



# Farmers and Plant Clinics: attendance drivers and barriers, knowledge use, dissemination and satisfaction

Case studies from Vietnam, Sri Lanka, Malawi and Zambia

January 2016

# Acknowledgements

This report on the Plantwise programme is written by the PED A International research team, the contents, however, reflect the collaborative efforts of all the organisations and individuals involved in the study in each country.

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## Photo

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## Acronyms

AEDC	Agriculture extension development coordinator
AEDO	Agriculture extension development officer
DAES	Department of Agricultural Extension Services
DARS	Department of Agricultural Research Services
LUANAR	Lilongwe University of Agriculture and Natural Resources
PEDA	People Empowering & Development Alternatives
SOF	Spill-over farmer

# Executive Summary

Plantwise is a global collaborative programme led by CABI that is working to improve food security and livelihoods by reducing crop losses particularly for the smallholder farmer.

CABI commissioned PEDDA to conduct studies in four Plantwise countries, namely Malawi, Zambia, Vietnam and Sri Lanka. The research was conceptualised to ascertain farmers' experiences of plant clinics as witnesses, and to assess how they benefited from the services.

The objectives of the study were:

- To collect verifiable evidence on plant clinic attendance for demonstrating success models and to evaluate factors such as clinic attendance barriers and drivers, gender spaces and ethnic diversity;
- To assess changes in farmers' knowledge, practices, yields and livelihood as a result of employing Plantwise recommendations;
- To assess farmers' satisfaction with plant clinic advice and study the willingness of farmers to pay for plant clinic services as a mechanism for improving the sustainability of the programme;<sup>1</sup>
- To determine spill-over formulae at the country and programme levels.

This report presents the outcome of these studies, which were conducted between September 2015 and 31 January 2016. The studies used both qualitative and quantitative approaches. The quantitative data were collected through a structured questionnaire covering aspects of clinic attendance; farmers' knowledge, attitude and practice; satisfaction levels; willingness to pay; and immediate outcomes and impact. Qualitative data on these same aspects were collected through focus group discussions and key informant interviews using a checklist.

The study was a collaborative effort involving CABI country staff and partners from academia, research institutes, civil society, the United Nations and governments in the four countries. It was developed and coordinated by PEDDA International research teams in each country, who led the survey, consultation, and local coordination with stakeholders and farmers. The study was conducted among a sample of 891 farmers grouped into three categories: 383 plant clinic users, 373 plant clinic non-users and 135 spill-over farmers. Thirteen districts across the four countries were covered. To ensure data comparability across the four countries, the research team used a standardised methodology and structured tools and questionnaire. The research sites were selected taking into account gender diversity of the farmers, accessibility of the clinics, climatic conditions, the seasonal calendar, and varieties of the crops.

## General findings

- The Plantwise programme was launched in 2012 in Vietnam and in 2013 in Malawi, Zambia and Sri Lanka. This programme started with vigorous training of plant doctors on crop pest and disease identification and how to make recommendations based on the identified problem. The Plantwise programme was appreciated by government institutions. It partnered with the relevant ones among these to work closely with their staff and build their capacity in identification of crop problems and their solutions.
- Both the plant clinic users and spill-over farmers in the four countries cited tremendous positive gains from the programme. The focus group discussions with plant clinic users

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<sup>1</sup> After a detailed review of documents and meetings with the CABI team, PEDDA divided objective 3 into two parts. The part related to farmers' satisfaction was detached from objective 3 and combined with objective 4 because of its relevance to farmers' willingness to pay.

revealed that most of the farmers were now able to protect their crops in an efficient way and were getting higher yields and incomes from the crops.

- The study found out that the government institutions in Malawi, Vietnam and Zambia were showing more interest and ownership of the programme and providing support to the programme where needed. However, there is work to be done with the government of Sri Lanka so that it can provide more support to the programme, take more ownership, include it among the government priorities, pay more attention to its delivery, and develop and monitor its activities at the national, provincial and district levels.
- The general feedback on the publicity of the programme among the farmers in all the research study countries was satisfactory. However there was emphasis that more needed to be done to reach more farmers. The farmers suggested additional publicity be provided using information tools such as electronic media and radio and through agro-dealers.
- A noticeable achievement seen only in Sri Lanka was the rising farmer interest in non-chemical remedies for the crop problems, which originated from the preference of non-chemical remedies by the trained plant doctors.
- There was need to strengthen the plant doctors' knowledge on non-chemical integrated pest management techniques and practices for better crop management.
- Farmers brought up the issues of the non-availability of chemicals for sale in the proximity of the plant clinics and the need to increase the number of clinics within the catchment areas or mobile clinics if all farmers are to be reached.
- A major constraint observed in Sri Lanka alone was the lack of trained doctors. Those who were trained had undergone only two or three training sessions, which was inadequate. There is need to upgrade the knowledge of the plant doctors on pest and disease management methods. Another important issue that affected the programme in Sri Lanka was the annual transfer of field staff. Agriculture inspectors usually were rotated or transferred every five years on service requirements. Some of the trained plant doctors in Rathnapura and Vavunaya districts were posted to non-field positions but their replacements were not trained plant doctors, which affected the efficiency of the functions of the programme.

***Objective 1: Collect verifiable evidence on clinic attendance for demonstrating success models and evaluate factors such as clinic attendance barriers and drivers, gender spaces, and ethnic diversity***

This section looked into the factors that either motivated or discouraged a farmer from visiting a plant clinic, categorised under awareness and information, quality of clinic services, and socioeconomic and cultural, natural, and personal factors.

- The majority of the plant clinic users showed good knowledge of the solutions to their crop problems, while for a good number of spill-over farmers this knowledge was fair. Plant clinic non-users had either very poor or no such knowledge. In Vietnam 97% of the plant clinic users had good knowledge of the solutions to crop problems and for 62% of the spill-over farmers this knowledge was fair. Among the plant clinic users in Sri Lanka 90% had a good level of knowledge of the crop problem solutions, while for 70% of the spill-over farmers this knowledge was fair. Responding to a multi-response question in Malawi, around 43.8% of the plant clinic users had good knowledge of their crop problem solutions and for 37% of them this knowledge was fair. The high level of increase in the knowledge on the solutions to crop problems in Vietnam was due to the knowledge and experience of the plant doctors and their interaction with local farmers. Plant doctors in Vietnam did not undertake follow-up visits with farmers unlike the plant doctors in the other countries.

- The satisfaction with the experience and knowledge of the plant doctors was so high that 99% of the clinic users in Sri Lanka, 90% of the plant clinic users in Vietnam and Sri Lanka, and 80% of the plant clinic users in Malawi indicated that that was the reason they wanted to continue visiting the plant clinics.
- According to 99% of the spill-over farmers in the four countries, the advice from the plant clinic users was beneficial in solving most of their crop problems.
- The location, accessibility and sitting areas of the plant clinics were not seen as barriers to attendance at the plant clinics as about 95% of respondents (users and non-users) in all four countries were satisfied with the location, sitting areas and accessibility of the plant clinics.
- Among all the farmers in the four countries, 86% did not think that access to the plant clinics was difficult for women, 87% each did not think that they affected young farmers or old farmers, and 80% did not believe that they affected physically challenged persons. For 95% of the farmers in the four countries, natural hazards were not a barrier to attendance at the clinics.
- For 98% of the farmers in Malawi, 99% of the farmers in Vietnam and 95% of the farmers in Sri Lanka, attending the plant clinic was not costly. In Zambia 13.8% of farmers considered it costly to visit the clinics owing to the transport costs associated with travelling the long distance to the clinics. The plant clinic non-users who said that it was costly to visit the clinics lacked the knowledge on the clinic operations or were aware that travelling to the clinics far away cost farmers money.
- The key barriers noted in attendance at the plant clinics were timing and frequency of the clinics. Around 49% of the plant clinic non-users in Sri Lanka had difficulty visiting the clinics because they were held too late in the evening. The most commonly cited reasons for not attending the plant clinics were that frequency and timing did not work for farmers, the clinics were far away, and information about the plant clinics was not known. The concept of timing here refers to the fact that the clinic schedule did not work for farmers because they were busy with their household activities; the plant clinics opened fortnightly, which was not enough because there were many farmers to serve; the plant doctor was busy; and that it took a lot of time to travel to the clinics. Another reason for not visiting the clinics among the spill-over farmers was that they relied on relatives or neighbours who went to the clinics to provide them with advice on crop problems.
- In Sri Lanka clinic attendance was low because the majority of the farmers preferred traditional pest and disease control methods. Farmers who visited the plant clinics were satisfied because the advice from there not only enhanced their knowledge but also improved their crop production, income and overall quality of life.
- Low clinic attendance was observed in areas where there were more part-time farmers, so there is need to adopt approaches that can attract these types of farmers.

**Objective 2: Assess the change in farmers' knowledge, practices, yield and livelihood as a result of employing Plantwise recommendations**

- The respondents were asked to rate themselves on 15 parameters for the level of change in their lives over the period the programme operated in their areas.
- The study showed that there were good outcomes in all the key change indicators. The majority of respondents stated that they had seen visible changes such as in the willingness to seek advice on crop problems, stated by 76% of clinic users. 66% of clinic users stated changes in crop productivity, 61% stated an increase in crop yield, 70% stated an increase in crop related income and 87% in quality of life.

- The majority of the farmers in Malawi experienced positive changes associated with the Plantwise programme, with 20% of them realising a high improvement in the quality of life, 66% seeing an improvement, and 7% a decline. Plant clinic non-users either did not see any change or saw a change for the worse.
- The plant clinics users were more knowledgeable about crop diseases and their solutions, they communicated crop problems better if they encountered any, and were reaping the benefits through increased quantity and quality of food and income.
- The study also looked into whether the plant doctor suggested the use of cultural practices. It would appear that this type of advice formed the bulk of the prescriptions, as 96% of the plant clinic users stated that that was the type of recommendation they received from the plant doctor. Among these recommendations 46% were preventive services. The common cultural practices were crop rotation and uprooting and burning of infected plants.
- Most of the farmers considered the Plantwise programme as being responsible for the improvement in their knowledge about crop problem identification and solutions. Before this programme they had limited knowledge on crops and their problems and they depended on local extension services and agro-dealers. This programme improved the knowledge of not only the plant clinic users but also the clinic non-users with whom the clinic users shared their knowledge and advice from the clinics. Farmers in Sri Lanka experienced improvement in their attitude towards crop problems and crop management. The project had positive impact on the farmers, as they became more aware of crop problem management and related issues and they no longer bought chemicals without consulting the plant doctors.

***Objective 3: Assess farmers' satisfaction with plant clinic advice and study the willingness of farmers to pay for plant clinic services as a mechanism for increased sustainability***

- Among the plant clinic users 98% were satisfied with the advice from the plant doctors for their crop problem and 97% were willing to share the plant clinic advice with plant clinic non-users.
- Over 95% of the plant clinic users stated that they would visit the plant clinic again. For the majority of them this was because they were satisfied with the plant doctor's knowledge and advice for their crop problem. Among the spill-over farmers, 95% were willing to visit the plant clinics.
- In Sri Lanka there was a need to do more work on information technology literacy among the clinic staff and training of plant doctors to use the Plantwise knowledge bank.
- In all four countries, the delay in getting the results, or the failure to deliver the results to the farmers, from samples referred to the diagnostic laboratories for analysis was a major concern.
- Among the farmers in the four countries, over 80% were willing to pay for plant clinic services, as they found them effective in solving their crop problems, which led to increased crop production and crop income and improvement in the overall quality of life. Approximately 60% of the farmers in Malawi and Zambia, 87% of the farmers in Vietnam and 90% of the farmers in Sri Lanka were willing to pay for the clinic services. The amount of fees suggested varied among the countries but ranged from US\$1 to US\$5 for each consultation.
- Most farmers in Zambia and Vietnam wished to have a one-stop shop at the clinics that would include selling of chemicals on clinic days or on request of farmers rather than just the advisory services.

- It is important to build good relationships with agro-chemical companies and local dealers to ensure that farmers are getting the right products at reasonable prices.
- The sustainability of the Plantwise programme depends on the way the plant clinics are conducted and also the engagement of other service providers to conduct plant clinics, such as agriculture production and research assistants, who are mandated to serve farmer communities.

#### **Objective 4: Determine spill-over formulae at the country and programme levels**

- All the spill-over farmers in the four countries showed their satisfaction with the plant clinic services and the advice they received from the plant clinic users.
- Some 97% of the spill-over farmers were willing to visit the plant clinics by themselves and 97% indicated that the advice they received from the clinic users was very helpful for their crop problems and diseases. The majority (59%) of the spill-over farmers in Zambia wished to visit clinics to gain more knowledge while 23% feel the visits more beneficial in crop management. 95% of respondents in Sri Lanka that received advice from another farmer found it very helpful in solving the crop problems.
- In Malawi plant clinic users shared the advice from the plant doctors with an average of four spill-over farmers, while in Sri Lanka and Vietnam it was an average of three spill-over farmers.
- On average each plant clinic user shared the information and knowledge from the plant clinic with three spill-over farmers.

## **Conclusion**

Plantwise was described by many stakeholders as well planned, appropriate and focused. Its achievements included increased knowledge and improved help-seeking behaviour among farmers for the management of their crop problems. These in turn manifested through impact elements like increased yields and production as well as improved quality of the agricultural produce. Evidence also shows that the livelihoods of the farmers who received plant clinic advice directly or indirectly were changed for the better. The majority of the plant clinic non-users were looking forward to the day when they too would visit a plant clinic, but a small proportion of farmers still doubted the usefulness of the plant clinics.

In the four countries, most of the stakeholders, including the staff of the Ministry of Agriculture, were of the view that the Plantwise programme should be fully incorporated into the mainstream extension system with its own clear budget line. It is essential to develop the capacity of the plant doctors to meet the needs of the farmers. The plant doctors working in the programme in all the four countries were government employees serving as extension officers in the plant clinics' catchment areas under the Ministry of Agriculture. This meant that the phasing out of the programme would still leave these employees intact in their areas of operation. Institutionalisation of the Plantwise programme was the main reason for the training of the already existing staff in the relevant ministries. There were indications that the perennial deficiencies in and erratic provision of operational funds for the general agricultural activities in the catchment areas had affected the operations of the clinics.

The main challenges for the Plantwise programme included (1) low coverage of the plant clinics, (2) the long distances farmers had to travel to get to the clinics, (3) a project view of the programme resulting in, among other things, inadequate operational resources, (4) inadequate publicity for the programme, (5) few stakeholders on board, (6) inadequate operational support, (7) prominence of the allowance syndrome among the staff and confusion over allowance payments, (8) poor staff mobility, (9) confusion over laboratory capacities between research and extension, (10) knowledge overload during training, and (11) lack of chemicals at the point of prescription.

## Recommendations

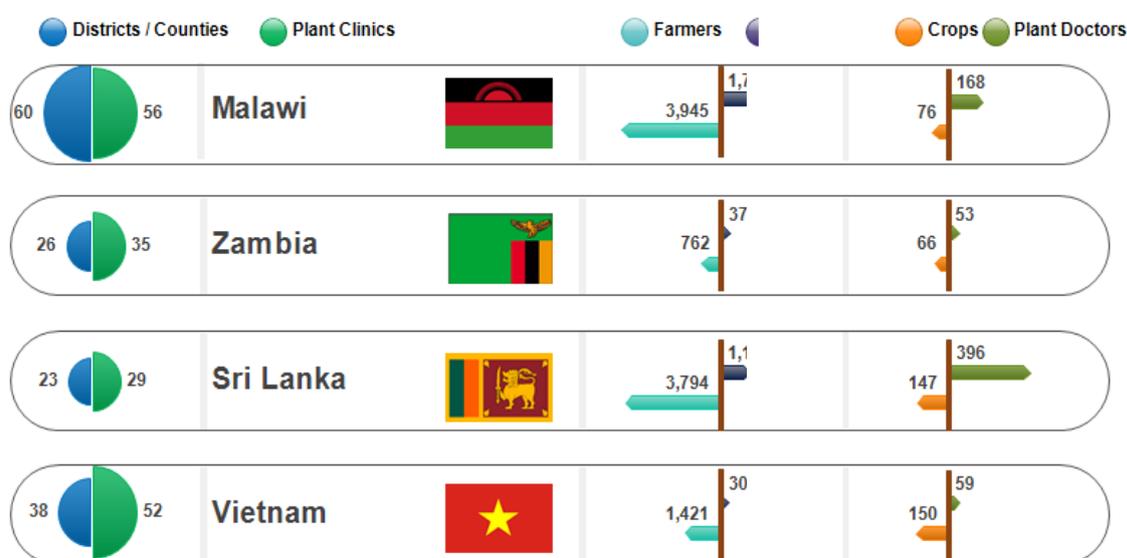
- Increase programme awareness campaigns: These should not be the one-off types of exercises. Lack of information about the existence of plant clinics should not be a reason for farmers to fail to attend them. More publicity and awareness will benefit more farmers. There is need for promotional programmes using local radio stations or distributing promotional materials such as T-shirts, caps and leaflets to spread awareness on the existence and services of the plant clinics.
- Increase programme coverage: In the four countries, farmers felt that the plant clinic services should be expanded to cater for a wide spectrum of agricultural related issues including animal diseases and pests, soil and water problems, and crop and livestock marketing issues. There is need for deployment to the districts of additional agricultural staff in several specialties and at the plant clinic or camp level in some areas. Where staff exist in areas other than crops, the incorporation of such staff in plant clinics might be one avenue to pursue.
- Plant clinic operational funds should be channelled through the national extension system in order to ensure sustainability of the programme. The provision of operational funds for both central and mobile clinics needs to be institutionalised in the national extension system. Having plant clinics on a fixed calendar at fixed or flexible locations will help provide better service to the wider farmer community.
- Plant clinics should consider partnering with agro-dealers: Plant clinics should consider either inviting agro-dealers to set up a stand where the plant clinics are held or they themselves stocking the chemicals that are frequently demanded by the farmers.
- Provide ICT services and training for plant doctors: In all four countries it was evident that there was need to train plant doctors on ICT tools and to ensure the services were efficient. There is also need for more information materials that are easily digestible by farmers. The use of the Plantwise online and offline resources by plant doctors and provincial/district coordinators should be encouraged and adequate resources must be provided for them to make the full use of these resources. Continuous capacity development for all the plant doctors and extension staff at the local level is essential.
- Equip the clinics with simple tools and visual leaflets: Simple tools such as a magnifying glass will be helpful for plant doctors. In addition, leaflets with pictures and illustrations are more useful than oral description for clinic users with low education.
- Integrate regular government extension services with those of the Plantwise programme: Plantwise interventions should be internalised into the mainstream ministry of agriculture activities, under the appropriate section, such as the plant protection department.

# 1. Introduction

## 1.1 Background

Plantwise started in 2011. It has grown rapidly to cover 3 countries<sup>2</sup> by the end of 2014 and to work with 201 partners, including governments, advisory services, nongovernmental organisations, farmers' representatives and other plant health stakeholders. As part of the programme 3591 plant doctors have been trained. The high demand from farmers and interest from extension providers and plant protection organisations have led to the speedy expansion of plant clinic networks in the participating countries. It is estimated that by the end of 2014 approximately 2 million farmers had received advice, directly or indirectly from 1413 plant clinics. The Knowledge Bank stores data from more than 75,000 records and facilitates informed decision-making by plant health stakeholders, along with providing access to critical resources such as pest distribution maps, an online diagnostic tool, and pest management support.<sup>3</sup> Figure 1 shows the numbers of districts/ counties, plant clinics, farmers who have visited clinics, different crops addressed at plant clinics and the numbers of plant doctors in each study country.

*Figure 1: Plantwise programme coverage in study countries.*



Plantwise is a global collaborative programme led by CABI that is working to improve food security and livelihoods by reducing crop losses, particularly for the smallholder farmer. Plantwise strengthens national plant health systems from within, enabling countries to provide farmers with the knowledge they need to lose less and feed more. Plantwise also works to help strengthen national plant health systems by facilitating links among key stakeholders, i.e. the government, research, extension, agro-input suppliers and farmers. Networks of locally owned and operated plant clinics are established based on an approach similar to that for human health clinics, where farmers can find advice to manage and prevent crop problems. Agricultural advisory staff trained as plant doctors learn methods to identify crop problems and provide advice according to good practice.

<sup>2</sup> <http://www.plantwise.org/about-plantwise/>

<sup>3</sup> Plantwise Strategy 2015–2020

## 1.2 The Agricultural Sector in Malawi, Sri Lanka, Vietnam and Zambia

Malawi is a landlocked country located in southern central Africa, along the western part of the Great Rift Valley. It is bordered by Tanzania to the north and northeast, Mozambique to the east, south and southwest, and Zambia to the west. The country has an estimated population of 16.7 million.<sup>4</sup> Malawi has a subtropical climate with the rainy season lasting from November to March. Agriculture is the largest sector of the Malawian economy, contributing a third of the gross domestic product and generating more than 90% of the export earnings. Malawi has long been dependent on the agricultural sector both as the leading foreign exchange earner and for subsistence farming in the rural areas.

Zambia is a landlocked country that lies in the southern Africa region. It has an area of 752,614 km<sup>2</sup> out of which 740,724 km<sup>2</sup> is land and 11,890 km<sup>2</sup> is water. Zambia is bordered by Angola in the west, the Democratic Republic of the Congo in the north, Tanzania in the northeast, Malawi and Mozambique in the east, and Zimbabwe, Botswana and Namibia in the south. The country is divided into 10 provinces. Lusaka is the capital and largest city. Agriculture is an important sector in the Zambian economy, second to the mineral sector, which was the backbone of the economy from post-independence times until the late 1980s. The agricultural sector in Zambia contributes approximately 18% of gross domestic product and about 70% of employment, mostly for the rural subsistence farmers. Zambian agriculture has three broad categories of farmers: small-scale, medium-scale and large-scale. Small-scale farmers make up 80% of the farming community and are generally producers of the staple food crop, maize, mainly for subsistence, with occasional marketable surplus. They also produce vegetable crops as important sources of income during the off-farm season. Medium-scale farmers produce maize and a few other cash crops for the market. Large-scale farmers produce various crops for the local and export markets.

Agriculture is Sri Lanka's economic pillar, accounting for 10.1% of the gross domestic product. The agricultural sector of Sri Lanka is economically significant as it forms the main source of employment and livelihood for nearly 72% of the population. The sector has not performed satisfactorily in the past two decades for a number of reasons that include adverse weather, rising cost of inputs and shortage of labour. The lagging agricultural production has led to tremendous increases in food imports, and the country is becoming a net food importer. 2014 was difficult for many producers, with many challenges, including adverse weather conditions and competition from imports. Gross domestic product rose 7.4% in 2014 but the agricultural sector's input edged up just 0.3%, largely owing to challenging weather. The sector grew by 4.7% the previous year. In 2014, Sri Lanka experienced broad-based growth with the exception of the agricultural sector, which suffered from a drought early in the year followed by heavy rains and flooding. Indicators suggest that agriculture continued to underperform against other sectors in the early part of 2015.

Vietnam, located on the Southeast Asian coast, has a tropical savannah climate with two seasons in the south (the rainy season that runs from mid-May to mid-September and the dry season that goes from mid-October to mid-April); a humid subtropical climate in the north with distinct spring, summer, autumn and winter seasons; and a tropical monsoon climate in the central and southern regions. Owing to Vietnam's coastal location, its climate is regulated in part by ocean currents that bring marine climate factors. Vietnam's decentralised administrative structure includes the provincial, district and commune levels. Vietnam is divided into 58 provinces and 5 cities under the central authority. Vietnam's population was around 88 million in 2013, of which the surveyed areas, Mekong Delta of south Vietnam, has around 18 million people and 40,548.2 km<sup>2</sup>. Agriculture is the most important economic sector of Vietnam, with more than 70% of population involved in it. In 2009 the value of agricultural output reached 71.473 trillion dong and accounted for 14% of

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<sup>4</sup> World Bank 2014, Malawi Country Data, <http://data.worldbank.org/country/malawi>

the total domestic product. The share of agriculture in the economy has been on the decline in recent years while other sectors have grown. Its contribution to job creation was bigger than its contribution to the gross domestic product.

### 1.3 The Research Studies

The research studies were commissioned by CABI to assess the impact of the Plantwise programme in the four selected countries of Malawi, Sri Lanka, Vietnam and Zambia. PEDDA, an independent consulting group is based in Pakistan with representatives in all the four study countries. The impact and sustainability of the programme were evaluated among the direct and indirect beneficiaries of the programme to demonstrate models of implementation, assess spill-over effects, and gauge farmers' satisfaction with the services and willingness to pay for them.

The studies were conducted with standard methodology and tools across the four countries to ensure that the results were comparable and the recommendations were actionable. The PEDDA research team employed a mix methodology to acquire data through questionnaires, semi-structured interviews and focus group discussions. They included empirical evidence from both the beneficiaries (plant clinic users) and the non-beneficiaries (plant clinic non-users) to identify the best models of implementation. Along with the primary data, the researchers used secondary data covering the country context, the role of agriculture in economic development and plant clinics and other best practices to visualise the project impact on a broader canvass. The tools for the primary data collection included a farmers' questionnaire, focus group discussions and key informant interviews.

The four key objectives of the study are elaborated in Figure 2 with a list of research variables and areas of focus under each. The first objective relating to verifiable evidence on clinic attendance was executed through an assessment of the drivers and barriers of clinic attendance. The second objective was an assessment of farmers' knowledge, yield, practices and livelihoods, comparing plant clinic users and non-users. The third objective concerning the spill-over formulae of the programme was executed through looking at the various ways through which information was transferred from the direct beneficiaries to the indirect beneficiaries. Lastly, farmers' satisfaction with the clinic services and their willingness to pay for them was explored through in depth study employing the questionnaire and the qualitative tools.

**Figure 2: Objectives of the study**



## 2. Methodology

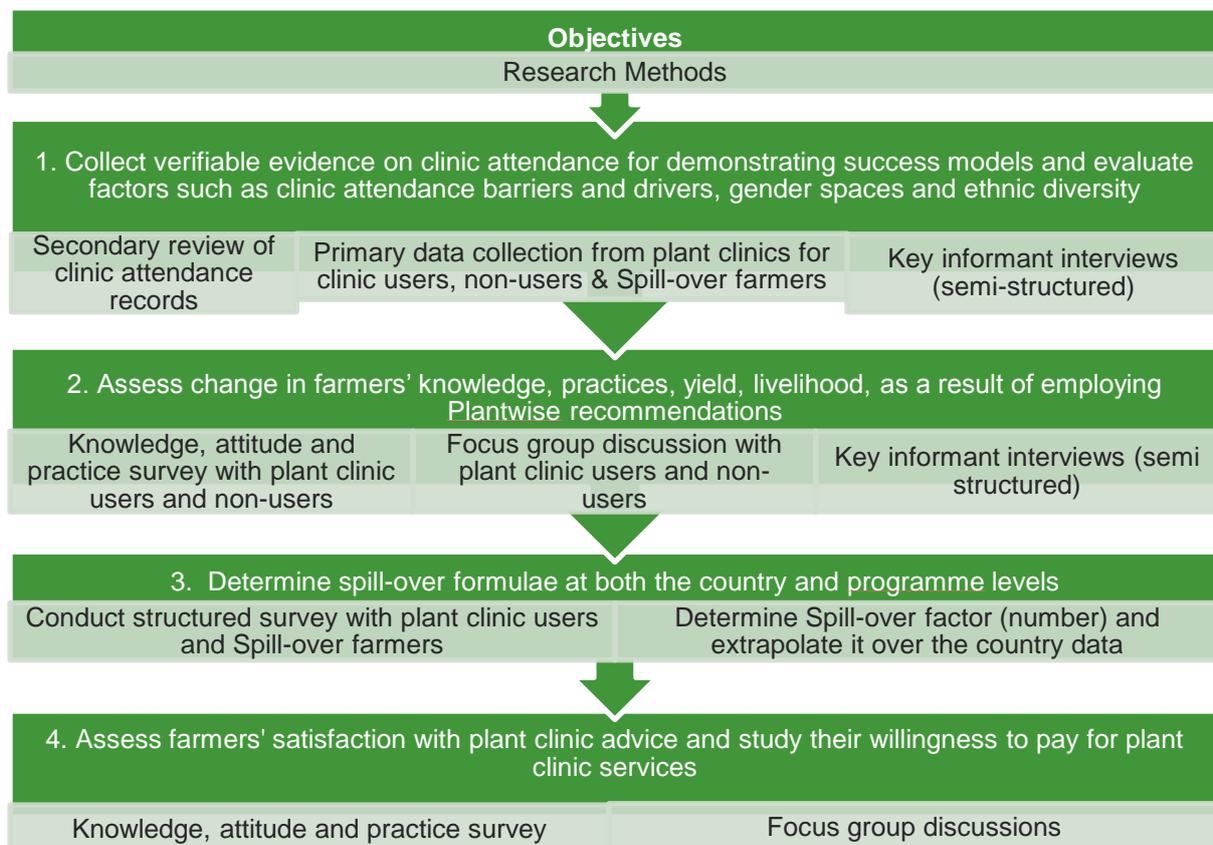
### 2.1 Study Approach

PEDA employed a mixed methods design for the studies that included collection of both quantitative and qualitative primary data with treatment and control groups, complemented with review of secondary data of relevant Plantwise documents on the country context, role of agriculture in economic development, and plant clinics and other best practices. To understand and estimate the programme impact, random sampling was used for both treatment and control groups, which were drawn from the same areas,<sup>5</sup>.

The quantitative data were collected through a structured questionnaire covering aspects of farmers' clinic attendance; knowledge, attitude and practice; satisfaction levels; willingness to pay; and immediate outcomes and impact. The qualitative data also focused on these aspects, collecting in-depth information and enabling triangulation of quantitative data. Qualitative information was collected through focus group discussions and the key informant interviews. Figure 3 provides details on the research methods used by PEDA against each strand of the study objectives.



*Figure 3: Research methodology used in the study.*



<sup>5</sup> Same area refers to the catchment areas of Plant Clinic decided in consultation with the Plant doctor and the local staff

## 2.2 Sampling Frame

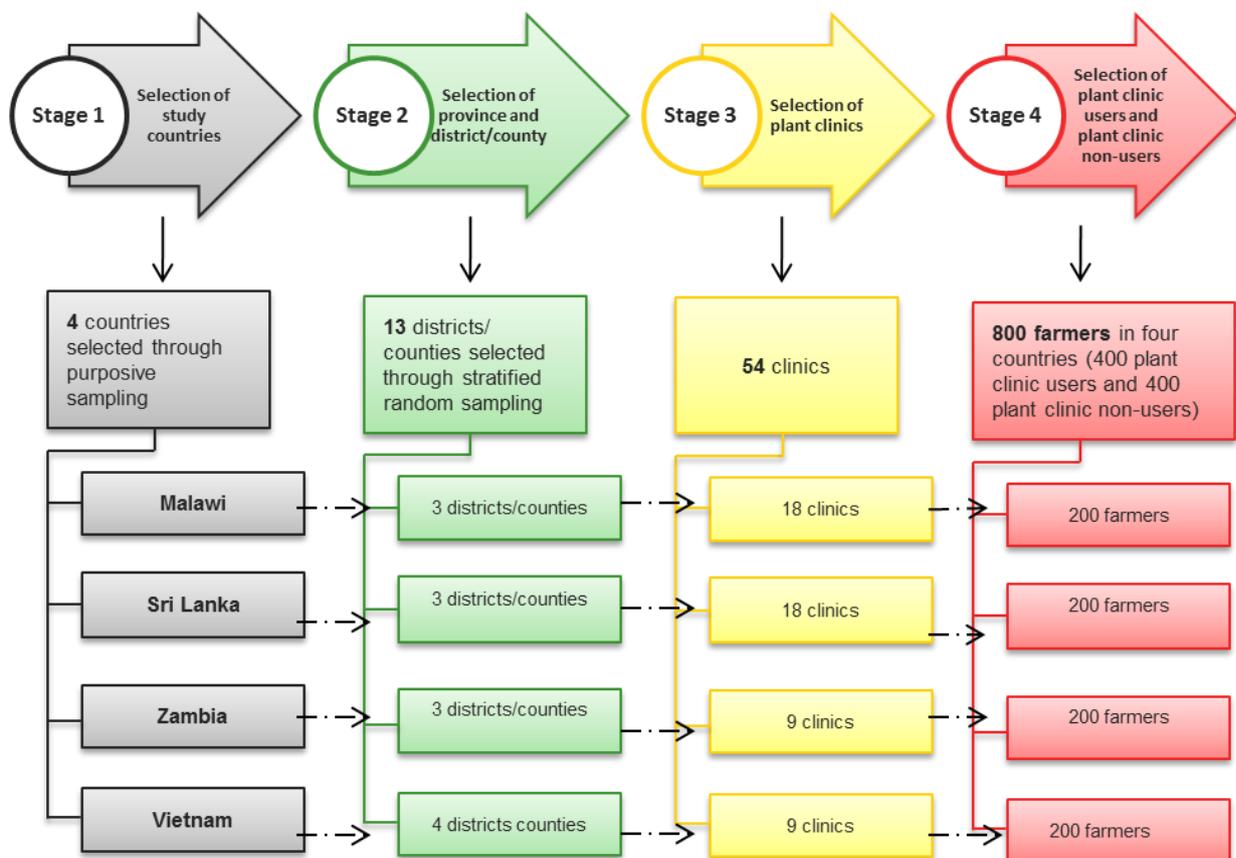
The sampling frame was prepared based on a review of available literature, meetings with the CABI team and detailed discussions with the partners in the countries. The sampling frame was further discussed with the country teams, and field work was initiated after finalisation of the sampling frame with all the partners. A standard formula was used to determine the sample size for the quantitative study from each domain:

$$n = \frac{Z_{2\alpha}(P) * (1 - P)}{d^2}$$

Where d is the difference between upper and lower limits of the interval estimate of 5% (0.05), which is standard, P is prevalence, i.e. the probability of the indicator to be measured, and n is the sample size. By custom, one wants 95% confidence ( $Z \geq 1.962$ ) so that the true value for an indicator would be within two standard errors of prevalence (P). The confidence level is assumed to be at 95% precision, 5% point ( $d = 0.05$ ).

The study comprised a number of indicators, and the prevalence of those indicators may have varied across the control and intervention groups. For a sample calculation, the study assumed a 50% prevalence rate in order to calculate a maximum size for the sample. Based on the above formula and the stated assumptions, the minimum sample size for each sampling domain was 384 (400) plant clinic users for all study countries. The sampled number of farmers was rounded up to 400 per domain. Similar numbers of plant clinic non-users were recruited using propensity score sheets. The sample size was allocated through a multistage sampling process as shown in Figure 4.

**Figure 4: Sample determination using a multistage process.**



## 2.3 Identification of Sample Farmers

**Treatment group:** Farmers for the treatment group, referred to as plant clinic users, were randomly selected from the Plantwise Online Management System (POMS) records database provided by CABI, with a total of four to eight participants per clinic.<sup>6</sup> The random selection ensured true representation of both male and female farmers. In some cases, this was not possible at every clinic. A sample of 100 plant clinic users was identified from the database covering plant clinic areas in each country.

**Control group:** The control group, referred to as plant clinic non-users, was identified using propensity score sheets. The propensity criteria included indicators such as land size, crop problems, size of the household and age of the farmer. Only farmers who scored at least 80% were included.

**Spill-over farmers:** Spill-over farmers were selected on the basis of the data provided by plant clinic users through the survey questionnaire. The PEDAs research team verified at least 20% of these farmers, who were in the catchment areas of the plant clinics. For example, if a clinic user claimed to have advised five farmers on the basis of the recommendations from the plant clinic, the PEDAs team made sure to randomly identify, contact and verify the information from at least one of these.

## 2.4 Coordination with Clients and Partners

The PEDAs research team met with a number of stakeholders including national and district agricultural officers, CABI country staff and other relevant partners to comprehend the nature of the programme implementation and to discuss the way forward for the studies. The meetings provided useful information and general understanding of the Plantwise programme. The opportunities and potential challenges in conducting the study were discussed candidly. The partners and CABI local staff agreed to help locate the clinics and the farmers during the implementation of the study.

## 2.5 Respondents

The key respondents of the research studies were mainly the direct and indirect beneficiaries of the plant clinics, who were termed as plant clinic users and spill-over farmers, respectively, and plant clinic non-users. These respondents were included in the quantitative strand of the study through participating in the farmers' questionnaire survey, and the qualitative strand through participating in the focus group discussions. The respondents in the key informant interviews included plant doctors, extension agents,<sup>7</sup> district/county level staff of the leading implementing organisations, agro-dealers and relevant professionals from research and academia.

The study tools were designed with a key focus on the four objectives of the research study. In consultation with the CABI team, PEDAs developed three tools for the study: a farmers' questionnaire, a focus group discussion questionnaire and a key informant interview checklist (see Table 1).

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<sup>6</sup> from the clinic sampled under stage 3 above

<sup>7</sup> Other than the plant doctors working with Plantwise programme

**Table 1: Tools used in the study**

<b>Tool</b>	<b>Details</b>
Farmers' questionnaire	<ul style="list-style-type: none"> <li>• This tool was devised keeping in mind the unique and cross-reference nature of the study objectives.</li> <li>• The four sections of the tool matched the four study objectives.</li> </ul>
Focus group discussion questionnaire	<ul style="list-style-type: none"> <li>• The focus group discussion questionnaire was devised according to the four study objectives but with open-ended questions and probing guidelines for the participants.</li> <li>• Focus group discussions were conducted with separate groups of plant clinic users (treatment) and plant clinic non-users (control).</li> <li>• The same tool was employed for both groups for easy comparison of the findings.</li> </ul>
Key informant interviews	<ul style="list-style-type: none"> <li>• The key informant interviews were semi-structured to help in analysing and triangulating the findings from the other two tools.</li> <li>• A wide array of respondents were engaged to gain local expert view and an independent opinion on the study objectives.</li> </ul>

## 2.6 Data Entry and Validation

The data entry operators for each country went through training to understand the tools, and were properly equipped with the skills to pinpoint and rectify any errors during data entry. Data entry was completed using MS Excel and was controlled to accept only pre-defined type of entries. The supervisor also conducted spot checks, where every 20th record was sampled and checked for possible errors. After data entry, frequencies were run to check for outliers and other data that did not make sense. A code was developed and ran to analyse the data. The code ensured that similar results were produced each time the code was run. The data analysis enabled in-depth understanding of the following factors:

- farmers' knowledge, attitude and practice
- motivators versus de-motivators for farmers' attendance at plant clinics
- barriers and challenges in the operation of the plant clinics
- farmers' preferences for plant clinic services
- cropping problems
- financial spending patterns on plant clinic services
- potential of farmers to contribute towards the plant clinic services
- characteristics of the plant clinic services

## 2.7 Study Limitations

Although no major limitations affected the results of these studies, managing the farmer survey within the given time was a big challenge. In Zambia, the study was initially designed to cover Lusaka, Central and Southern provinces, but Southern province was dropped owing to the challenges in accessing the full list of names of farmers to be sampled for the survey. Instead, the sample size was increased in the other areas of the study, notably Chongwe district. In some instances spill-over farmers could not be located, which made it difficult to verify the information that was provided by the plant clinic users.

In Sri Lanka, December and January are the busiest months for farmers as that is when they prepare for cultivation in the maha season. Therefore, farmers were reluctant to attend meetings during the daytime. Considering the time needed to locate farmers, organise meetings and travel to field locations, completing the data collection in 15 days was a challenge.

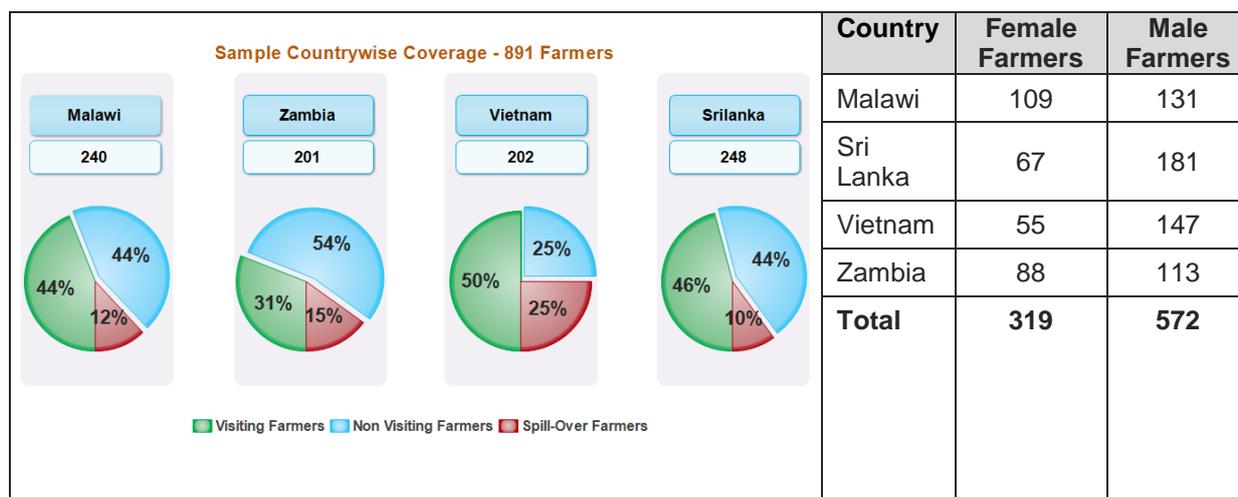
In Vietnam, data collection within a short time was also a challenge. The blanks and non-responses observed in some of the questionnaires can be attributed to that factor.

### 3. Findings, Analysis and Discussion

#### 3.1 Demographic Characteristics of Sampled Farmers

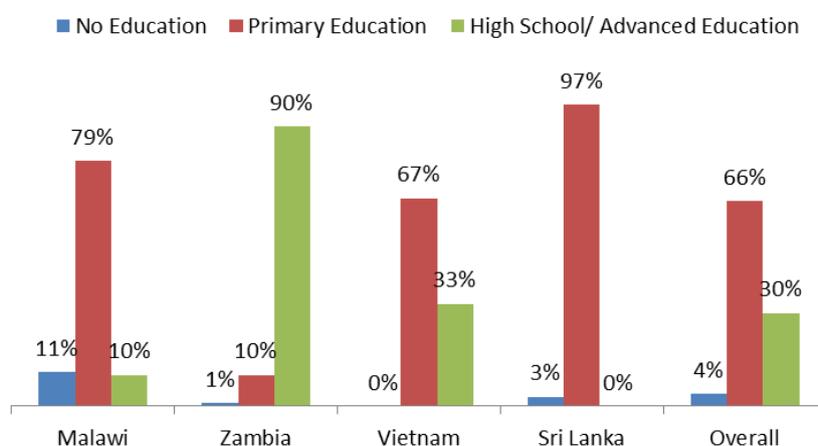
The total sample for all the four project countries was 891 farmers, 240 in Malawi, 201 in Zambia, 202 in Vietnam and 248 in Sri Lanka (Figure 5). Gender segregation of the sample was 64% male and 36% female. The respondents were selected from different age groups for better assessment and broader coverage of the population to determine the impact of the project on the different age groups. About 10% of the respondents were up to 30 years of age, 23% were aged 31–40 years, 29% were 41–50 years old, 23% were 51–60 years old and 14% were more than 60 years old.

Figure 5: Sample coverage in the study countries



Among the sampled farmers 66% had primary education and about 30% had high school education (Figure 6). The majority of farmers in all the countries were educated and very few were illiterate. There were no illiterate farmers in Vietnam, and only 3% of the farmers were illiterate in Sri Lanka. Malawi had the most illiterate farmers, at 11% of the sampled farmers.

Figure 6: Respondents' education.



Among the respondents, 36% had 1–2 acres of land, and only 17% had more than 8 acres (Table 2). A large majority of 97% of the farmers owned the land they cultivated and only 3% rented it. In Vietnam and Sri Lanka 100% of the farmers owned their land.

**Table 2: Respondents' land size (% of farmers owning land)**

Land size	Malawi	Zambia	Vietnam	Sri Lanka	Overall
1–2 acres	63	5	17	54	36
3–4 acres	24	13	32	30	25
5–6 acres	6	12	26	10	13
7–8 acres	2	13	14	3	8
More than 8 acres	5	57	10	2	17

## 3.2 Specific Findings

### **Objective 1: Clinic attendance, barriers and drivers, gender spaces, ethnic diversity**

The majority of the farmers interviewed, regardless of whether or not they used the plant clinics, were of the opinion that the current set-up of the plant clinics, both their physical and organisational arrangements, was favourable and conducive to their attendance there. They overwhelmingly disagreed that factors like clinic location, sitting arrangements etc. in any way affected their ability to attend the plant clinics. The majority of them also did not see any evidence of discrimination in the provision of services at the plant clinics based on age, race or tribe, economic status, or gender. Furthermore, even after admitting that in some areas there was evidence of natural hazards, they still did not think that these were in any way fundamental in influencing attendance at the plant clinics. The main issue, though, that kept coming up from the farmers interviewed was that distance to the plant clinics was quite long and was a challenge for most farmers to access the plant clinic services. Also the frequencies of the plant clinics were considered inadequate.

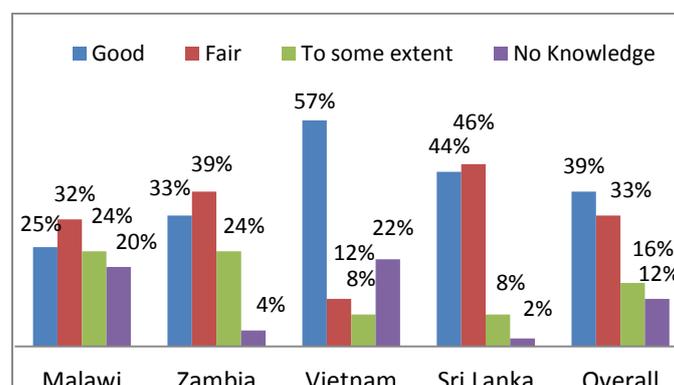
### **Awareness and information factors**

This section looks at the knowledge base of the farmers and how and where that knowledge may have been acquired. We also capture farmers' perceptions about the plant clinic services.

#### **Knowledge about crop problems**

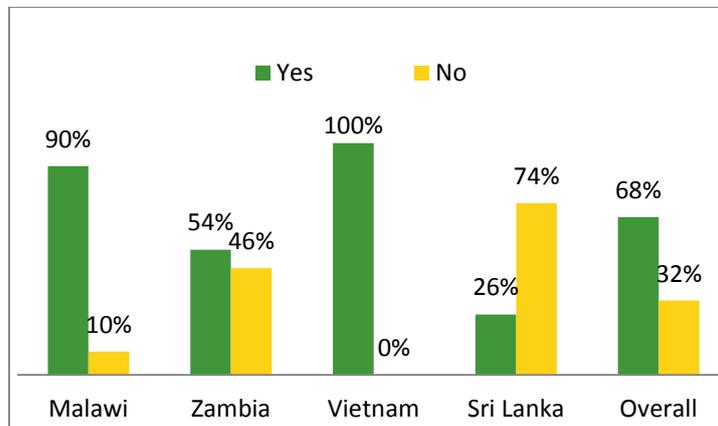
For the majority of the plant clinic users and spill-over farmers, the knowledge levels on crop problems and their solutions was either good or fair. Some 12% of all plant clinic non-users had no knowledge of solutions to their crop problems, while for 16% that level was "to some extent" (Figure 7). Vietnam had the most farmers with no knowledge of their crop problems. This could be mainly because of poor local extension services and improper sensitisation on the plant clinics and their services that could enhance crop knowledge of farmers. This appears to be an indication that visiting plant clinics improves farmers' knowledge about solutions to their crop problems.

**Figure 7: Farmers' knowledge about solutions to crop problems**



The majority of the farmers were satisfied with the information material they received from the plant doctors. Sri Lanka had the most farmers, who were dissatisfied with the information and information material provided by the plant doctors at 74%, (Figure 8). This dissatisfaction could be due to lack plant doctors' awareness about the information material and/or non-availability of the material.

**Figure 8: Farmers' satisfaction with information material from the plant clinics**

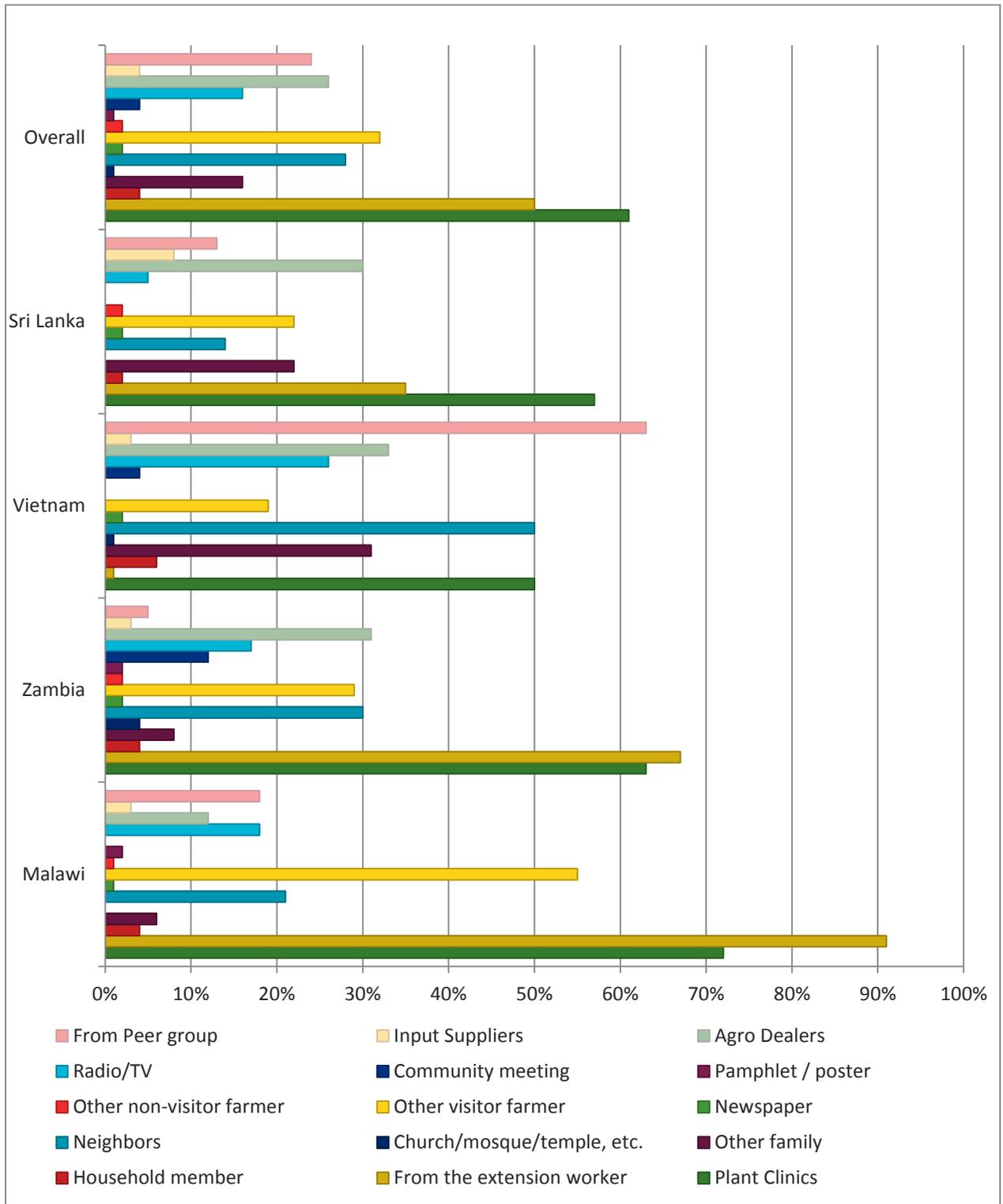


**Source of knowledge and information and perception on the clinics**

Figure 9 shows the most important sources of knowledge for farmers. Plant clinics formed the largest source of knowledge for the plant clinic users, and 61% of the farmers considered them their main source of knowledge. Next were extension workers, on whom 50% of the farmers relied as a source of knowledge. For 32% of the farmers, other farmers were the most important source of knowledge, but these were particularly important in Malawi, where the level was 55%.

In Vietnam only 19% of the farmers relied on their counterparts as a main source of knowledge, but neighbours were their main source at 28%. Spill-over farmers relied on neighbours for knowledge the most. Agro-dealers were an important source of knowledge for 26% of the farmers. They had been involved in the communities for long so many people trusted them and found them reliable for crop knowledge. About 16% of the farmers used the radio and television as major information sources. Previously no information was broadcasted through TV or radio but more recently, the government has tried to create awareness among farmers about crop problems through radio & TV. In Sri Lanka only 5% of the farmers relied on radio and television as a source of knowledge.

Figure 9: Reported sources of information for farmers

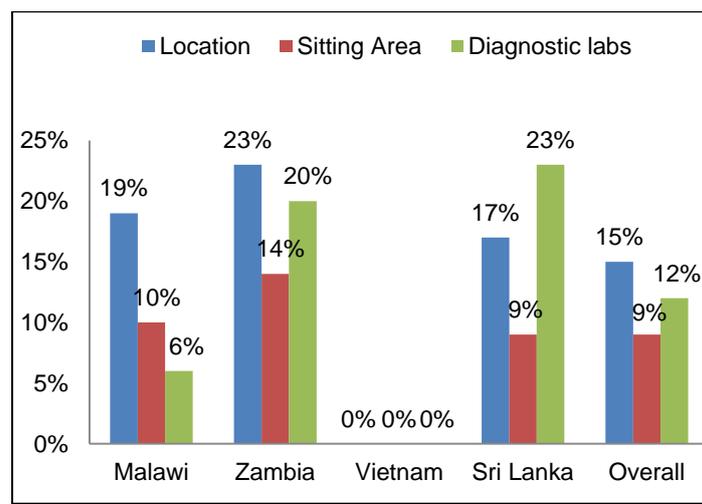


## Clinic quality factors

### Location and sitting area of the clinics and diagnostic labs

It was observed that 85% of the farmers did not find the location or sitting area or the existence of diagnostic laboratories as a factor in their attendance at a plant clinic (Figure 10). Only 15% of the respondents found these to be drivers to visit the clinics. None of these factors were important for farmers in Vietnam, while for 23% of the farmers in each of Sri Lanka and Zambia, diagnostic laboratories were an attraction to visit the clinics. The sitting area was a driver for clinic attendance for 9% of the farmers.

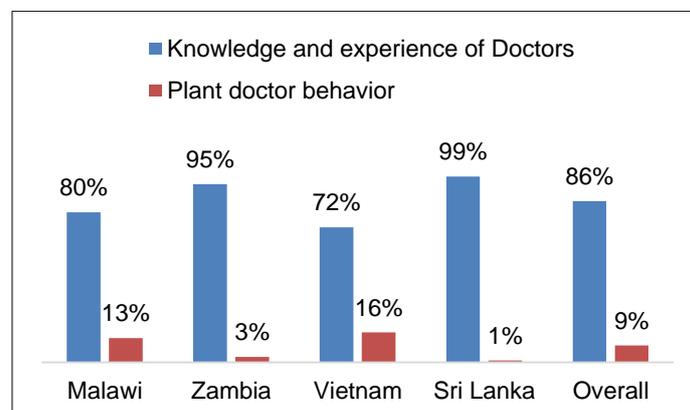
**Figure 10: Farmers who were drawn to the plant clinics by their location, sitting area or diagnostic labs**



### Knowledge and attitude of clinic staff

Figure 11 shows the respondents' views on the value of the knowledge, experience and attitude of plant doctors in attracting farmers to the plant clinics. For 86% of the farmers the knowledge and experience of the plant doctors were drivers for clinic attendance. Sri Lanka had the most farmers with this view, at 99%. These farmers considered the plant doctors to have acquired special training to be in the programme and to have extensive experience in the field. Farmers in Zambia had scores close to those of Sri Lanka, but neither country considered the attitude of the plant doctors as an attraction. Vietnam and Malawi had a few farmers who viewed the attitude of the plant doctors as a driver in clinic attendance.

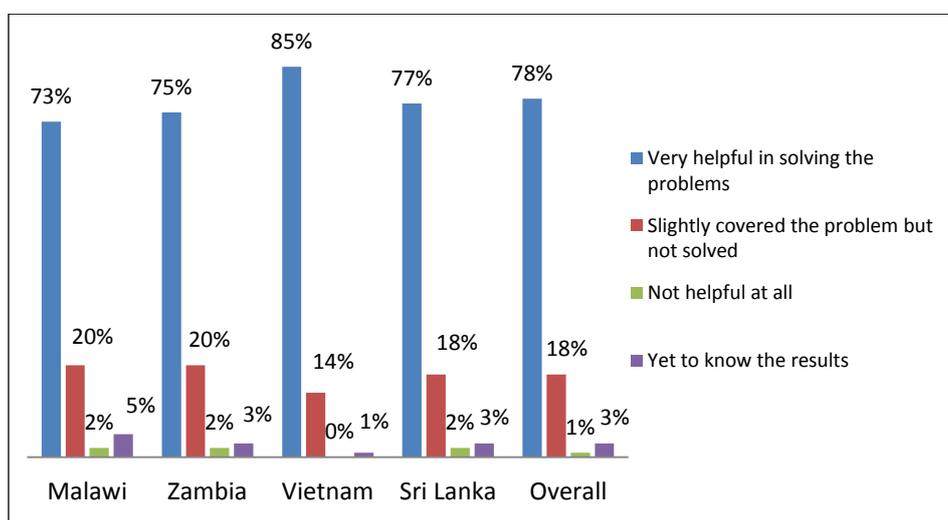
**Figure 11: Knowledge and attitude of plant doctors as factors in clinic attendance.**



## Effectiveness of the plant doctors' advice and rating of plant clinic experiences

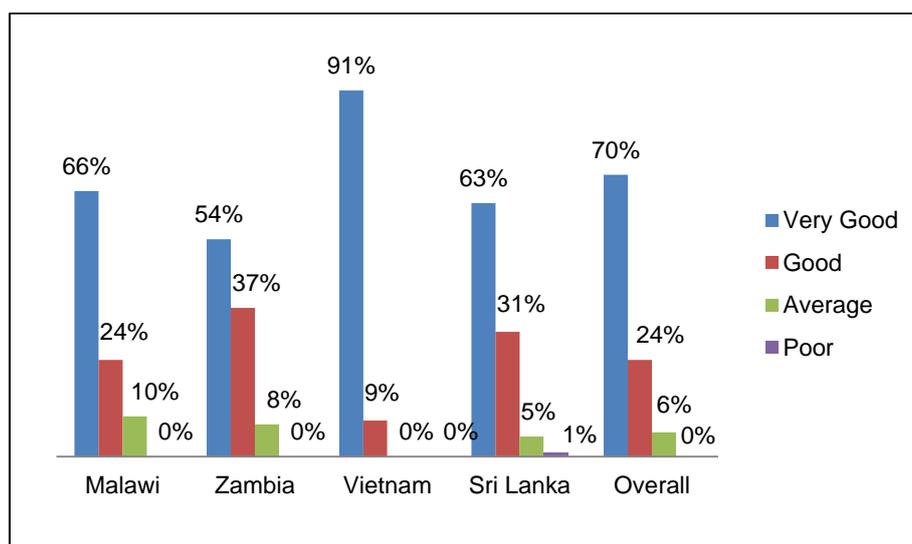
A majority of 78% of the respondents found the advice from the plant clinics very helpful in solving their crop problems, whereas for 18% of the farmers the advice received only slightly helped with the problem and 3% were awaiting the results to know whether the recommendations had solved the problem or not (Figure 12).

**Figure 12: Usefulness of the plant clinic advice in solving the crop problem**



70% of the farmers rated their experience with the plant clinics as very good, 24% regarded it as good and 6% considered it average (Figure 13). Only in Sri Lanka did some respondents rate the experience as poor. This might have been due to the lack of trained plant doctors there.

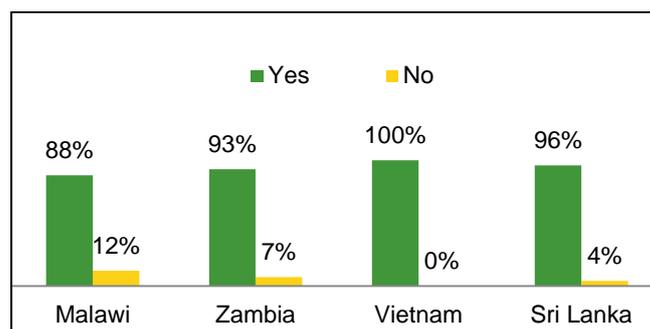
**Figure 13: Rating of the visit to the plant clinic**



## Availability of the recommended products/services

Overall, 96% of the farmers stated that the products recommended by plant clinics were easily available (Figure 14). However, 12% of the respondents in Malawi, 7% respondents in Vietnam and 4% respondents in Sri Lanka were not satisfied and that they had problems in getting recommended products or the recommended products were not easily available.

**Figure 14. Availability of the recommended products**



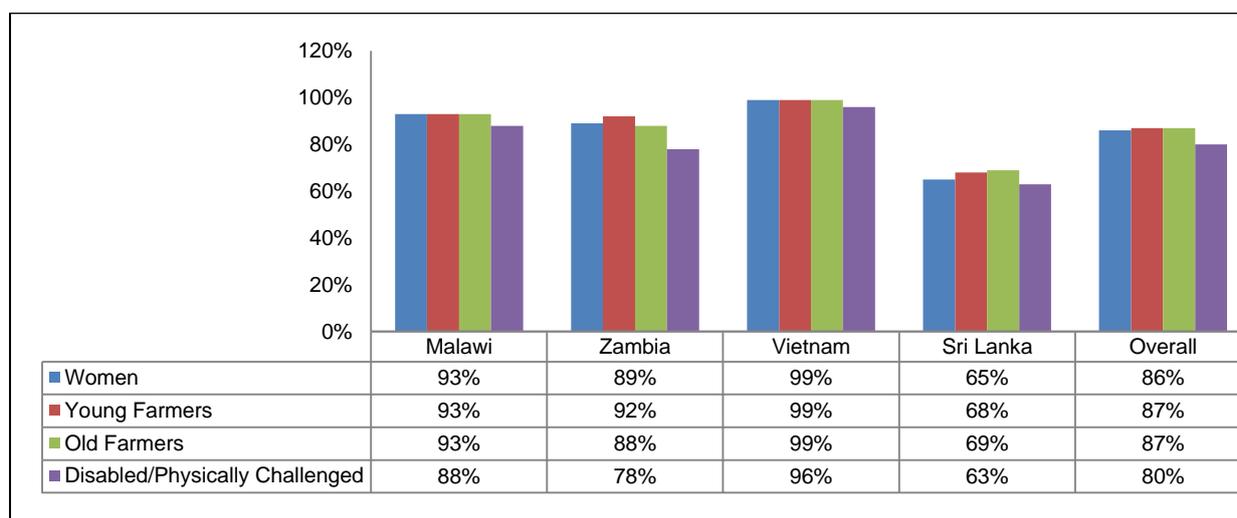
### Socioeconomic and cultural factors

The socioeconomic and cultural factors evaluated for their influence on farmers’ decisions to attend or not attend the clinics included accessibility of the plant clinic services by different gender and ethnic groups, stigma from poverty, economic or wealth egoism, cost associated with access to the clinics and availability of other or even better options.

#### Accessibility to plant clinic services by women, young and old farmers and farmers with physical disabilities

Figure 15 shows that generally the respondents believed that everyone had easy access to the plant clinics regardless of their gender, age or physical condition. According to 87% of the respondents, young and old farmers alike had no barriers to their attendance at the clinics. For 80% of the farmers, people with a physical disability could access the clinics easily. Although some plant clinic non-users were of the view that plant clinics were not easily accessible to these groups of farmers, this view was seen to be associated with their lack of awareness of the Plantwise programme and its services.

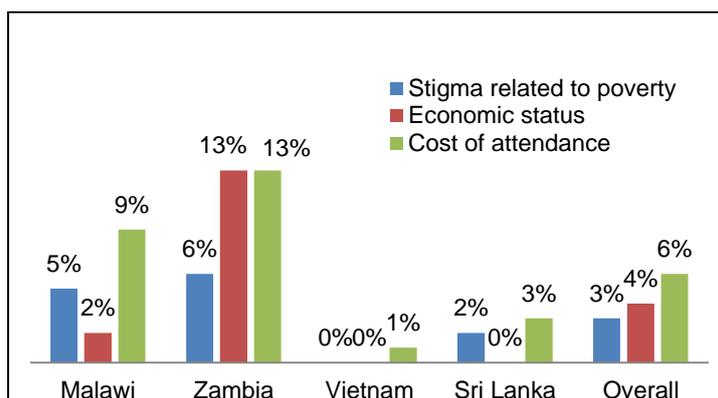
**Figure 15: Ease of access to the plant clinics by women, young and old farmers and farmers with physical disabilities**



#### Poverty stigma, economic or wealth egoism and cost of accessing the clinics

In general, only a few respondents felt that poverty stigma, the economic status of the farmer or cost were barriers to access to the clinics. Only in Zambia did relatively substantial numbers of farmers consider clinic attendance to be affected by a farmer’s economic status and to be costly (Figure 16). This was the view of plant clinic non-users, who had never visited the clinics and did not have any idea of how they worked.

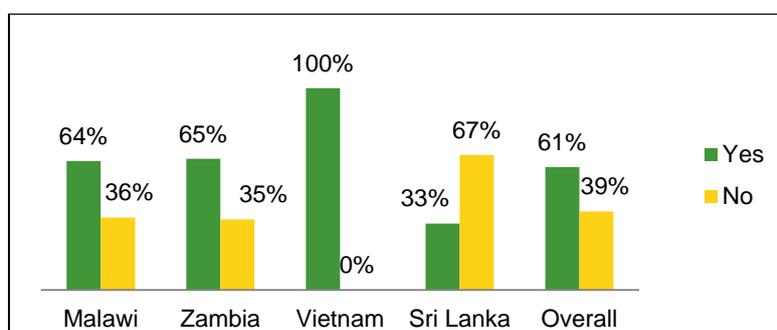
**Figure 16: Socioeconomic factors in attendance at the plant clinics**



**Availability of other or even better extension service options**

Overall, 61% of plant clinic non-users were satisfied with the local extension services. They regarded them as better than plant clinics. All the plant clinic non-users in Vietnam were of this view (Figure 17).

**Figure 17: Availability of other or even better extension services than plant clinics**

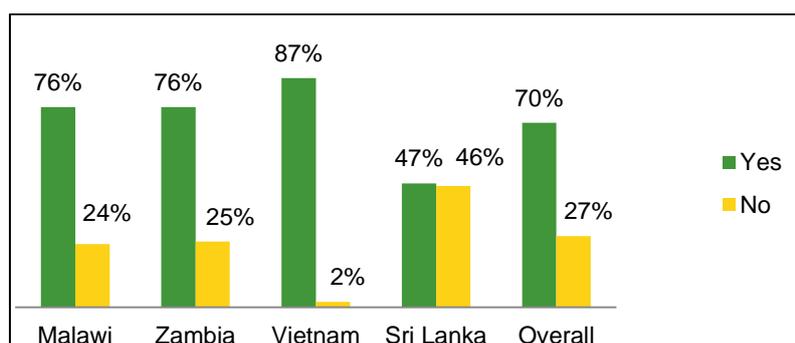


**Natural factors**

**Suitability of the clinic place and timing with social and climatic conditions**

For 70% of the farmers, clinic timings and place were suitable to the climatic conditions (Figure 18). In Sri Lanka 46% of the farmers stated that the timings of the clinic were unsuitable, as the clinics were held once a month and normally during the day time when farmers were busy with household activities. But this was not the case, and the meetings were held in evening when everyone could attend. The respondents who regarded the timing as a problem were probably not aware of the plant clinic schedule.

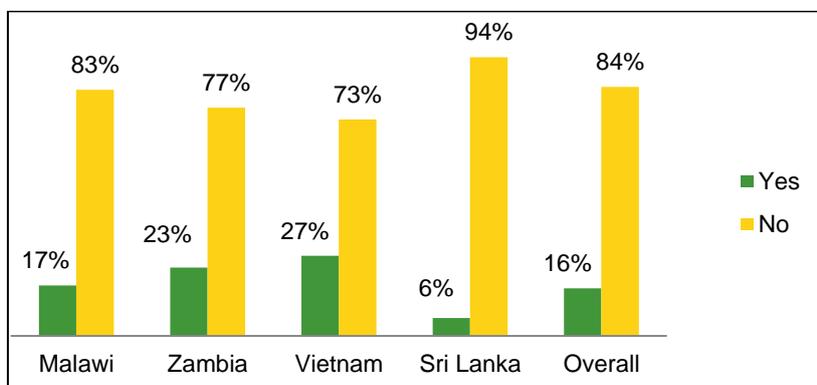
**Figure 18: Clinic timing and place suitability to the social and climatic realities.**



## Natural hazards

For 84% of the respondents there were no natural hazards to bar clinic attendance (Figure 19). The respondents who mentioned hazards as a barrier were concerned about flooding, heavy rain and cyclones, which could affect clinic attendance.

Figure 19: Natural hazards and clinic attendance



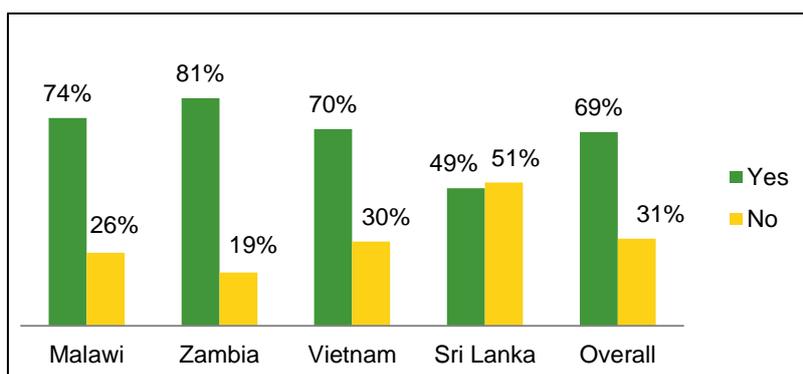
## Personal factors

Personal factors included suitability of clinic frequency and timing with a farmer's routine, language, and communication as drivers or barriers to a farmer's attendance at the clinics.

### Suitability of clinic frequency to farmers' routine

For 69% of the farmers, the clinic frequencies were suitable to their routine (Figure 20). Zambia had the highest number of farmers with this view. Mostly their clinics were held once in a month and in the evening when most farmers were free from their household responsibilities.

Figure 20: Clinic frequency suitability to farmers' routine



## Objective 2: Change in farmers' knowledge, practices, yield, and livelihood

### Knowledge, attitude and practice

Comparison was made of plant clinic users and non-users' knowledge, attitude and practice attributes using key impact indicators such as crop production, crop yield, quantity of food intake, household crop income, and overall quality of life. The results outcomes under this objective were the perceptions the farmers shared during the interviews. The research team did not test them.

## Crop productivity

In terms of change in crop productivity, 65% of the plant clinic users saw an increase, 8% had no change, 4% saw a decrease and 23% could not tell if there had been any change (Table 3). For plant clinic non-users, 23% had an increase in crop productivity, 34% no change, 18% a decrease and 25% could not tell. Over two-thirds of the farmers in Sri Lanka, both clinic users and non-users, could not tell if crop productivity had changed.

*Table 3: Level of change in crop productivity*

		Malawi	Zambia	Vietnam	Sri Lanka	Overall
<b>Visitors</b>	Can't say anything	8%	0%	0%	69%	23%
	Decreased	5%	7%	5%	0%	4%
	No Change	10%	12%	15%	0%	8%
	Increased	54%	73%	64%	31%	53%
	Highly Increased	24%	8%	17%	0%	12%
<b>Non Visitors</b>	Can't say anything	14%	2%	12%	66%	25%
	Decreased	39%	14%	4%	8%	18%
	No Change	29%	36%	55%	26%	34%
	Increased	16%	48%	29%	0%	23%
	Highly Increased	2%	1%	0%	0%	1%

## Crop yield

For 62% of the plant clinic users, crop yield rose, for 4% it decreased and for 11% it did not change. Some 23% could not tell whether there had been change. Crop yield went up for 22% of the plant clinic non-users, stayed the same for 37% and decreased for 17%. The change could not be determined by 24% of the respondents (Table 4).

*Table 4: Level of change in crop yield*

		Malawi	Zambia	Vietnam	Sri Lanka	Overall
<b>Visitors</b>	Can't say anything	7%	3%	1%	69%	23%
	Decreased	4%	8%	7%	0%	4%
	No Change	13%	15%	18%	0%	11%
	Increased	48%	68%	60%	31%	49%
	Highly Increased	29%	5%	15%	0%	13%
<b>Non Visitors</b>	Can't say anything	10%	1%	12%	67%	24%
	Decreased	40%	14%	4%	4%	17%
	No Change	33%	36%	61%	28%	37%
	Increased	15%	46%	22%	1%	21%
	Highly Increased	2%	3%	0%	0%	1%

## Household crop income

Household crop income rose for 62% of the plant clinic users, for 12% of them highly, declined for 5%, stayed the same for 8% and could not be determined for 24%. Among the plant clinic non-users, 32% had an increase, 29% had no change, 16% saw a decline and 23% could not tell if there had been a change (Table 5).

*Table 5: Change in household crop income*

		Malawi	Zambia	Vietnam	Sri Lanka	Overall
<b>Visitors</b>	Can't say anything	7%	10%	0%	69%	24%
	Decreased	8%	5%	8%	0%	5%
	No Change	6%	22%	12%	0%	8%
	Increased	58%	52%	64%	31%	50%
	Highly Increased	22%	12%	17%	0%	12%
<b>Non Visitors</b>	Can't say anything	11%	3%	0%	66%	23%
	Decreased	38%	11%	16%	0%	16%
	No Change	30%	35%	33%	21%	29%
	Increased	19%	48%	51%	14%	30%
	Highly Increased	2%	4%	0%	0%	2%

## Overall quality of life

The overall quality of life improved for 58% of the plant clinic users, worsened for 3% and did not change for 17%. The change could not be determined for 22% of the clinic users (Table 6). Some 31% of the plant clinic non-users saw an improvement in the overall quality of life, 14% a decline, 34% no change and 22% could not tell if there had been any change. The change in the quality of life is determined by many qualitative variables, and factors that were outside the scope of this study might have contributed to the change in life aspects.

*Table 6: Change in the overall quality of life*

		Malawi	Zambia	Vietnam	Sri Lanka	Overall
<b>Visitors</b>	Can't say anything	7%	0%	0%	69%	22%
	Decreased	1%	7%	8%	0%	3%
	No Change	7%	20%	9%	31%	17%
	Increased	66%	62%	66%	0%	46%
	Highly Increased	20%	12%	18%	0%	12%
<b>Non Visitors</b>	Can't say anything	9%	3%	2%	65%	22%
	Decreased	32%	9%	12%	0%	14%
	No Change	38%	35%	37%	27%	34%
	Increased	19%	49%	49%	8%	29%
	Highly Increased	2%	5%	0%	0%	2%

There is a very sharp contrast between plant clinic users and non-users, which seems to underscore the value of plant clinic services for farmers. They are more knowledgeable, they communicate their crop problems better if they encounter any and they are reaping benefits through increased crop production both in quantity and quality. An interesting observation is

that an unusual proportion of plant clinic users also stated that incidences of disease had increased. This could be a reference to some disease outbreaks that had been reported in bananas and tomatoes. Further investigation into this may be required. The chi-square test reveals that there was significant difference between plant clinic users and non-users in all parameters. This is reflected in the p-value of 0.000 being lower than the threshold of 0.05. The results confirm that the benefits for plant clinic users made them significantly better off than plant clinic non-users. In other words, the differences between the two categories of farmers were real and were not due to any form of chance.

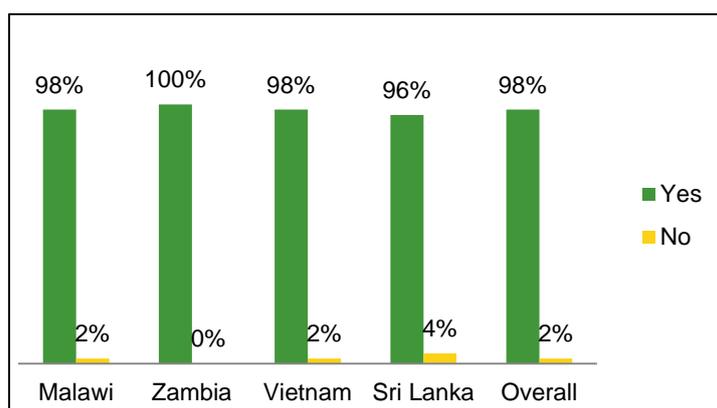
### **Objective 3: Farmers' satisfaction with plant clinic advice and willingness to pay**

Under this objective the study assessed the extent to which farmers were satisfied with the services provided at the plant clinics and the extent to which these farmers would be willing to pay for these services, which is important for the sustainability of the programme.

#### **Farmers' satisfaction with plant clinics**

Over 98% of the plant clinic users were satisfied with the advice they received for their crop problem (Figure 21). It would have been good to know the reasons why the 2% of the clinic users were not satisfied with the advice from the plant doctors. Unfortunately, that information was not collected.

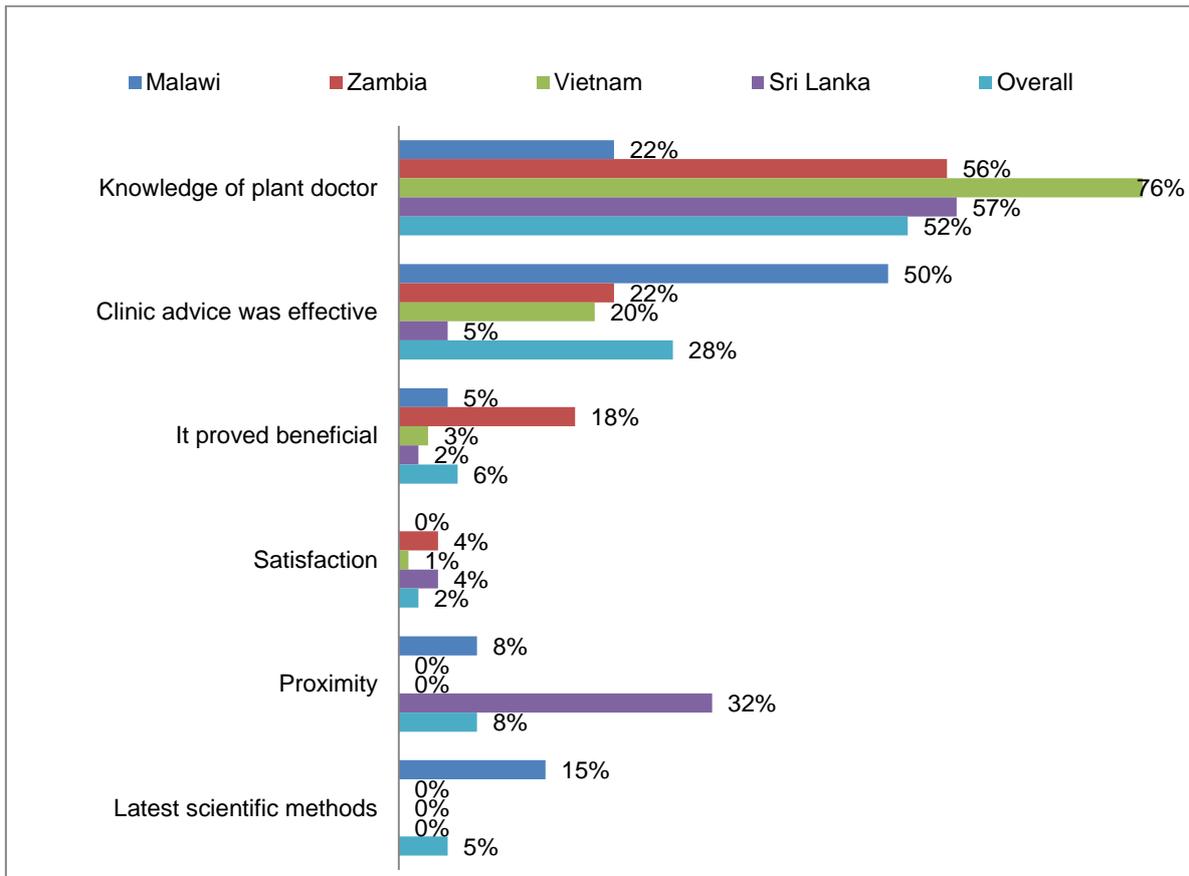
**Figure 21: Farmers' satisfaction with the advice for the crop problem**



When asked whether they would be willing to visit the plant clinics again, 99% of the plant clinic users answered in the affirmative. The levels for this among the countries were 100% in Zambia and Vietnam and 99% in Malawi (Figure 22). Broken down by gender, this was 100% for the males and 98% for the females. When the same question was asked to the spill-over farmers, 90% of them (with the male ratio at 91% and the female ratio at 86%) stated yes, they would visit the plant clinic.

The knowledge and experience of the plant doctors were the reason 52% of the farmers wished to visit the plant clinics again, while for 28% of the farmers it was the recommendations from the plant doctors, which were very helpful in solving their crop problems. The other factors had relatively low scores.

**Figure 22 Reasons farmers wished to visit the plant clinics again**

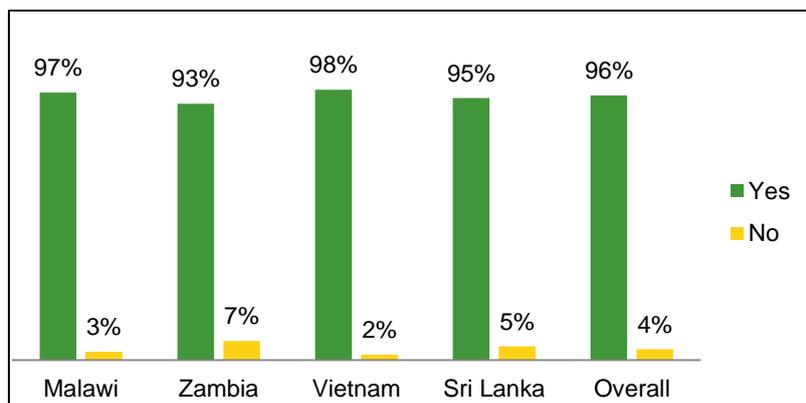


### Whether plant doctor suggested the use of cultural practices

The study also looked into whether the plant doctor suggested the use of cultural practices. These types of extension advice formed the bulk of the prescriptions, as 96% of the plant clinic users considered their advice from the plant doctor as a cultural practice (Figure 23). This connects with the finding that the farmers regarded the recommendations from the clinics to be more preventive than curative.

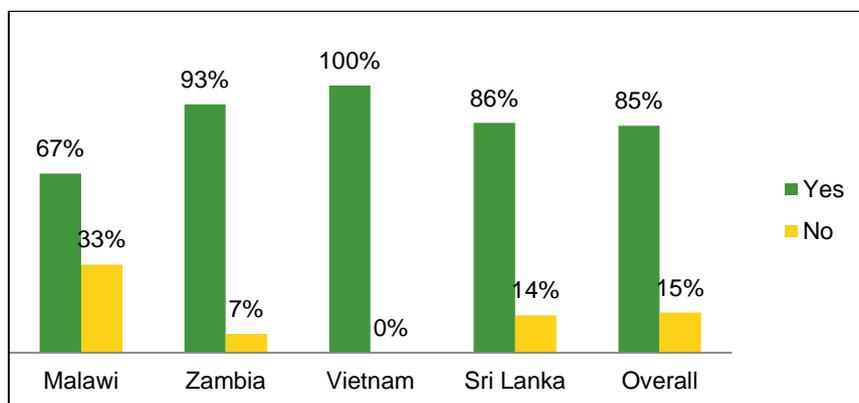
While the preventive services were larger in proportion, they were not always popular. In one focus group discussion, a female farmer referred to the advice she received from a plant doctor to uproot her bananas as unpalatable. Like with any other clinic, plant clinics may make prescriptions that might not always be pleasant.

**Figure 23: Whether the plant doctor recommended cultural practices**



For 85% of the farmers, the plant doctors suggested the use of chemicals to address the problem that they had presented at the clinic (Figure 24). The chemicals mentioned were Cypermethrin, Dimethoate, Acephate, Sevin, Karate, Dithane M45, Copper Oxychloride and weevil kill. Agro-dealers mentioned Nova Actellic, Round Up, Bullet, Harness, Daconil, and Carbaryl as additional chemicals that farmers had been buying.

**Figure 24: The plant doctor recommended the use of chemicals.**

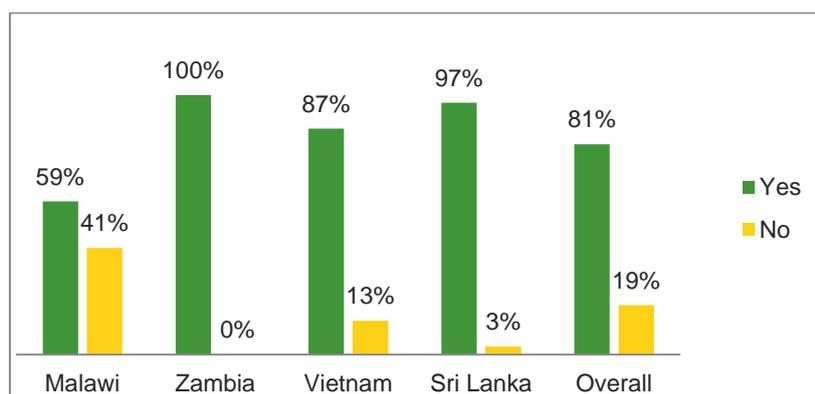


Given the numbers of farmers stating they have received cultural and chemical recommendations it is possible that plant doctors were recommending both options to the farmers, chemical as a quick fix, and cultural as a longer term solution. This was not investigated further during the survey.

### Willingness of farmers to pay for plant clinic services

Overall, 81% of the plant clinic users were willing to pay for clinic services (Figure 25). The reason 61% of these farmers were willing to do this was that they were satisfied with the services, while for 14% it was that the services proved to be effective. Other reasons included that the advice had helped improve income, that the services were valued etc.

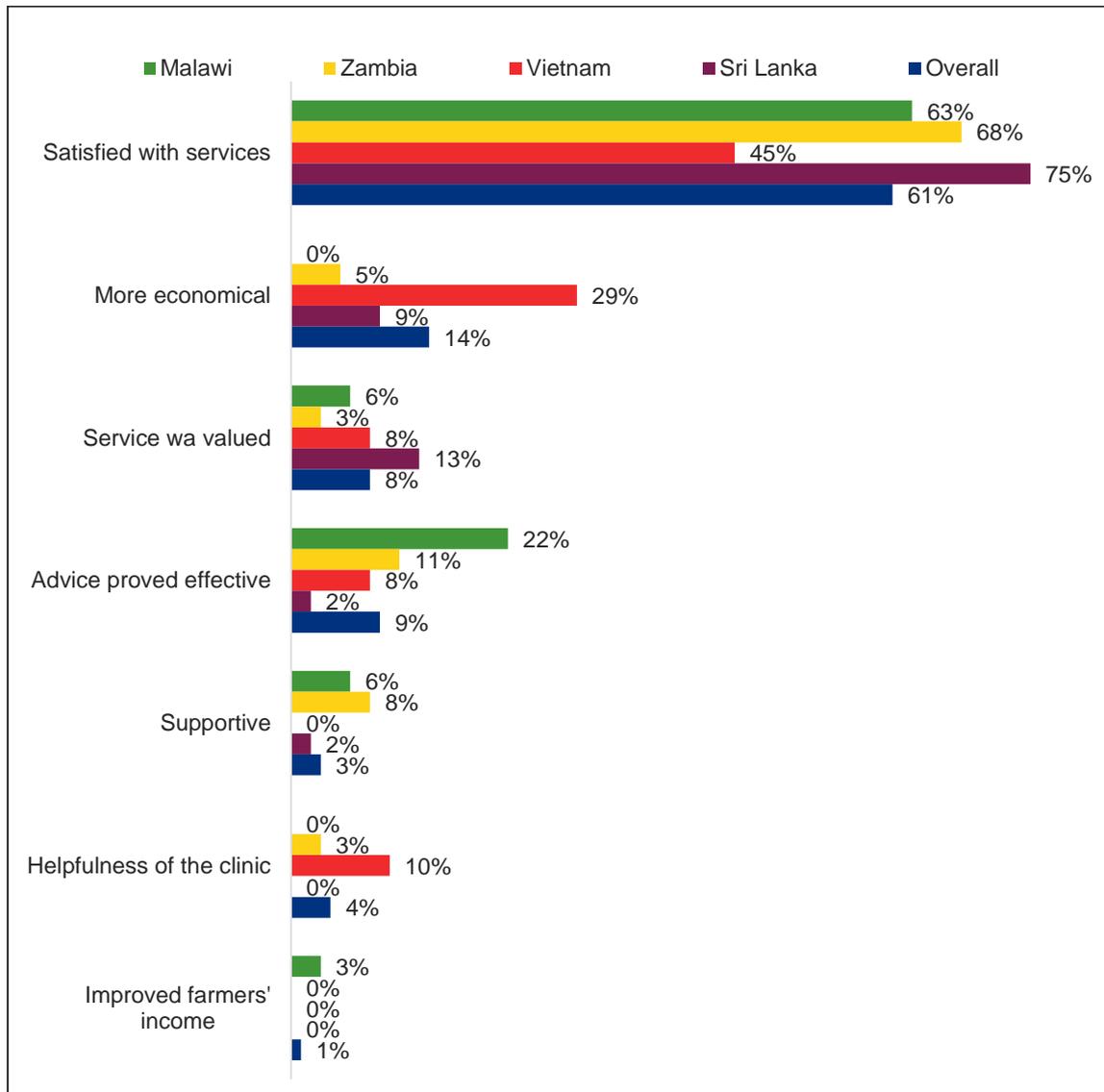
**Figure 25: Farmers willing to pay for clinic services**



In Zambia, 56 farmers said that they would be willing to pay for plant clinic services, with their fee suggestions ranging from US\$0.45 to US\$4.55 per visit, and the average at US\$1.63. In Sri Lanka, 98% of the farmers were willing to pay for the services, simply because they were very satisfied with the services. Of the 58 respondents, 69% suggested Rs 100–Rs 200 (about US\$1–US\$2), 19% suggested up to Rs 500 (US\$5), and 12% suggested Rs 500–Rs 1,500 (US\$5–US\$15). In Vietnam 81% of the farmers were willing to pay for the services. They compared plant clinic services to veterinary services, for which they did pay when their livestock or pets fell ill. They suggested a minimal fee of about US\$1

per visit to be paid monthly if the farmers are many. All the farmers in Sri Lanka agreed that there was need for a fee for each visit to the plant doctor, which would be enough to cater for the doctor’s transport at a minimum.

**Figure 26: Reasons farmers were willing to pay for clinic services**

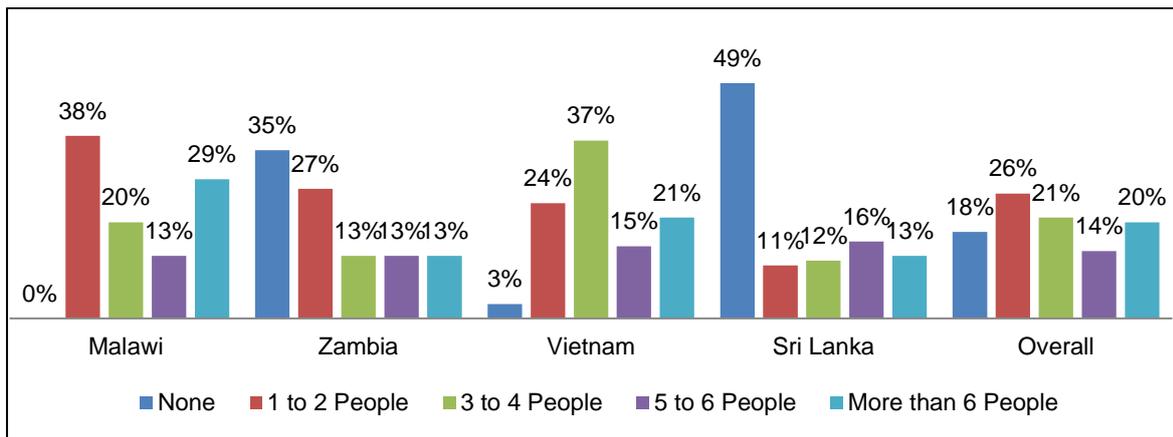


**Objective 4: Spill-over formulae at the country and programme levels**

All the spill-over farmers were satisfied with the advice that they had received from the clinic users, which had solved their crop problems or helped to manage them. Also 90% of them indicated that they would want to visit the plant clinics themselves instead of getting the messages from other people.

The numbers of spill-over farmers that the plant clinic users shared the plant clinic advice with are shown in Figure 27. On average each plant clinic user shared the clinic advice with three spill-over farmers. The largest proportion of the plant clinic users of 26% shared the information with 1–2 spill-over farmers. Some 95% of the spill-over farmers indicated that the advice from the plant clinic users was very helpful in solving their crop problems.

Figure 27: Number of farmers with whom clinic users shared plant clinic advice



### 3.3 Findings from Focus Group Discussions and Key Informant Interviews

- Farmers who were not using the clinic services ranged between 30% and 70%. Their reasons for not doing so included (1) overcrowding in meetings, which meant that the peer group served by the clinic was given priority, (2) the clinic days were not clear, (3) farmers preferred to receive information from plant clinic users, and (4) farmers lacked the skills to describe the crop problem to the plant doctor.
- Farmers indicated that after the introduction of the plant clinics, they experienced an increase in crop yields and productivity of 20–50% owing to an input decrease of 20–30%. Farmers required a bigger investment in time and effort, but since most of the farms were household size, the farmers did not care much about the time and effort. The input decrease and productivity increase were considered successes.
- Input decreases resulted from (1) the plant doctors' encouragement of the farmers to use biological fertilisers, which are environment friendly, and decrease chemical fertilisers, especially the hazardous types, although chemicals were promoted by their manufacturers and sellers, and (2) the plant clinics led farmers to adhere to the three-rights principle of right medicine, right time and right dose. The farmers showed a higher appreciation of plant doctors' than agro-dealers' prescriptions.
- Technical challenges existed in the referral of samples from the plant clinics to the laboratories, where the results were delayed or not returned at all. The delay was in the excess of five months in some cases.
- There is low coverage of the plant clinics despite the high demand for their services. The clinic services could be cut down during the low season for cropping and increased during the high season. This will be difficult, though, because there are few plant doctors available.
- There is not enough publicity about the services of the plant clinics and therefore farmers end up using extension workers. In some cases the extension worker and the plant doctor is the same person.
- Poor farmers sometimes do not visit the plant clinics because they are concerned about what to wear for the meetings and sometimes cannot afford the fare to the plant clinics.
- In areas where most of the plant clinic users cultivate only horticultural crops, clinic attendance has gone down because the poor rainfall, which has led to low water levels and in some cases drying up of streams, has forced farmers to abandon their gardens.

- In some cases fact sheets are not sufficient at the clinics, which makes it difficult to identify diseases together with the farmers. This affects farmers' appreciation of the services of the plant clinics.
- It takes a lot of time to fill the prescription form while there is not enough time to discuss the crop problems with farmers.
- Plant doctors would like to undergo refresher training to stay current with the developments in the field and to provide relevant solutions to the farmers' problems. In addition, there is need to train more plant doctors to handle the mobile clinic services as well as those handling the clinics who have not received any formal training in their operation.
- The Plantwise online information resources are a good initiative but some of the pictures on the website do not show the diseases as the farmers see them on the crops. Internet connectivity does not exist in most clinics.
- Plant clinic staff lack transport to facilitate the delivery of plant clinic services to farmers living in the periphery of the villages or communities.
- Provision of pesticides is not incorporated into the Plantwise programme, so there is need to partner with agro-dealers to sell chemicals during clinic days.
- The programme should continue using the existing facilities and staff provided by the Ministry of Agriculture to reduce plant clinic expenditure. The plant clinic concept has been institutionalised, to a certain extent, in the extension system and has a full structure in place. The programme is currently running with minimal support and is considered as part of Ministry of Agriculture.

## 4. Conclusion, Challenges and Recommendations

An important aspect of the Plantwise programme is that it is widely accepted as being relevant. The government, non-governmental organisations and farmers alike are buying into its philosophy and operational approach. It is generally accepted by various key informants interviewed that the Plantwise programme is well placed and in line with the governments' agriculture strategies and anchored in their policy initiatives. Despite the extremely encouraging picture, Plantwise faces operational and programme level challenges:

- **Low coverage:** Owing to the low numbers of plant doctors, the clinics were quite sparsely located. Also the frequency and timing of the clinics were major barriers to their attendance. This meant that many farmers had to travel long distances to attend plant clinics. Focus group discussions in Malawi noted that some farmers had to travel up to 19 km one way. In Vietnam the limitation of plant doctors' working hours meant that the clinics were quite sparse. This resulted in many farmers having to travel long distances to attend plant clinics. Because of overcrowding at the plant clinics, farmers living outside of the plant clinic's community found it hard to get a consultation with the plant doctors. Moreover, each clinic located in a community was set up to serve only the growing area for the specified crop such as pomelo, durian or longan. In Zambia the plant clinic programme had limited coverage owing to its central operation approach, and hence low visibility among smallholder farmers that were intended to be its direct beneficiaries. In Sri Lanka awareness and publicity were not adequate at farmers' level, which was one of the main reasons for poor clinic participation.
- **Engagement of a limited composition of stakeholders:** A multi-sectoral programme like Plantwise needs the active participation of various partners and stakeholders. At the national level, the programme had good leadership, technical knowledge and organisational capabilities. At the ground level, the delivery of the programme was the responsibility solely of agriculture instructors/plant doctors. The key informant interviews indicated that currently the programme had engaged two government departments and one NGO, but agro-dealers were on the periphery. This might have resulted in the inadequacy of resources because technical synergies were not being harnessed.
- **Inadequate publicity for the programme:** It was clear from both the quantitative data survey and the focus group discussions and key informant interviews that awareness on the programme was not adequate. People cannot patronise a service that they have not heard of.
- **Operational support issues:** In Malawi the design of the programme provided the plant doctors an allowance of Kwacha 2,000 (about US\$ 4) per day to cover mainly lunch expenses. This was expected to be paid quarterly taking into account the number of clinic days a doctor had worked. The reality was that these allowances were paid very irregularly. One plant doctor had waited for a year for her allowances. In another case a plant doctor was paid on two occasions while a colleague had not been paid at all. Motivation of the plant doctors is critical to the success of the programme and such issues seem counterproductive. In Sri Lanka, low motivation of clinic staff was noted. The majority of the plant doctors complained of poor support for mobility. Such demotivating factors need to be addressed expeditiously. In Zambia, the perennial problems associated with inadequate funding of the extension system may lead to the demise of the innovative Plantwise programme. The tents supplied initially for the clinics were heavy and proved to be cumbersome to set up and difficult to carry on a motorbike. In most cases there was a lack of agro-dealers near where the plant clinics are held. Farmers usually had to travel long distances to access the services of agro-dealers either along the highways or in central business areas where most of them were found. In Vietnam mobile plant clinics were working without simple tools such as a magnifying glass.

- **Internet and IT access:** In Zambia the lack of internet access at most plant clinics prevented plant doctors from fully utilising the online Plantwise resources.
- **Confusion on laboratory capacities between research and extension:** It was evident that there was a disconnect between the expectations of the staff of the Department of Agricultural Research and the field staff of the Department of Agricultural Extension in regard to sample processing. The former expected many more samples than were reaching them, considering that many cases of what they termed as misdiagnosis had been reported. However, the extension field staff (cluster managers and plant doctors) complained that the results for the samples sent to the research stations for disease or pest verification were either returned very late or not at all. This was the case in Zambia, involving the central laboratory in Lusaka, where samples were sent by plant doctors from the districts for disease identification when they were unable to diagnose visually.
- **Lack of chemicals at the point of prescription:** In some cases, chemicals prescribed by plant doctors were hard to find near the plant clinic or were not found at all. Sometimes agro-dealers provided farmers with alternatives to the chemicals prescribed by the plant doctor that did not work. Farmers equate the plant clinics to veterinary or human clinics and thought that they should stock chemicals on the spot to buy. In Zambia, farmers often chose to go straight to the agro-dealer if they have an idea of the plant problem instead of visiting the plant clinic first.
- **Government prioritisation:** In Sri Lanka the Plantwise programme was not mandatory but rather a special project under the Plant Protection Service. It was not given sufficient attention by the national and provincial decision-makers. The key stakeholders interviewed shared a similar point of view that the programme required strong policy recognition, sense of ownership and commitment at the national, provincial and local levels, and resource allocation.

## 5. Country Specific Recommendations

### 5.1 Malawi

- **Expand the programme to cover more areas by training more plant doctors:** This could include having the training for the plant doctors as an integral part of higher learning institution programmes where the agriculture extension development officers and agriculture extension development coordinators are currently trained. Specially tailored training arrangements should also be explored with the Lilongwe University of Agriculture and Natural Resources, for example at the Natural Resources College campus. In the meantime thought should be given to using lead farmers as nurses to the plant doctors. Whatever the case, this study has shown that all efforts need to be made to ensure that plant doctors are well trained and motivated to do their work properly, as they are the key drivers for attendance of farmers at the plant clinics.
- **Integrate Plantwise programme with regular government extension services:** The study found that the Plantwise initiative was attractive because it fitted well with extension activities. Interventions should be internalised in the mainstream Department of Extension Services activities. This department has many sections and an appropriate one should be chosen for this, such as the Crop Protection Department.
- **Increase Plantwise programme awareness campaigns:** These should not be one-off types of exercises. Farmers should not be hindered from attending plant clinics for reasons of lack of awareness about their existence.
- **DAR and DAES should urgently align their expectations on sample referrals:** DAR and DAES are departments within the Ministry of Agriculture and Food Security. Operational guidelines for referrals and their follow-up process should be developed and be duly adhered to. Regular meetings could serve as a follow-up forum for issues, including those on samples and referrals.
- **Explore the possibility of having agro-dealers during the clinic:** Chemicals prescribed by plant doctors could be sold to farmers by representatives of agro-dealers like the Agricultural Trading Company, Farmers World etc. at the clinic location. Obviously the agro-dealers will consider the business volume that could be generated, but this may be worth exploring and trying.

### 5.2 Zambia

- **Increase programme coverage:** In Zambia farmers felt that the services of plant clinics should be expanded to cater for a wide spectrum of agricultural issues including animal diseases and pests, soil and water problems and crop and livestock marketing issues. There is need for the deployment of additional agricultural staff in the districts with several specialties, and in the plant clinic or camp level in some areas. Where staff already exist in areas other than cropping, their incorporation in plant clinics activities might be one avenue of expanding plant clinic resources.
- **Plant clinic services should operate as a mobile service:** There is need for plant clinics to be mobile so that farmers who live a long distance from their central points can have access to their services. This will generate additional operational costs to be met from resources that currently are thinly spread among the plant doctors.
- **There is need for plant clinics to consider partnering with agro-dealers or stock chemicals at plant clinics:** Plant clinics should consider either inviting agro-dealers to set up a stand where the clinics are held or they themselves stocking the chemicals that are frequently demanded by farmers.

- **Plant clinics' operational funds** should be channelled through the national extension system to ensure sustainability.
- **Provision of information and communication technology services and training for plant doctors:** There are two options to address the problem of low usage of ICT services by plant clinics. The first option involves providing computers and internet facilities to all the plant doctors. This would be costly and may be viable only in the long run. This is especially so in consideration of the fact that most of the plant clinics are not connected to the national power grid. Solar powered energy systems might be needed, which might prove expensive in the short run. The second option would be to make sure that the doctors with computer and internet connectivity who are linked to and use the systems under the Plantwise initiative share the latest information on diseases and pests and their control measures rapidly with the far-flung doctors.
- **Increase visibility of plant clinic services:** There is need to deliver promotional programmes through either the local radio stations or distribution of promotional materials such T-shirts, caps and leaflets to spread awareness on the existence and services of the plant clinics.

### 5.3 Sri Lanka

- **Increase programme awareness campaigns:** More publicity and awareness of the plant clinics will benefit farmers. Running the plant clinics on a fixed calendar at fixed or flexible locations will ensure provision of predictable services to the wider farmer community.
- **Provision of ICT services and training for plant doctors:** There is need for more information materials that are easily digestible by farmers. The use of the Plantwise online and offline resources by plant doctors and provincial/district coordinators should be encouraged and adequate resources must be provided for them to make full use these resources.
- **Increase programme coverage:** In order to enhance the reach and coverage of the Plantwise programme, the number of trained agriculture instructors/plant doctors should be increased.
- **Training and capacity building:** The future success of the Plantwise programme is dependent upon the devotion, commitment, knowledge and skills of the plant doctors. Continuous capacity development for all the plant doctors and extension staff at the local level is essential.

### 5.4 Vietnam

- **Increase programme coverage:** There are many well-trained plant doctors working with the Southern Agricultural Research Institute (SOFRI) who could be deployed to the plant clinics to meet the local service demand. Plans are ready to expand the programme but there are budget limitations.
- **Increase funding from the state budget for the extension programme:** The Plantwise programme coordinator in the south was of the view that the extension programme should be connected to a research programme in the Ministry of Agriculture so that the research budget will run the extension programme in its initial stages. This has yet to be approved, but there is hope it will receive MARD approval in 2017. However, most of the key informant interviews stated that support from CABI or a similar institution was needed to fund extension.
- **Use of instant information sources for the publicity of the programme:** Many farmers were not aware of the clinics' existence because the publicity of the programme had been inadequate. Information from focus group discussions and key informant

interviews suggests that the programme information could be spread more sensibly using a brochure or via community meetings and speakers.

- **Encourage more stakeholders to come on board:** MARD needs to take a lead to encourage more stakeholders to join the programme. More agro-dealers and agriculture production dealers should cooperate with the programme. This can bring benefits to all stakeholders rather than only farmers.
- **Mobilise more staff or increase the staff working hours:** All plant clinic staff are government staff, which means that they have other mandates and responsibilities besides the Plantwise programme. There is need to increase the labour force to meet the local farmers' demand for crop health services.
- **Set up a core team to serve the spill-over farmers and other farmers during the clinic off time:** Information from the key informant interviews and focus group discussions indicated that the core plant clinic users played very important roles in spreading the plant doctors' recommendations to other farmers. Since the clinics cannot open at all times, a core team should be created including knowledgeable and experienced farmers who also have a strong connection with plant doctors to serve other farmers during the clinic off time.
- **Equip clinics with simple tools and graphical leaflets:** Simple tools such as a magnifying glass will be helpful to plant doctors to diagnose plant issues. Illustrated leaflets will be useful for clinic visitors who have low education.
- **Integrate regular government extension services with those of the Plantwise programme:** The Plantwise interventions should be internalised into the mainstream MARD activities. The ministry has many sections, and an appropriate one should be selected.
- **Explore the possibility of having agro-dealers present at the clinics:** The plant doctors' prescriptions requiring chemicals would be handled by a representative of the agro-dealers on the spot. Obviously the agro-dealers will be looking at the business volume of the arrangement, but it is worth exploring and trying.

## Annex. Selected country cases

### A farmer's experience of plant clinics and their results in Malawi

Esther is 45 years of age and lives in Section 3 catchment area of Jenda plant clinic in Mzimba district, northern Malawi. She is a user of the clinic, which she learned about through government extension workers. Her first experience with the clinics was when she saw some caterpillars on her maize crop. She took some of the caterpillars to the plant doctor who advised her to spray her maize crop with Cypermethrin. She had been farming for many years with varying fortunes. She was happy that with the establishment of the plant clinics she could obtain advice on various crop problems. She also went to a plant clinic for advice when her tomatoes were attacked by caterpillars, and an orange tree by aphids and ants. She was advised to use Cypermethrin on the tomatoes, which she did with very good results, and to use both Cypermethrin and Carbonyl on the orange tree.

Esther stated emphatically that her life had changed since the opening of the plant clinic at Jenda. Her maize yields had more than doubled. "I used to harvest around 45 bags of 50 kg in a year. Now with advice from the plant doctors I harvest around 90 bags of the same weight," she said with a smile. "The increase in maize yield," she added, "has not only been due to the increased knowledge in dealing with pests, but the plant doctor also advised me to change the crop variety to a more appropriate one for our area."



Esther is so proud of her association with the plant clinics that she runs campaigns urging other farmers to visit them. She does this at church and community meetings. With her increased crop production, which has also increased her income, she has been able to build a better home and purchase a bicycle. Esther bemoaned the fact that the chemicals recommended by the plant doctors were not readily available, or if they were, they were rather expensive. She said that the few plant doctors available could not adequately serve the area, so only a few farmers benefited from the plant clinic services.

Esther was concerned about mobility of the plant doctors and farmers. "There is a mobility problem for both farmers and plant doctors, as most of the farmers live very far from where the plant clinic is located and as such cannot access these services." In general her livelihood has changed in terms of income, quality of produce, quality of food consumed etc. Esther is so satisfied with the plant clinic that she says she is willing to pay for the services if need be.

### An experience of a Zambian farmer

Mr Darius Mwale, aged 53 years, who uses the Kanakantapa plant clinic in Chongwe district, boasted that his marketable tomato volumes had significantly improved. He used to lose five boxes of tomatoes and now only loses one box after starting to use the plant clinics. At the time of the survey he was getting boxes made for his large tomato crop (see picture below).



He attributed the increased tomato yields to his participation in plant clinic activities. He heard about the plant clinics through the camp extension officer and plant doctor, Mr Professor Siyaneyuka.

Mr Mwale showing the research team the tomato boxes a carpenter was making for him. His income rose from the high quality tomatoes that he sold. He was so satisfied with the plant clinic services that he was willing to pay about US\$20 per visit.

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