Mites* October 2015	Chemical acaricides followed by an organic product to prevent a 2nd attack	He applied the products as recommended & saved his crop	His next celery crop was free of mites, without chemicals
8 Gerardo Quirós *Male* San Ramón, Alajuela	**Beans** *Mites* ca 2011	Acaricide	Used chemical successfully, then experimented with crop rotation	He adopted the Rx, but also tried crop rotation based on articles he read
9 Hada Rodríguez *Female* San Ramón	**Chayote** *Thrips* 2015	Pyrethrin (natural insecticide)	She applied the product, which solved the problem	Farmers tend to accept chemical Rx
10 José Ramírez *Male* San Ramón	**Lettuce** *Bacterial rot* 2013 or 2014	Move vegetables to a cooler place	He moved his vegetables to a higher altitude, built a new greenhouse	Major change in cultural practices, based on sound grasp of the Rx

Table C. Farmers visited, Nepal. Queries taken to the plant clinic and farmers' responses

Farmer	Crop, diagnosis, date of clinic visit	Recommendation	Farmer's response	Analysis
1 Ratna Maya Strestha *Woman* Gokarna, Kathmandu	**Sponge gourd** *Fruit maggots* 22 Sep 2016	Pheromone traps	Did not use traps	It was too late in the season
2 Gita Bhandari *Woman* Gokarna, Kathmandu	**Tomato** *Leaf eaten by insect (& disease as well, pos. late blight)* 6 June 2016	Change variety, use fertiliser, test soil pH, keep field clean, use pesticides only as needed. A 2nd Rx was prob. for fungicide, roguing & crop rotation	Applied insecticide & fungicide. Did not rotate crops or test for pH, but as tomato plants died she replaced them with cauliflower & spinach	She adapted the Rx, but may not have understood that the disease-causing fungus was soil-borne
3 Rozendro Shrestha *Male* Gokarna, Kathmandu	**Cucumber** *Fruit fly* Date	Pheromone traps when the plants are flowering	Bought a trap, tried it. Then made more traps for a larger area. Left the traps up for longer	Applied Rx creatively. Is in close contact with the plant doctors & the cooperative
4 Sabita Thapa Pandit *Female* Gokarna	**Tomato** *No diagnosis (probably* Tuta*)* 22 Sep 2016	Cleanliness, change variety. Apply Krilaxyl Gold, Agromin	She applied the fungicides; the crop died	Plant doctors did not recognise this invasive pest
5 Santi Thapa *Female* Hemja, Kaski	**Rice** *Foot rot & stem borer* 16 June 2016	Foot rot: dip root in Bavistin while transplanting. Stem borer: apply Furadan in sand or ash in whorl	Barely recalled the Rx. Did not apply	The farmer did not think the damage was important
6 Rozendro Karki *Male* Hemja, Kaski	**Pumpkin** *Fruit fly* 16 May 2016	Bury fruit. Make malathion-fruit traps. Wrap setting fruit in newspaper. Pheromone traps	He did not remember the Rx or act on it	He eats the leaves & not the fruit, so he was uninterested in controlling the fruit fly
7 Bhagwati Poudel *Female* Hemja, Kaski	**Tomato** *Powdery mildew* 19 July 2016	Crop rotation. Clean host plant. Apply a mix of sulphur & lime every 10 days for 3 times. Copper sulphite every 10 days	She thought sulphur would damage the tunnel* plastic, so did not spray. Used another pesticide which did not work. Uprooted tomato & planted cilantro	The only part of the Rx she used was crop rotation, but she did that because of the season of the year, not to manage disease
8 Debu Triphati *Female* Hemja, Kaski	**Cucumber** *Fruit fly* 6 May 2016	Bury damaged fruit. Use pheromone traps. Cleanliness	She used the traps until hail ruined the crop	Learned about pheromone traps in a previous FFS
9 Junu Gaha *Female* Arye Bhanjyang, Palpa	**Tomato** *Late blight* September 2016	Remove affected parts. Mancozeb with Metalexil, once every 10 days. Next year treat soil with solarisation	She took the Rx form to the shop. Applied fungicide & fertiliser she made from buffalo urine & plants,	The liquid fertiliser is the creative use of information from FFS

Farmer	Crop, diagnosis, date of clinic visit	Recommendation	Farmer's response	Analysis
10 Siri Sara Bhogale *Female* Arye Bhanjyang, Palpa	**Tomato** *Pith rot* September 2016	Cleanliness. Copper oxychloride. Treat soil next year with solarisation	Also took the Rx to the shop, applied the fungicide & liquid fertiliser	Same as above
11 Dhana Maya Bhogale *Female* Arye Bhanjyang	**Chilli** *Root rot* September 2016	Crop rotation. Copper oxychloride. Treat soil next year with Bavistin	She avoided fungicide, but used liquid fertiliser. The crop did well	She planned to eat the fruit herself, & did not want pesticides. FFS grad
12 Shamsher Singh Rana *Male* Bhalwari, Rupandehi	**Mustard** *Aphids* February 2016	Ash, spray soap water. Demethoate when the problem is bad	He applied the insecticide but it was not effective because of fog	He preferred chemicals to soapy water
13 Boram Kaphle *Male* Bhalwari	**Lentils** *Blight* 2015	Mancozeb every 7 days, 3 times	Applied, & the plants grew, but never formed pods	Misdiagnosis. Prob. wrong variety for the area
14 Laxshmi Gyeveli *Female* Bhalwari	**Onions** *Thrips* 2015	Field monitoring. Cow urine in water & imichloropid	She bought the chemical & applied it, but the onions died	Applied insecticide at 25 times the proper rate, i.e. trouble calculating the dilution rate

Source: Prescription forms from the plant clinics (columns 1- 3) and farmer visits (column 4).

*Like a greenhouse, a structure with a plastic roof, but the walls are usually left open

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