CABI plantwise

Annual Report 2019

KNOWLEDGE FOR LIFE

Plantwise is a global programme, led by CABI, that aims to increase food security and improve rural livelihoods by reducing crop losses. Working in close partnership with relevant actors, Plantwise strengthens national plant health systems from within, enabling countries to provide farmers with the knowledge they need to lose less and feed more.

Contents


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Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AIR	American Institute of Research
CHAP	Centre for Crop Health and Protection
DAS	Diagnostic and Advisory Service
DCA	Data Collection App
DFID	Department for International Development – United Kingdom
DGIS	Directorate General for International Cooperation - the Netherlands
FAW	Fall Armyworm
ICT	Information Communication Technology
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
KB	Knowledge Bank
MEL	Monitoring, Evaluation & Learning
MEC	Mass Extension Campaign
PEAT	Progressive Environmental & Agricultural Technologies
POMS	Plantwise Online Management System
PRISE	Pest Risk Information Service
SDC	Swiss Agency for Development and Cooperation
ToT	Training of Trainers
USAID	United States Agency for International Development
PMDG	Pest Management Decision Guide
PHR	Plant Health Rally

Introduction

Plantwise is a global programme, led by CABI, to increase food security and improve rural livelihoods by reducing crop losses. Working in close partnership with relevant actors, Plantwise strengthens national plant health systems from within, enabling countries to provide farmers with the knowledge they need to lose less of what they grow, and to feed more. This is achieved by establishing networks of plant clinics where farmers can receive practical plant health advice. Plant clinics are run by extension staff trained as plant doctors. The services at plant clinics are reinforced by the Plantwise Knowledge Bank, a gateway to online and offline actionable plant health information, including diagnostic resources, pest management advice and basic pest data for effective global pest surveillance.

The donors contributing to Plantwise in 2019 included the UK Department for International Development (DFID), the Directorate General for International Cooperation (DGIS, the Netherlands), the Swiss Agency for Development and Cooperation (SDC), the International Fund for Agricultural Development (IFAD), the Australian Centre for International Agricultural Research (ACIAR), and the Ministry of Agriculture of the People's Republic of China and the Koppert Foundation. Others that have supported the programme, for example through the use of tablet computers at plant clinics and/or spin-off projects, include the UK Space Agency, Corteva Agriscience and the contribution made through the St Andrews Prize for the Environment, which was awarded to Plantwise in 2017.

Plantwise is managed by a Programme Board comprising senior management from CABI and implemented in participating countries through partners working on three interconnected components:

- plant health systems development
- the Plantwise Knowledge Bank
- monitoring, evaluation and learning, including gender

After 10 years of operation, across 34 countries (of which it was active in 30 at the end of 2019), Plantwise has been demonstrated to be a working concept for the effective delivery of plant health information to smallholder farmers. Plantwise's value to stakeholders is now supported by a full body of evidence of its impact, generated through a number of studies carried out with varying levels of rigour, in different countries. This includes evidence of its contribution to:

- increased crop productivity and household incomes, with positive economic benefits to male and female farmers who use plant clinic advice

- improved country systems for managing threats to plant health through engagements in multi-stakeholder partnerships that enable coordinated action at institutional levels
- establishing systems for detection and providing good management advice based on integrated pest management (IPM) approaches to solve plant health problems
- opportunities for corrective action in the case of inappropriate use of agro-inputs, such as farmers using internationally restricted pesticides
- understanding the usefulness of digital devices in enhancing the efficiency of the delivery of agricultural advisory services to farmers and supporting the management of agricultural data systems

All these pieces of evidence indicate the potential for the broader application of the Plantwise concept in sustainable agriculture, especially in good production practices in smallholder farming systems. Thus, from 2020, a new global programme (**Plantwise+**) will be piloted, first as a three-year proof of concept in a few countries in Africa, Asia and the Americas, before being rolled out to additional countries.

This report presents an update on Plantwise implementation between January and December 2019. It lists key highlights during the reporting period and provides a narrative on progress, lessons learned and next steps for each of the three programme components. Gender is embedded in activities under all Programme components but is covered in a standalone section because of its unique requirements. There are also updates on donor engagement and finances, as well as medium-term opportunities in the context of an evolved Plantwise.

The report contains three annexes: Annex 1 provides a report on progress against the finalized programme milestones for 2019; Annex 2 sets out the new programme milestones for 2020; and Annex 3 provides one-page country reports showing highlights, challenges and lessons learned.

Table 1: Plantwise countries by year of programme launch

Pre-2009	2009–2011	2012	2013	2014	2015
Bangladesh	India	Afghanistan	Brazil	Costa Rica	Jamaica
Bolivia	Kenya	Barbados	Burkina Faso	Myanmar	
DR Congo**	Nepal	Cambodia	Ethiopia		
Nicaragua	Pakistan	China	Malawi		
Sierra Leone**	Peru	Ghana	Mozambique		
Uganda	Rwanda	Grenada	Thailand		
Vietnam	Sri Lanka	Honduras***	Zambia		
	Suriname*	Tanzania**			
		Trinidad & Tobago			

** Exited in 2014; ** Limited activities since 2015; ***Minimal activities beginning 2019*

Executive summary

The Plantwise reach of 44.1 million farmers (cumulative) by the end of 2019 has been possible due to improved efficiency in the delivery of actionable information on plant health to farmers through 175 partnerships with public, private as well as civil society organizations in more than 30 countries. Plant clinic networks continue to grow: currently, over 4,500 (cumulative) plant clinics have been established, of which 3,000 were active by the end of 2019. Concurrently, the number of plant doctors has also grown, with almost 11,500 extension officers now trained to run plant clinics effectively, with 95% of the trainings in 2019 being conducted by national trainers in all countries where Plantwise is active.

By applying the lessons learned during its implementation, CABI has continued to evolve Plantwise to ensure it responds better to emerging global challenges, as well as country-specific needs. Thus, although the priority work areas for the programme in 2019 remained the same as those for 2018, a significant amount of effort was put into exploring how to better align the programme with emerging challenges to agricultural production – in particular, resilience to climate change and ensuring gender inclusivity.

The focus of programme activities during the year consisted of:

- designing concepts for evolving Plantwise so that it would incorporate smallholder farmers' resilience to climate change and provide opportunities for employment creation, especially for women and youth
- strengthening evidence of the programme's outcomes and impact
- using ICT tools and applications in agro-advisory services to enhance reach and efficiency in service delivery
- promoting in-country use of plant clinic data
- exploring opportunities for further engagement with private sector organizations in Plantwise
- embedding gender to enhance equity in access to information

On the basis of the lessons learned from implementation of Plantwise over the years, CABI began shifting focus, evolving Plantwise into a new global programme (**Plantwise+**), with a stronger focus on the impacts of climate change on rural communities in developing countries. Through **Plantwise+** CABI will build on the systems, products and services already established under Plantwise and the Action on Invasives programme in order to deliver improved food security and economic development.

The focus of **Plantwise+** activities will be to:

- accelerate the uptake of climate-smart practices by smallholder farmers
- increase the supply of higher-quality, safer and more nutritious food
- strengthen detection and the response to pest outbreaks
- enhance the availability of safer plant protection products

Plantwise+ will begin in 2020 with a three-year proof of concept phase during which its interventions will be tested in six to seven countries in Africa, Asia and the Americas. The programme is envisioned to run for over 10 years in 20 countries.

In 2019 a detailed review of the outcomes and impacts of Plantwise interventions was conducted using data and information gathered from 2011 to 2018, with the aim of further consolidating the evidence of Plantwise's impact. This is now documented in a single **analytical review** report (which can be accessed **here**). The report spells out the areas of Plantwise's impact, including improved knowledge of plant health resulting in scalable adoption of good agricultural practices, with judicious use of pesticides; and increased crop productivity and household income. At a systems level, improved institutional co-ordination in the management of plant health is also a major outcome of the programme in many implementing countries.

During the past year American Institutes for Research (AIR) conducted an impact assessment of Plantwise in Pakistan. The findings of this assessment further corroborate the various pieces of evidence presented in the analytical review. The AIR assessment explicitly shows that the benefits of the programme outweigh the costs of its implementation, with a cost–benefit ratio of 1:1.2 and an internal rate of return of 28% (by comparison, a 2017 study from Kenya gives corresponding figures of 3:1 and 58%, respectively). The difference between the findings of this AIR study and those in the Kenya study can be attributed to the socio-economic contexts and administrative systems within which Plantwise is implemented in the two countries, the study designs used for each country and the choice of crops that were targeted for data used to derive the programme costs and benefits.

Another study conducted in 2019 evaluated Plantwise's ICT-enabled extension approach in Uganda. Its findings showed that the use of digital devices and the associated social media networks improved efficiency in the delivery of advice to farmers.

The ICT developments in 2019 under the Knowledge Bank component of Plantwise included the release of an improved version of the Data Collection App and the re-design of mobile-responsive Knowledge Bank and Plantwise Online Management System (POMS) sites. These developments were undertaken side by side with training plant doctors in the use of ICT tools and applications. Currently, over 3,400 (cumulative) plant doctors have been trained on the use of these devices, and they run 1,090 e-plant clinics in 25 countries. The net effect has been increased data flow into POMS and access to online information in the Knowledge Bank, with the former increasing the number of plant clinic records in POMS to 650,000 (with an additional 80,000 records in the China system).

During the year, ICT-dependent social networks formed part of the work of the Plantwise Diagnostic and Advisory Service (DAS), as part of which Plantwise partners and countries were supported in pest identification and additionally provided with diagnostic and advisory support through a number of social media plant doctor groups. As a result, five pests (groundnut ringspot virus (GRSV), tomato chlorotic spot virus (TCSV), *Spodoptera frugiperda, Pentalonia nigronervosa*, *Thrips parvispinus*) and one potential biological control agent (*Microplitis manila*) were identified in four countries. ICT tools and applications provided a peer-support mechanism for plant doctors through social media in 27 countries, with WhatsApp, Telegram and Facebook being widely employed in communications on pest problems and solutions.

The use of plant clinic data was reported in 16 countries in 2019. One of the critical uses of this data that has the potential to grow further is pest monitoring. Major highlights during the year were plant clinic data being used by Kenya to support the work of an 'early warning team' established to deal with pest threats, and Pakistan's use of plant clinic data as a routine practice in cotton production systems.

During the year CABI also continued to explore the potential to use automated tools for the validation and analysis of plant clinic data, and it trialled an Excel-based automatic data validation tool with data validation teams in Kenya and Ghana. The results of comparing validation by the tool with the manual process in Kenya showed a high level of similarity of the outcomes of the two process, though with significant variations in the former for two of the criteria for data validation. The tool will be further co-developed with in-country users.

Implementation of a Plantwise spin-off project, the Pest Risk Information Service (PRISE), in Ghana, Kenya, Malawi and Zambia was closely linked to other programme activities in these countries. Preliminary observations show good potential of PRISE to improve response to emerging pest threats through the use of predictive models. The development of an early warning service by the project to forecast pest outbreaks presents an opportunity to further improve preparedness to manage pest risks in crop production.

Some elements of Plantwise continue to show potential to provide value to private sector organizations. For example: (i) running plant clinics; (ii) contributing to the establishment of systems for performance rating of agro-input dealers in China; (iii) providing trainings for agro-entrepreneurs in India and Bangladesh; (iv) incorporating elements of the programme in training courses for agro-input dealers – such as in India; and (v) using plant clinic prescription forms as a monitoring tool for agro-input dealer operations in Sichuan province (China). By the end of 2019, engagement of Plantwise with the private sector had been trialled in 14 countries (cumulative), with most examples occurring in Asia. Examples include collaborating with the Syngenta Foundation in India using plant doctor training resources in advisory services to address industry-specific needs; and the use by Dialog, the largest telecommunications service provider in Sri Lanka, of Plantwise Pest Management Decision Guides (PMDGs) and Factsheets for Farmers for a mobile messaging service, run through GoviMithuru app, in Sri Lanka. Engagement with the private sector in Plantwise is also ongoing in China, where a 'Green Control' subsidy programme in the Beijing area has necessitated that agro-input dealers follow plant doctors' recommendations to buy IPM-compatible products as a criterion for benefiting from the subsidies. However, one area that requires further exploration is engaging with the private sector as a way of sustaining the programme's operations in many countries.

In regard to gender inclusivity, Plantwise has tested various methods to address barriers to women accessing plant health advice and information in a number of countries. These include establishing women-only plant clinics in communities where the culture is restrictive as regards to men mingling with women in public places (for example, in Ghana, Afghanistan and Pakistan); training village-based women as lead farmers to support activities aimed at sharing plant health information (in India and Bolivia); siting plant clinics and scheduling clinic sessions to accommodate the needs of women (in Ghana and Uganda); adapting communication methods to target women farmers and training extension agents to be more gender-sensitive in their engagement with farmers (in India, Malawi and Uganda); and initiating collaborations with other stakeholders to support farmers' access to agricultural inputs, including loans (in Ghana, Uganda and Afghanistan).


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Programme highlights

Programme level

- Over 13 million farmers were reached in 2019 (44.1 million farmers cumulatively) through plant clinics, plant health rallies, mass extension campaigns and farmer-to-farmer sharing of information
- Evolution of Plantwise and Action on Invasives into the **Plantwise+** concept, based on lessons learned from the two programmes. **Plantwise+** will promote climate-smart approaches to crop production to increase smallholder incomes and the supply of safe and nutritious food
- More than 175 in-country partners actively engaged in Plantwise in 2019, with budget contributions of GBP 1.1 million in 23 countries
- Plantwise impact was also demonstrated in a reduction in the number of recommendations for pesticide use being issued, and an increase in farm productivity for farmers who used plant clinics, with a cost–benefit ratio of 1:1.2 and an internal rate of return of 28% in Pakistan
- Plantwise interventions resulted in a reduction in the number of recommendations being issued to farmers that include internationally restricted (red list) pesticides
- The programme continued to show the potential for some of its elements to add value to private sector organizations, in countries such as India, China, India and Bangladesh
- The 8th Plantwise donor forum was successfully conducted in the Hague, hosted by DGIS, on 8–9 May, with the participation of DFID and DGIS; useful donor feedback was received on the need for a clear forward strategy for the programme

Plant health systems development

- Plantwise's value to governments recognized: for example, by the uptake of Plantwise activities in regular work plans and budgets in 2019–2020 provincial plans in countries such as Nepal, and by the award made by the Bolivian Government to Plantwise for its contribution to sustainable agricultural production
- Supported local partners and national plant protection organizations through the plant clinics and UK-based DAS to identify six new species of importance (five pests and one potential biological control agent) in four countries
- Almost all plant doctor trainings (95% in 2019) were led by local trainers, with 1,540 people (28% female) trained in 21 countries
- The high value of the Plantwise concept for stakeholders was re-affirmed by continued expansion of plant clinic networks (874 plant clinics established in 21 countries in 2019), bringing the cumulative total to 4,500
- The scale of Plantwise's reach has continued to grow, with a total of 13 million farmers reached in 2019

Knowledge Bank

- 2.1 million visits to the online Knowledge Bank to date (319,000 in 2019), many of which were sessions on the Factsheet app in Plantwise countries
- Increased number of plant clinic records (650,000 now available on POMS, plus an additional 80,000 in China's system), with evidence of use by partners in 25 countries
- Mobile-responsive online Knowledge Bank and POMS released to support users on mobile devices and to futureproof the sites
- POMS data analysis tools redesigned to accommodate reporting by PowerBI and to increase the accessibility of clinic data analytics for users
- Machine learning tools tested for the ability to analyse clinic recommendations; proof of concept initiated for checking recommended chemical pesticides against Plantwise's red list of internationally restricted active ingredients
- PRISE modelling work completed, with a projected application in pest forecasting in five countries

Monitoring, evaluation and learning

- An analytical review of Plantwise outcomes and impact from 2011 to 2018 showed evidence of improved farmers' crop productivity and income; improved plant health knowledge of extension officers trained as plant doctors; and positive changes in country systems where the Plantwise approach is being institutionalized
- Mass extension campaigns were found to increase farmers' knowledge on plant health issues, but the effectiveness of campaigns depends on the choice of media for delivery
- ICTs and social media were found to speed up plant health information flows, leading to faster diagnosis and response times by farmers

Gender

- Lessons learned over the years has necessitated that Plantwise adopts innovative methods to overcome the barriers to accessing plant health extension advice faced by women farmers. Such methods include:
  - women-only plant clinics in communities where the culture is restrictive as regards women mixing with men in public (initiated in Ghana, Afghanistan and Pakistan)
  - training village-based women lead farmers in activities aimed at sharing plant health information broadly (India, Bolivia)
  - flexibility in siting and operational hours of plant clinics to accommodate the needs of women (Ghana, Uganda)
  - adopting a wide range of communication methods, including those adapted or deliberately designed to reach women farmers with plant health messages (India, Malawi, Uganda)
  - training extension agents to be more gender-sensitive (Uganda, India, Ethiopia)
  - initiating collaborations with other stakeholders to support women farmers to get better access to agricultural inputs, including loans (Ghana, Uganda, Afghanistan)

Monthly highlights

MARCH

New and responsive Plantwise website goes live

APRIL

The Plantwise Impact Report 2011-2018 is published

MAY

The newly designed and dynamic Plantwise Knowledge Bank launches

JUNE

Plantwise makes an impression at European Development Days, receiving press coverage

AUGUST

Head of Plantwise Knowledge Bank, Dr Claire Beverley is guest of honour at International Conference on Plant Protection in Horticulture, India

SEPTEMBER

Plantwise releases two educational game apps for plant doctors

OCTOBER

Plantwise becomes Vanguard member of the Million Lives Club

Plant health systems development

Progress in 2019

Thirty countries were active in Plantwise implementation in 2019, with funding from the traditional Plantwise donors supporting programme activities in 28 of these. Overall, public sector partners continued to play the biggest role in Plantwise implementation in most countries.

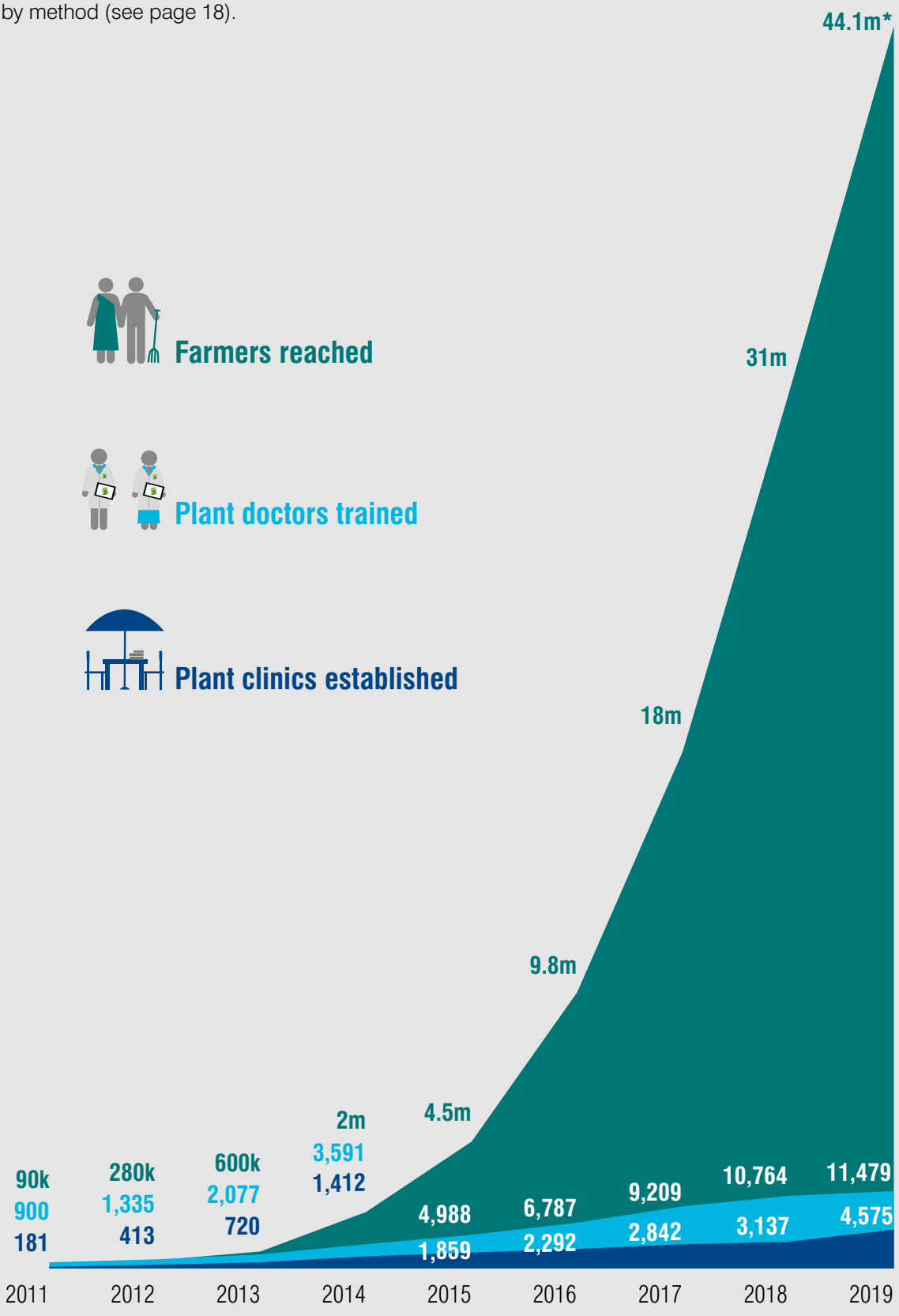
Private sector-run plant clinics have been trialled in 14 countries over the past decade. However, these have been small in terms of scale of operations. Recent developments in Asia show the potential opportunities for some elements of Plantwise to benefit private sector organizations. Examples include the use of **plant doctor training resources** by private sector advisory services to address industry-specific needs, as in the engagement with Syngenta Foundation in India. In Sri Lanka, Plantwise PMDGs and Factsheets for Farmers are used by Dialog as sources of information and have been repurposed for a **mobile messaging service**, an advisory service that is run through GoviMithuru app. The success of this service led to CABI signing a similar agreement with Mobitel. In China, private sector engagement has been used to adapt the Plantwise concept to business models where, for example, Beijing Plant Protection Station coordinates its **'Green Control' subsidy programme**, where farmers are given a subsidy for agro-inputs if they follow plant doctors' recommendations to buy IPM-compatible products. Another example from China is the use of an adapted version of the Plantwise prescription forms to monitor the diagnoses and recommendations of agro-input dealers for compliance with the 2017 Pesticide Management Regulation.

Partnership with an NGO also presented a new opportunity for scaling out some elements of Plantwise with iDE (formerly International Development Enterprises, an international **nonprofit organization** that promotes a business approach to increasing income and creating livelihood opportunities for poor rural households, which is already a partner in Nepal) to Bangladesh to enhance the capacity of "farmer business advisors" to diagnose and advise on plant health problems.

In 2019 **more than 330 Plantwise trainings** were led by partners and/or CABI across all Plantwise countries. The major focus of these were diagnostics, giving good advice and operating e-plant clinics. Women accounted for approximately 28% of the 1,540 people trained, 119 of whom trained as trainers. Local trainers conducted 95% of the trainings. A total of 874 new plant clinics were established in 21 countries in 2019, bringing the cumulative total to over 4,500 since inception of the programme. Of these, about 3,000 were active during the year but the frequency and regularity of operations were variable from country to country and from partner to partner.

Delivering at scale

The programme's reach is determined through estimations of primary reach (farmers reached directly through Plantwise activities) and secondary reach (farmers reached indirectly, e.g. as a result of plant doctors operating outside of Plantwise and farmers receiving advice from peers who visited plant clinics). In addition to reporting cumulative numbers, reach is also segregated by method (see page 18).



*Determined through estimations of primary reach (farmers reached directly through Plantwise activities) and secondary reach (farmers reached indirectly, e.g. as a result of plant doctors operating outside of Plantwise and farmers receiving advice from peers who visited plant clinics). Diagram not to scale.

Although the expansion of plant clinic networks had been expected to slow down in 2019 due to reductions in budgetary allocations from donor funds to routine operations, with countries taking on the costs, additional funding from DGIS during 2019 led to the establishment of a number of new clinics.

The Plantwise DAS continued to support Plantwise partners and countries in pest identification, and additionally provided diagnostic and advisory support to a number of social media plant doctor groups (see the "Lessons learned" section for details). In this way, the DAS team processed 119 diagnostic queries from 40 countries, 76% of which were from Plantwise countries. Through this support, the **DAS team identified six new species** (five pests and one potential biological control agent) in four countries. These included groundnut ringspot virus (GRSV), tomato chlorotic spot virus (TCSV), *Spodoptera frugiperda*, *Pentalonia nigronervosa*, *Thrips parvispinus* and *Microplitis manila*.

In 2019 **Plantwise reached approximately 13 million farmers,** through various outreach activities (see Table 2), of whom 268,610 (16% women) were reached through plant clinics, and 155,187 (41% women) through plant health rallies and related activities in 15 countries. Mass extension campaigns delivered through radio, television, social media and print media **in seven Plantwise countries** reached approximately 2.2 million farmers. It is estimated that about 10.4 million additional farmers were reached through farmer-to-farmer sharing of information, so that the total number **reached directly and indirectly** by the programme in 2019 was approximately **13,006,670**, for a **cumulative total reach of 44.1 million** for the programme since its inception.

Table 2: Plantwise farmer reach in 2019, categorized by extension method

Extension method	Farmers reached
Plant clinics	268,610
Plant health rallies and other face-to-face advisory activities	155,187
Mass extension campaigns	
Radio (repeated broadcasts on a single topic)	1,712,685
Mobile messaging	60,445
Social media	4,407
Mixed approach (TV, print, YouTube videos)	400,000
Sub-total (direct reach)	2,601,334
Farmer-to-farmer sharing (indirect reach)	10,405,336
Total (direct and indirect)	**13,006,670**

The **use of clinic data by partners was evident in 16 countries** in 2019. In addition to uses in pest monitoring, activity planning and plant doctor assessment, new uses were observed. Examples include the use of plant clinic data for 'early warning on pests' in Nakuru County, Kenya; and in Uganda, the Department of Crop Protection and CABI successfully lobbied the National Food and Agricultural Statistics Systems (NFASS) committee to link the Plantwise Knowledge Bank to the national database, with the ultimate aim of linking NFASS to POMS as a way of ensuring plant clinic data is used to inform government decisions in agriculture.

CABI continues to explore the potential to use automated tools for validation and analysis of plant clinic data and, in 2019, trialled a simple Excel-based automatic data validation tool by giving its prototype to data validation teams in Kenya and Ghana for testing. A comparison made between validation by the tool and the manual process showed a high level of similarity of the outcomes. However, there were cases of variation in the automated process for two of the criteria for validation. This necessitates further refinement of the tool, working closely with its in-country users. In parallel, CABI also began to investigate machine learning-based solutions, to work towards a first, basic proof of concept for a data validation process. It is anticipated that automation tools and processes will complement rather than fully replace the manual data validation process.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Lessons learned

In-country partners **assessed Plantwise progress** in 2019 using the sustainability roadmap milestones developed by CABI to monitor progress of the programme in implementing countries. The results show that Plantwise is at the sustainability phase in six countries (China, India, Jamaica, Peru, Pakistan and Sri Lanka), where core elements of the programme are embedded in regular partner institution operations; it is at the scale-up phase in 14 countries; it as at the consolidation phase in nine countries; and it is at the pilot phase in one country.

With increased uptake of Plantwise operations by partners, CABI is shifting the focus of its role in the programme towards quality assurance as it **encourages partners to identify alternative mechanisms** to sustain Plantwise interventions. These changes are not expected to significantly disrupt Plantwise operations in most countries.

The analysis of plant clinic data for pesticide-based recommendations to farmers by plant doctors commenced in 2018 and was repeated in 2019, with the findings showing a **distinct reduction in the frequency of recommendations** of **red list pesticides** beginning in 2018, as a result of CABI's work with partners. A major highlight of this was a decision in mid-2019 by the Agricultural Pesticides Technical Advisory Committee of Pakistan to enhance efforts to phase out highly-hazardous pesticides. Seeking sustainable solutions to the problem of inappropriate use of pesticides remains an area of focus for CABI's future interventions.

Social media continued to be a peer-support mechanism for plant doctors in 27 countries in 2019, with WhatsApp being the most commonly used platform, followed by Telegram, Facebook, WeChat (China only), Line (Thailand only) and Zalo (Vietnam only). A Masters of Advanced Studies in Integrated Crop Management (MAS-ICM) thesis focusing on social networks in Uganda showed that many plant doctors also use Instagram, Twitter and Snapchat to communicate and access plant health information. These networks have been shown to enable **timely and accurate diagnosis** of plant health problems. The DAS team monitored the activity of 29 Telegram and WhatsApp groups from 19 countries in Africa, Asia and the Americas throughout 2019 and recorded a total of 159 requests for diagnostic support. In most cases a response was provided by one or more of the local group members: the DAS team only stepped in when a query was unanswered for more than a week. A study exploring the extent to which social media was being used to share images and diagnose crop problems found that about 10% of diagnosed cases were unlikely to be accurate, mainly because the ability to provide a diagnosis with confidence was limited by the poor quality of shared images.

By the end of 2019, **Plantwise concepts** had been **included in government strategy and/or operational documents in nine countries**, with the focus mostly being on plant clinic operations (for example, in Burkina Faso, Ethiopia, Kenya, Malawi, Peru and Uganda) or as part of job descriptions and staff performance contacts (as in Kenya and Uganda, and under the Punjab provincial government in Pakistan). The **budgetary allocations by in-country partners to Plantwise activities** amounted to GBP 1.1 million in 2019, across 23 countries.

The need for programmes like Plantwise is no less now than it was at the start of the programme. This was very powerfully exemplified in a Plantwise blog posted in late 2019 about the **importance of education on safe pesticide use**. In a rural area of one Plantwise country, CABI and its partners observed a dangerous lack of knowledge on pesticide-related risks, to the extent that farmers were stirring pesticide mixtures with their bare hands and consumers were eating fruit with visible residues from pesticides that had been applied just two days earlier. There is clearly a need for more people to be talking about and actively **promoting safe and sustainable agricultural practices**. For several years CABI has been encouraging Plantwise partners to avoid advising farmers to use highly toxic pesticides, as defined by the **Plantwise pesticide red list**.

Subsidized biological controls in China

In 2019, 72,474 prescriptions issued by plant doctors to over 6,000 farmers in the Beijing area between 2015 and 2018 were analysed to assess changes in pesticide recommendations. **Plantwise** plant clinics played a key role in reducing China's reliance on high toxicity pesticides. The combination of the **Green Pest Control** subsidy programme, plant clinics, and training of additional intermediaries as plant doctors improved the outreach and efficiency of extension services in implementing agricultural policies and related subsidies.

Outreach of plant clinics and the "Green Pest Control" subsidy programme in Beijing municipality, 2015 vs 2018.

Plant clinics

2015	2018
25	68

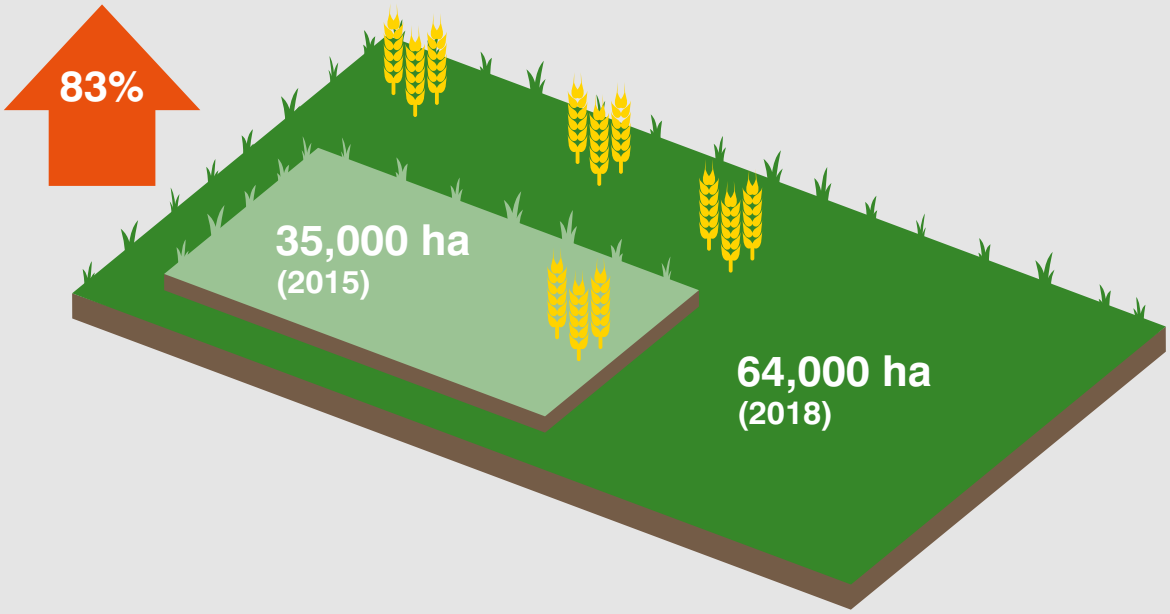
Plant doctors

2015	2018
34	137

Prescriptions

2015	2018
11,495	37,484

The total area treated with non-chemical or least toxic/residual pesticides.



In 2018, the total area treated with non-chemical or least toxic pesticides was approximately 83% greater than the area covered in 2015 when the scheme was not linked to plant clinics.

Next steps

The **focus of Plantwise in 2020** will be **sustainability assessment**, through identifying elements of the programme that work best for various country contexts: prioritization of activities will be based largely on country-specific decisions and interests. However, there will still be consideration of donors' interest in expanding plant clinic networks in areas affected by fall armyworm (FAW).

For the countries that are used to core Plantwise activities being supported by donor funding, there will be a need for close monitoring and guidance if operations begin to falter. A likely consequence of this would be reduced frequency of plant clinic sessions. Going forward, CABI will support partners in most countries to find innovative and sustainable approaches to maintaining some Plantwise activities as part of a broad approach to sustainability assessment (see the "Next steps" subsection within the "Monitoring, evaluation and learning" section for more information).

Linked to sustainability, CABI will need to test ways to facilitate **continued development of information materials for agricultural advisors and farmers,** and the delivery of these through ICT-based methods, including digital tools and online resources. Despite the fact that the plant doctor training modules having been embedded in the capacity building processes of some partner organizations, there will be a need to continue sharing updated versions of these in 2020 and beyond. Although getting the training modules integrated into formal educational institutions remains a slow process, this will be pursued further in 2020.

CABI will release its e-learning course on diagnostics, **CABI Academy Crop Pest Diagnosis**, to Plantwise partners in 2020. The course, which complements Module 1 of plant doctor training, will be made freely available to all plant doctors, trainers and relevant partners, in order to achieve three key objectives: (i) to contribute to further capacity building of plant doctors; (ii) to provide evidence of learning impact; and (iii) to obtain user feedback to inform further product development. Although it will be offered to all plant clinic partners, the roll-out will be treated as a pilot, in order to monitor and evaluate the interest of potential users, with the results providing insights into the course's accessibility and suitability for various public and private sector agricultural advisors across Africa, Asia and the Americas.

Knowledge Bank

Progress in 2019

The focus in 2019 was on continuing to lay a solid foundation for **Knowledge Bank sustainability** from 2020 onwards, with major activities centred around delivering the vision identified in 2017 of ensuring: (i) that every Plantwise country is equipped with adequate tools to collect plant clinic data, and with access to extension materials on the Plantwise Factsheet app; (ii) improved capacity for analysing and using plant clinic data; (iii) that every POMS user is able to access the tool on a mobile device; and (iv) the use of available data and content linked to other CABI products and services, such as pest forecasting and support to pest surveillance. The ICT developments in 2019 focused on: (i) releasing a fully-functioning data collection app (DCA); (ii) designing/building/releasing mobile-responsive Knowledge Bank and POMS sites; and (iii) investigating products for flexible and powerful data analysis on POMS.

Re-design of the DCA and POMS services in 2019 provided an opportunity to incorporate Google Analytics, which will allow streamlined analysis of site traffic to POMS, providing further insight into users and their behaviour. The rebuilt DCA allows greater flexibility and enhances its use.

Cumulatively, over 3,400 plant doctors have been trained on the use of tablet computers at plant clinics in 28 countries and at over 1,090 e-plant clinics running in 25 countries. In 2019, training took place in three countries in Latin America and the Caribbean (Bolivia, Costa Rica and Honduras), six Asian countries (Afghanistan, Bangladesh, India, Pakistan, Sri Lanka and Thailand) and four African countries (Ethiopia, Ghana, Kenya and Uganda).

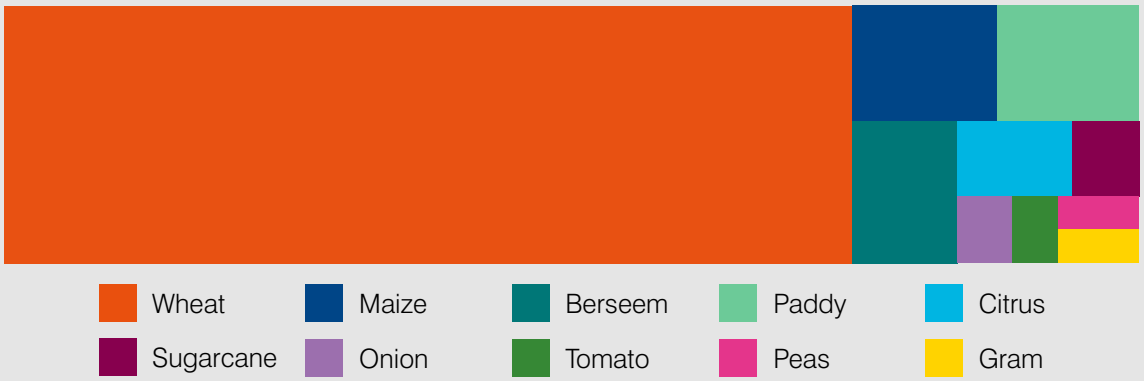
More than 60,000 plant clinic records and 12,000 photographs were submitted through tablets in 2019, with over 57,000 records submitted from the desktop version of the DCA.

The continued increase in the number of plant clinics leads to an **increase in the number of plant clinic records submitted to POMS**, and this body of data can have several uses such as assessment of plant doctor performance and monitoring trends of pests in farmers' fields. Efforts to promote data sharing by countries continued in 2019, after the successful piloting of workshops in Bangladesh and Pakistan in 2018. Tools and models to map data ecosystems, developed by CABI through a Bill and Melinda Gates Foundation project, were used in Ghana. The aim was to identify challenges and incentives for sharing data, for which solutions ranged from data sharing agreements at institution and project levels, to the development of a national data sharing policy.

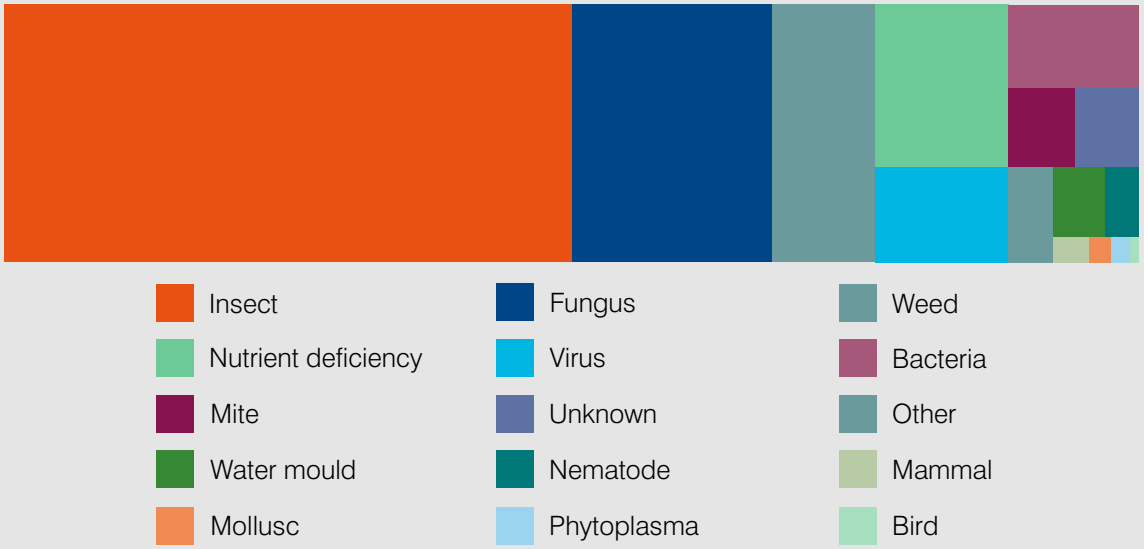
A global view of plant clinic data

Updates to the Plantwise Online Management System (POMS) were carried out in 2019 which allow users to better visualise data.

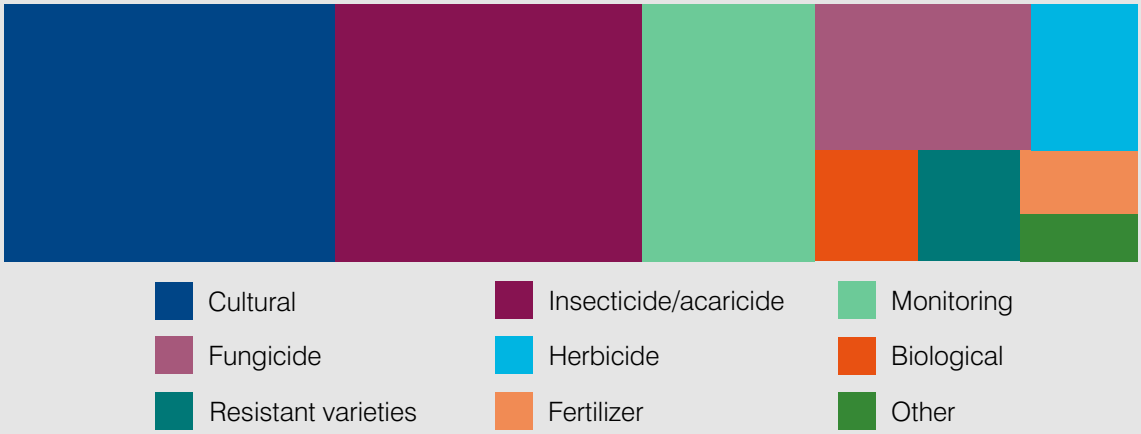
Which crops are most commonly discussed at plant clinics?



What types of problem are most commonly seen at plant clinics?



What types of recommendation are most commonly made at plant clinics?



In tandem, technical investigations took place to identify an analytical tool that could be offered as part of POMS. User requirements for improved clinic data analysis were used to inform investigations. A user-centred design approach was followed to further identify requirements, and **development to incorporate a PowerBI dashboard into the POMS** began in 2019. As a result, users will be able to view metrics such as major issues and common practices at plant clinics. For example, in 2019, the highest number of clinic queries was uploaded by plant doctors in Pakistan. The dashboard will allow the user to highlight this information and drill down to the most common issue (jassid), and the most common recommendation (insecticide), plus further metrics such as recommendations regarding high-risk pest control products and plant doctor information.

Global analysis of plant clinic data remains challenging and self-service data management tools continue to be promoted to partners for managing data, including reharmonizing existing POMS data with the newest tool – the reharmonization tool. In 2019, 29 countries harmonized data, with seven reharmonizing over 18,000 records. Bolivia and Kenya reharmonized the most records (7,102 and 5,144, respectively). An exploration of the possibility of automating the harmonization of a portion of plant clinic data via machine learning was initiated in 2018, and led to further investigations in 2019 regarding matching the pesticides recommended by plant doctors with the Plantwise red list of internationally restricted substances. A proof of concept will be available in 2020.

In 2019 POMS activity was highest in Kenya, India, Pakistan, Sri Lanka and Ghana, as was the case also in 2018. Activity was lowest in Mozambique, Cambodia, Barbados, Honduras and Vietnam (in 2018 it was lowest in Bolivia, Barbados, Uganda, Ethiopia and Grenada). Nearly 50% of users from the previous year returned to POMS, and activity showed a 7% growth compared to 2018. Nearly 100 POMS accounts were created in 2019, which represents an 18% decrease since the previous year, but more than a 130% increase compared to 2017.

Of the 319,000 sessions on the Knowledge Bank in 2019, the highest percentage came from India (28%). Most sessions were from India, the USA and the Philippines, as was the case in 2018. Nearly 50% of online Knowledge Bank visits were made via mobile devices, nearly 70% from Plantwise countries. In parallel, an emphasis was given to deploying digital services for use in plant clinics, with a vision to ultimately put a tablet into the hands of every plant doctor. As part of the vision to match digital growth, in 2019 the focus was on releasing **mobile-responsive online Knowledge Bank and POMS sites**. Comparing top device category by percent of users between a 28-day period in 2019 (pre-launch of the Knowledge Bank) and the equivalent period in 2020 (post-launch), there has been a marked increase in the percentage of Knowledge Bank users on mobile devices, from 39% to 49%.

Over 10,500 factsheets are now available through the online Knowledge Bank, with 3,470 specifically developed within Plantwise to be available through the Factsheet library app; 10 updates of factsheets were completed by partners in 2019. The most commonly viewed factsheets in 2019 were the green list for FAW on wheat (PMDG); Factsheets for Farmers on early and late leaf spot on groundnut, written in Sierra Leone; and a technical factsheet on angular leaf spot of cotton (now found under “Species” on the Knowledge Bank). The Plantwise PMDG model remains an attractive information resource that is continuously used to develop spin-off projects, some supporting the development of more PMDGs for priority pests and countries or regions: for example, new/updated green and yellow lists created/published for CABI’s Action on Invasives programme (four), PRISE (50), and IPM@PMI and other projects (40).

In 2019, there were 507 new subscribers to the **pest alert service**, which represents a 130% increase from 2018. The continued significant increase in the number of subscribers is a result of the service being available from both the Knowledge Bank and Invasive Species Compendium sites.

Plantwise continues to ensure with improvements to better align its products and services to CABI’s information resources, safeguarding the future of Knowledge alignment of its products and Bank tools. In 2019 CABI developed **a new distribution database**. This new resource draws together all of CABI’s location data from Compendia products, CABI projects and Plantwise activities, and will make it easier for CABI to share spatial information across different products

and services. For the first time, CABI staff will have a user interface that will allow them to search, add and manage location data within the database, to ensure users have access to the most up-to-date distribution information. Following the release of the database, which is planned for 2020, Knowledge Bank users will have greater access to more detailed species distribution data.

Closely aligned to Plantwise is the **UK Space Agency**-funded PRISE project, which, since its inception in 2017, has been delivered in three Phase I countries (Kenya, Ghana, Zambia), and which, from 2019, is being implemented in Malawi. The PRISE modelling can now inform extension workers and farmers of the most appropriate time to act on specific pests including FAW and *Tuta absoluta*. Early indications of impact in Kenya show losses by maize farmers by those who received pest information based on PRISE alerts averaged 21% of the expected pest-free yield, compared to 26% for those who did not.

Lessons learned

A rebuilt DCA, to allow greater flexibility and enhanced use, was released in 2019 after a number of issues were reported by some plant doctors in the field. Considering the number of plant doctors using the app (over 3,400 trained to date), migration to the updated app posed a challenge and required significant cooperation between several implementation teams and partners on the ground. Rapid uptake of the latest version each week since launch in May has been reported. Capacity to support users of the DCA was strengthened in 2019 by providing refresher training to all CABI Country Coordinators and Regional Coordinators of the Plantwise programme.

In response to lessons learned about how users interact with tools that have been developed to support their work, and the fact that the number of smartphone users worldwide is projected to reach 3.5 million in 2020, mobile-responsive Knowledge Bank and POMS sites were developed/ released in 2019. **Analysis of Knowledge Bank visitors shows a slight increase in new visits post-launch of the new site, compared to pre-launch, in 2019**. Returning visitors slightly decreased. It is known that most visits to the Knowledge Bank are the result of organic searches in search engines, therefore improvements to search engine optimization were initiated in 2019. Initial results show that visitors generally search for pest problems, such as “angular leaf spot of cotton” or “mango hopper”; few searches include control language. In 2020, improvements will be made to both primary and dynamic pages, based on analysis of search terms that lead visitors to the Knowledge Bank.

Workshops to identify and resolve barriers to data sharing were initiated in 2018, and continued in 2019 with the inclusion of Ghana. Data sharing in plant health extension was strengthened following the workshop in Pakistan in 2018. An Office Order was issued by the Director General of Agricultural Extension (in Pakistan) to establish clinics with daily sessions over a two-month period, to deal with cotton pests. Monthly clinic data reports are shared with the Director General as a direct result of the workshop. However, extensive follow-up is required and the movement of key contacts mean that challenges with data use by partners remain in all countries. In 2020 consideration will be given to refocusing efforts, and revisiting territories where workshops have taken place, recognizing that embedding processes and resolving blocks to data sharing requires further input. In tandem, a project was initiated to develop a user-friendly solution for analysing clinic plant data, aimed at all users across the data knowledge spectrum, irrespective of data analysis ability, integrated into POMS. PowerBI was identified as the most suitable off-the-shelf solution and release of this enhancement is expected in early 2020.

Next steps

In 2020, CABI will continue to monitor use of Knowledge Bank tools, and will work alongside the rest of the Plantwise programme in developing a strategy and securing funding to sustain the Knowledge Bank as a core component of new projects. Major activities will include:

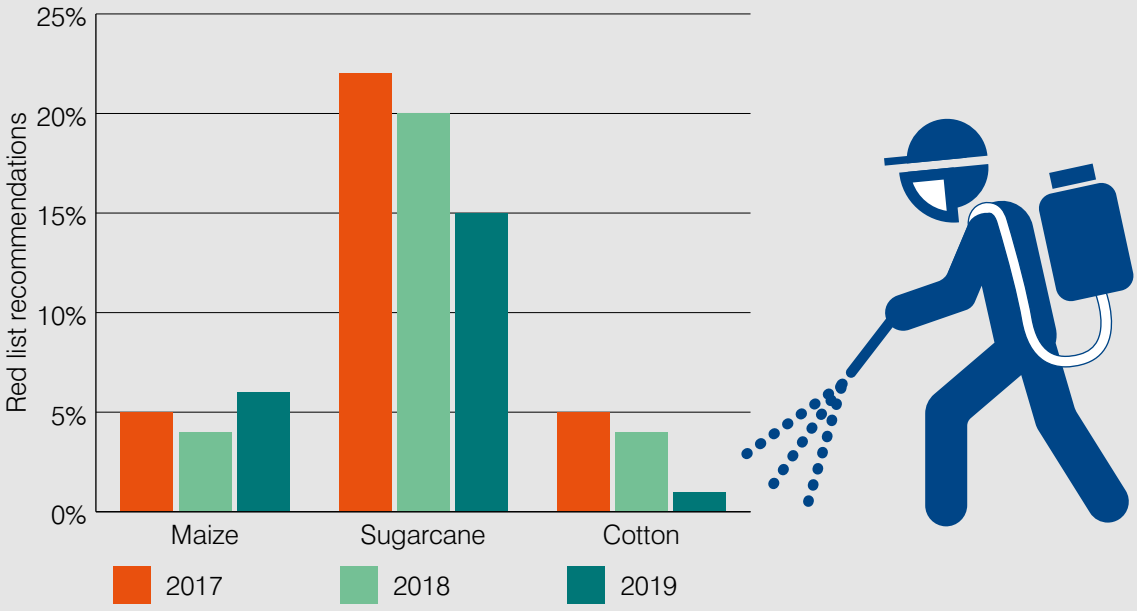
- monitoring use of the DCA, to ensure the app remains fit-for-purpose
- monitoring use of the mobile-responsive Knowledge Bank site, and rolling out improvements of search engine optimization
- monitoring use of the mobile-responsive POMS site, and releasing a dynamic data analysis tool
- linking the Knowledge Bank to the new CABI distribution database, for an enhanced user experience, and to futureproof the site
- completing a proof of concept for data harmonization and pest management recommendations, using machine learning
- continued resolution of barriers to data sharing in territories already visited
- continued support of country partners to review and update extension materials, with an emphasis on updating recommendations and improving monitoring/description sections as necessary
- developing Knowledge Bank-associated projects to sustain activities, focusing in particular on projects that are complementary to Plantwise

For PRISE, the activities will include:

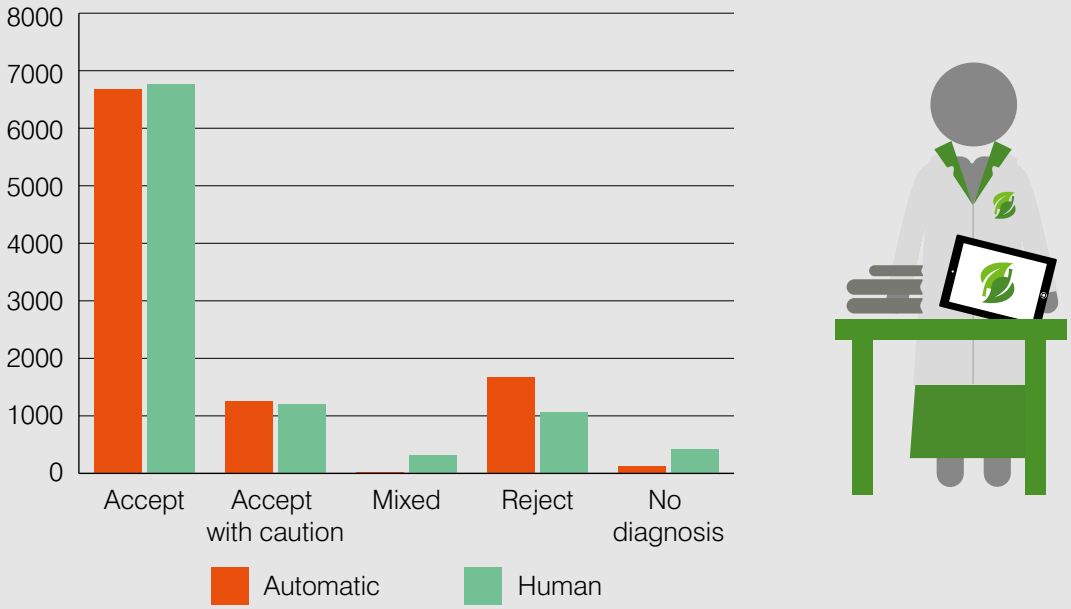
- implementing the new pest models, built on a broader risk framework and resulting in a more actionable output of the number of days to action for most efficient and effective intervention
- continued development of two PRISE products:
  - a pest risk advisory service to communicate the most timely action to be taken to address a pest outbreak on a crop
  - an interactive dashboard providing support to agricultural decision-making and planning through access to a range of agro-met datasets, models and recommendations
- scale-up and assessment of in-country partnership engagement and piloting to test the best sustainable models for PRISE

Assessing advice through data

Interventions to tackle and reduce red list recommendations began in 2018 and continued in 2019, showing a general decline in recommendations with red list pesticides. For maize, the increase in 2019 is attributed to lack of options for the control of FAW in newly invaded countries.



Work to improve the automatic validation tool continued in 2019. Automatic vs human validation showed strong agreement particularly on accepted records.



Monitoring, evaluation and learning

Progress in 2019

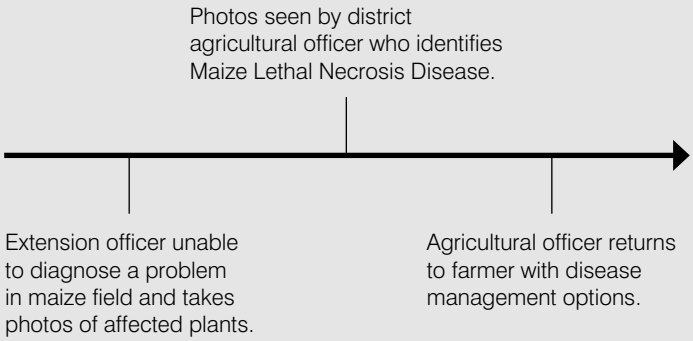
In 2019, the monitoring, evaluation and learning in Plantwise focused on the assessment of systems changes due to the programme's interventions. This mainly sought to assess system-based changes for which it is typically more difficult to demonstrate impact as their indicators are generally qualitative. Among the areas where such evidence was demonstrated in 2019 was the use of ICTs and social media, plant health performance in Pakistan, and reduced economic costs due to prompt responses to pest outbreaks.

The outcome- and impact-related studies completed during the year are listed in Table 3. Some of the studies that started in 2019, which will be reported on in 2020, are also included in the table.

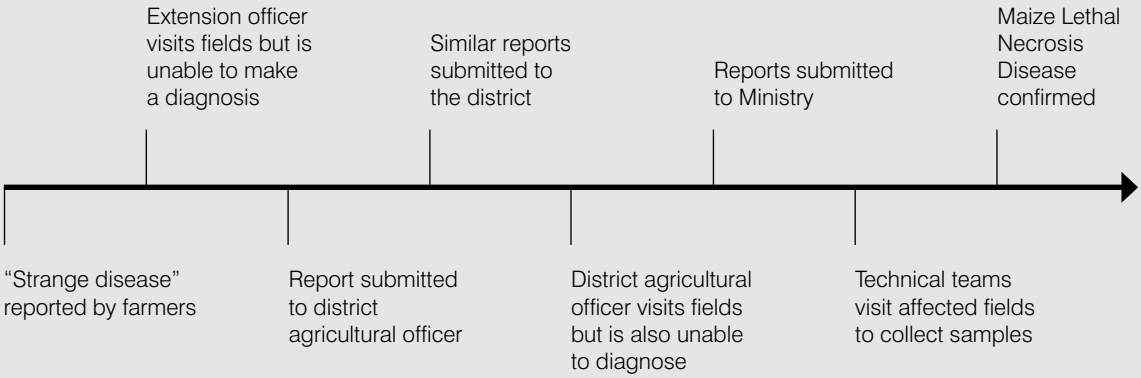
Two different timelines of disease detection and response to farmers

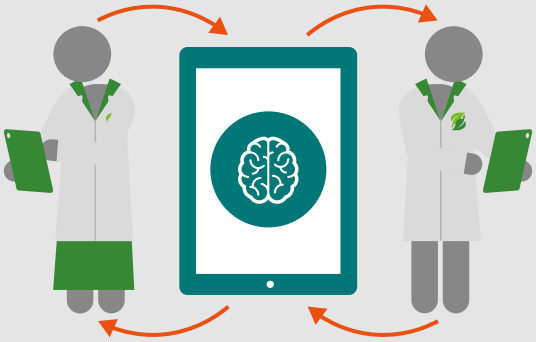
ICT use speeds up response time to farmers. Two cases of Maize Lethal Necrosis Disease detection and response in Uganda show that through sharing photos and communicating in a chat group online, ICTs enabled extension officers to expedite sharing management options with farmers within 3 days compared to 6 weeks using traditional channels.

Digital, Tororo district: 3 days



Traditional, Busia district: 6 weeks





ICTs develop new pathways of communication in pest detection and response

With the deployment of the e-plant clinics and the development of the Telegram groups, Plantwise has not only facilitated direct communication between plant doctors but also integrated plant doctors into communication networks that include local and global actors.

Table 3: List of key studies based on adoption of plant clinic advice and plant health system change pathways

Pathway	Study	Indicator	Completion Date
Plant clinic advice adoption	On-farm impact study (Pakistan) (external evaluation)	Change in crop loss through reduced pest damage Change in pesticide use Change in farmers' productivity Change in farmers' income	March 2019
	Gendered impacts of plant clinics in Zambia	Change in crop loss through reduced pest damage Change in pesticide use Change in farmers' productivity Change in farmers' income	March 2020
Plant health systems change	Role of Plantwise interventions and digital innovation in early detection and rapid response to pests and diseases (Uganda, Rwanda, Kenya)	Adoption of Plantwise approach (integrated extension response, data management)	January 2019
	On-farm impact study (Pakistan) (external evaluation)	Change in crop loss through reduced pest damage Change in pesticide use Change in farmers' productivity Change in farmers' income	March 2019
	Economic model of costs of FAW under different control regimes (Ghana)	Adoption of Plantwise approach (integrated extension response, use of plant health information for management strategies)	March 2019
	Analysis of use of ICTs in mass media dissemination of agricultural information (Uganda)	Adoption of Plantwise approach (integrated extension response and delivery)	April 2019

An **analytical review of all evidence of change due to Plantwise** from 2011 to 2018 was published in 2019 in a single document that analyses and summarizes all the evidence on Plantwise's outcomes and impacts, as well as reporting key lessons learned. The review key highlights indicate that:

- Plantwise has helped to **improve farmers' plant health knowledge**, contributing to the adoption of good agricultural practices, safer use of pesticides, and increased crop productivity and farm-level income
- Plantwise is **improving the plant health knowledge of individual extension officers** and their confidence in providing good advice to farmers, as well as improving institutional co-ordination in national systems for managing plant health and generating knowledge and skills to detect and respond to pest outbreaks
- countries are **institutionalizing Plantwise elements,** such as plant doctor training, plant clinic operations and the use of ICT platforms, and taking the approach to scale as part of the regular activities of agricultural advisory and plant protection staff

The report concluded that "Plantwise has had a positive impact on the lives of smallholder farmers in Asia, Africa and the Americas through positive contribution to improved plant health management, leading to increased yields and income. The programme has achieved this by strengthening the capacity of extension staff to deliver quality plant health advice through plant clinics and complementary extension approaches as well as through strengthening the linkages among plant health system stakeholders. Plantwise has also contributed over the years to increased detection of new pest species, such as the FAW and tomato leaf miner, in several countries around the world."

An AIR-led assessment of Plantwise impact was concluded in Pakistan. The study was based on data from a total of **1,805 households from 120 communities in Punjab province**. In this area wheat, cotton and rice represented 75% of the crops grown and occupied 88% of the cultivated land area. The results of the study (Table 4) show that:

- Plantwise has positive and significant impacts on agricultural practices, including pesticide use, value of production and net income for farmers
- qualitative data showed that Plantwise trainings sufficiently prepared Agricultural Officers to act as plant doctors, providing relevant advice to farmers, with plant clinics also increasing the direct contact of Agricultural Officers with farmers
- Plantwise activities had led to some level of system change in Punjab. However, given the size of the programme compared to the number of farmers, existing systems and other agriculture programmes in the country, Plantwise did not have the reach, scale and influence to significantly change systemic approaches to pest and disease management in Pakistan
- Quantitative data show that Plantwise contributes to:
  - increased use of cultural practices, such as early planting and timely weeding, and the use of traps as a pest control method
  - improved practice when using pesticides at the farmer level, with clinic users being 5 percentage points less likely to use pesticides and there being a 5 percentage points increase in the wearing of gloves and a mask when handling pesticides, a 4 percentage point increase in wearing goggles when spraying pesticides, and a 4 percentage point decrease in the propensity to store chemicals in living areas
  - increased farm productivity of farmers who use plant clinics. Overall, there was an 8% increase in the value of the combined yield and net income for all crops by clinic users compared to non-users

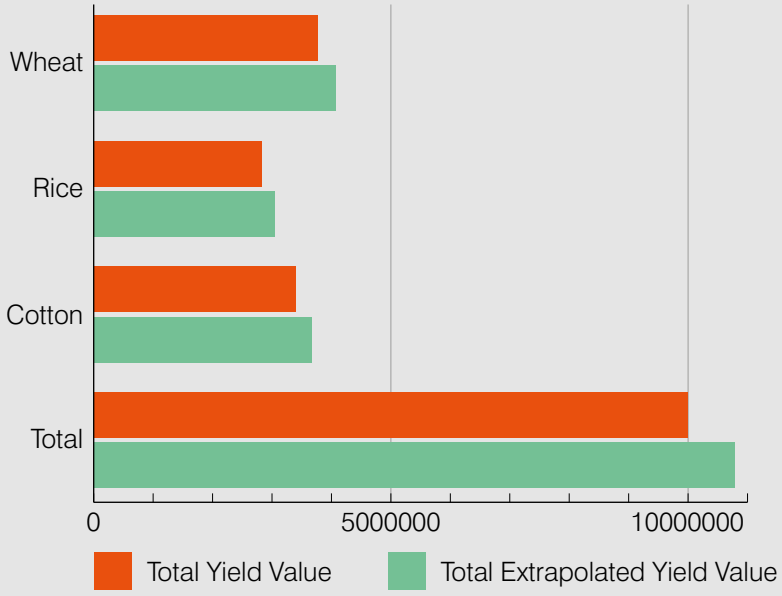
A cost–benefit analysis of Plantwise in Pakistan shows positive monetary benefits, at a cost–benefit ratio of 1:1.2 and an internal rate of return of 28%. Compared to the findings reported for Kenya in 2017 (a cost–benefit ratio of 1:3 and an internal rate of return of 53%), the lower figures for Pakistan are partly attributable to the differences in socio-economic and administrative contexts in which Plantwise is implemented in the two countries, the use of different study designs to assess the impact of the programme, and the selection of crops in relation to which the data used to derive the benefits and the costs was collected. The study in Pakistan used a quasi-experimental design, with costs and benefits derived using data on rice, wheat and cotton, while in Kenya a randomized control design was used, with costs and benefits derived using data on maize. The value of production was also higher for Kenya, given the unusually high prices of maize during part of the time the data was collected.

Table 4: Impacts on value of yields, and costs for farmers with plant health issues

Outcome of interest	Mean control (Pakistani rupees (PKR))	Mean clinic users (PKR)	Impact estimate – % change	N
Panel A. All crops				
Value of production per acre (PKR/acre)	70,263	76,880	8**	934
Total cost per acre (PKR/acre)	20,333	21,590	5	926
Cost of inorganic fertilizer per acre	8,518	8,955	4	926
Pesticide cost per acre	1,669	1,808	9	926
Net income (PKR/acre)	44,356	48,050	8*	839
Panel B. All crops—controlling for severity of plant health Issue				
Value of production per acre (PKR/acre)	70,263	76,880	9**	934
Total cost per acre (PKR/acre)	20,333	21,590	6	926
Cost of inorganic fertilizer per acre	8,778	8,604	-2	926
Pesticide cost per acre	1,620	1,755	8	926
Net income (PKR/acre)	44,356	48,533	9**	839

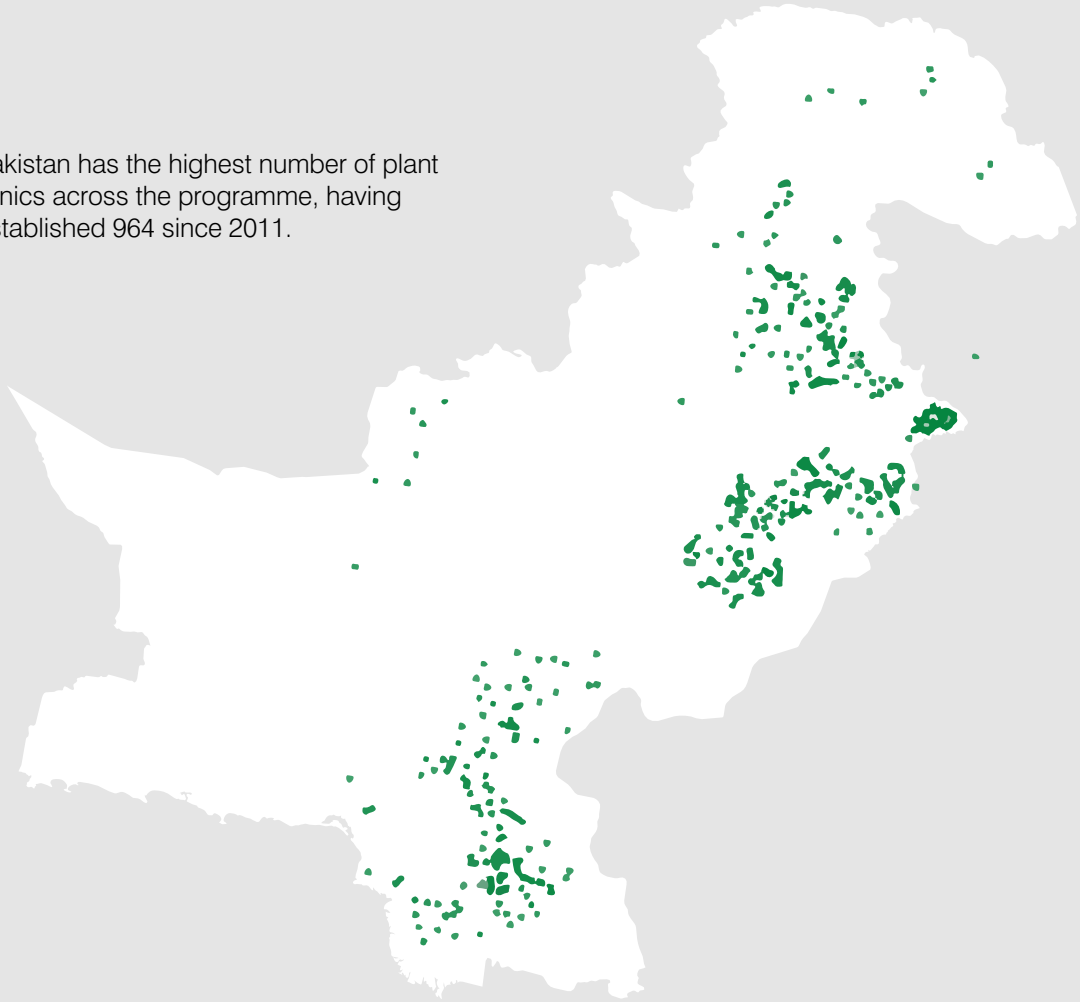
Pakistan impact assessment

An evaluation of plant clinics in Pakistan found that plant clinic users saw an 8% increase in the value of yields and net income compared to non-users. Using the increase in yield value determined in the impact study, the total increase in value can be extrapolated to the whole country across key crops – USD 10.8 million.



+$10.8m

Pakistan has the highest number of plant clinics across the programme, having established 964 since 2011.

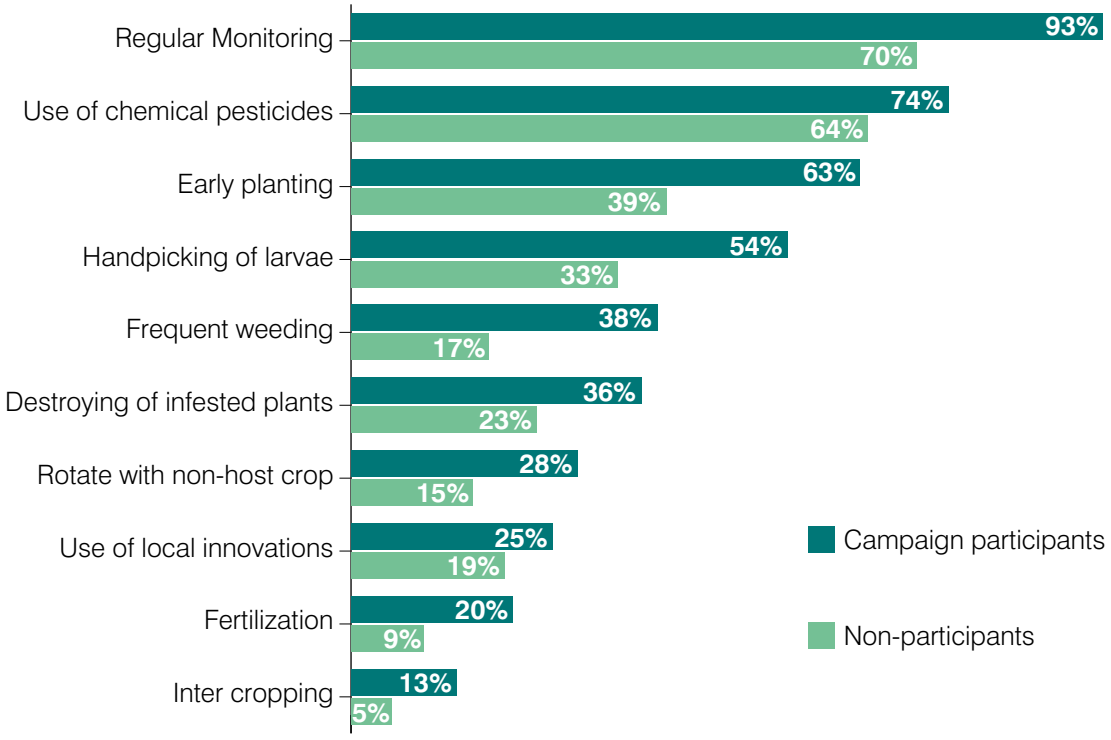


A study to evaluate the impact of an ICT-enabled extension campaign on farmers' knowledge in the identification and management of fall armyworm in Uganda was conducted in 2019 using 607 randomly selected maize-producing households. Farmers from the areas covered by the campaign were interviewed using structured questionnaires. This included households that had participated in the campaign and those that had not. The study sought to establish the reach of the FAW extension campaign, and to assess if it increased farmers' knowledge of the pest and their likelihood of adopting practices for its management.

The ICT-enabled extension campaign used village-based video screenings, SMS messaging and interactive radio talk shows to reach farmers. As part of the complementary approach of the campaign, the radio series publicized the video screening locations and schedules, and advertised the SMS short code for participating in the campaign. The findings of the study show that:

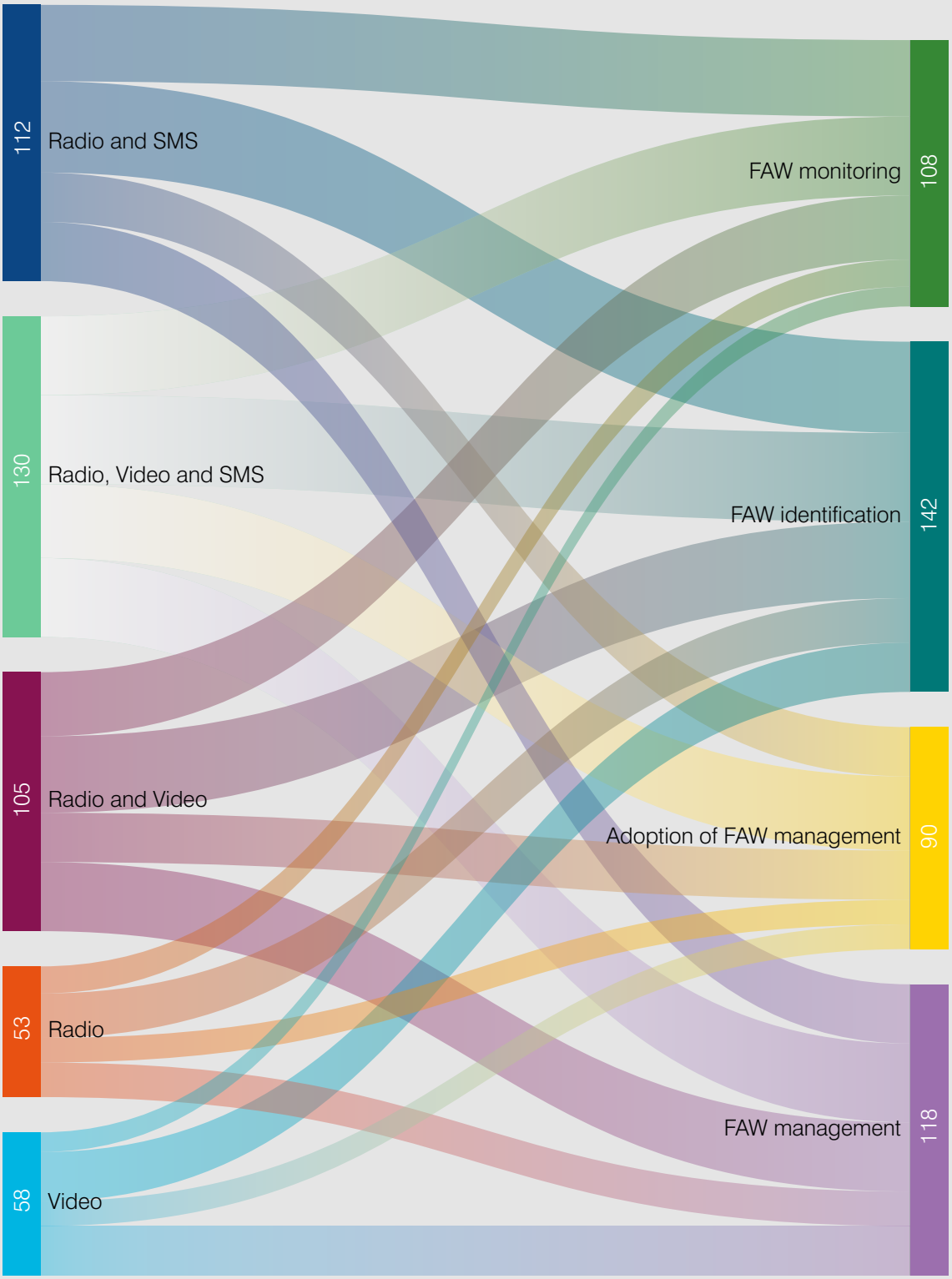
- the campaign significantly increased farmers' knowledge about FAW and stimulated the adoption of agricultural technologies and practices for managing the pest (Figure 1)
- of the three channels (radio, community video, SMS messaging) radio was most effective in achieving widespread coverage, while video had the greatest impact on farmers' knowledge about FAW
- **exposure to multiple campaign channels led to greater impact** in terms of knowledge about FAW and the adoption of practices for its management than exposure to a single channel
- in a low-literacy population, ICT applications that allow both verbal and visual communication (such as village-based video screenings) should be prioritized
- poorer households had a higher probability of participating in the campaign, particularly in video screenings
- the campaign contributed to **a 17% increase in knowledge** related to FAW identification, monitoring and management, which translated into the adoption of two additional FAW management practices

Figure 1: FAW management practices reported for campaign participants and non-participants after controlling for confounding factors



Effect of campaign channel on knowledge uptake

Using ICTs in campaigns helps reach more farmers but do the different channels or combination of channels affect farmers' knowledge uptake? When scoring farmers on various aspects of information, research shows that a combination of radio, video, and SMS produces the highest level of knowledge and adoption of management practices.



Another study was conducted on the use of social media and ICT tools in the early detection of, and rapid response to, crop pests, targeting institutional response to the emergence of maize lethal necrosis disease (MLND), *Tuta absoluta*, and FAW in Rwanda, Kenya and Uganda. The study assessed whether ICT tools, especially social media groups, played a role in the early detection of, and response to, the emerging pests and diseases. The research used key informant interviews with individuals from the relevant organizations in order to understand the role of ICTs and social media in the response to new pest outbreaks. The results of the study showed that:

- ICT increases the speed with which information flows within plant health networks, leading to faster diagnosis and response times for farmers, and faster advice delivery by extension workers
- the e-plant clinics and Telegram groups facilitated direct communication between plant doctors and integrated plant doctors into regional and international communication groups, as new pathways of communication that have helped in pest detection and response
- plant health systems in countries have established communication pathways but ICT can disrupt these and other communication patterns
- the use of data collected through ICT provides real-time information that enables local governments to demonstrate the extent of damage and spread of a pest, and hence lobby for extra funding to address pest problems. Overall, there is the potential for social media to contribute as a tool for pest surveillance since the use of ICT improves efficiency in the exchange of pest information

A study to model economic costs due to control actions was conducted for FAW in Ghana. Its purpose was to understand and assess the economic costs of the FAW invasion under different control scenarios. The three scenarios modelled under this study were

- one with no farmer-applied control measures
- one with limited control measures
- one with proactive control measures used in Ghana in 2017

Maximum, minimum and mid-range estimates of losses were presented for the second and the third scenarios. The model demonstrated that when coordinated actions are taken, they reduce the losses experienced by a country as compared to losses that might be experienced if the only actions taken are ad-hoc measures. The model showed that the difference in **economic losses could be as high as USD 15 million in a single year**. The model supports the conclusions reached in 2018 by the FAW task force in Ghana, reinforcing the need for preparedness for new pest infestations through coordinated action by a multi-disciplinary group of stakeholders.

Lessons learned

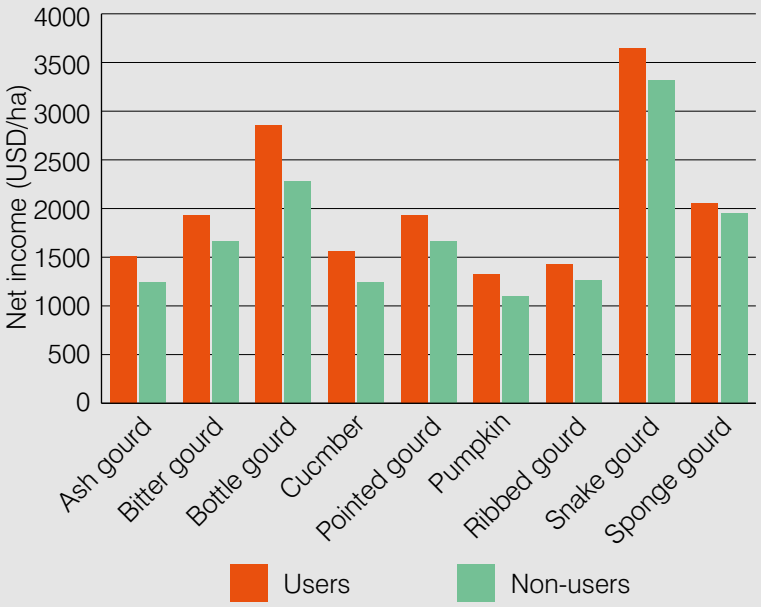
The 2019 studies that focused on systems change provided evidence of impact but also raised further questions about how systems and organizations, structures and people within the systems react and respond to external drivers of change.

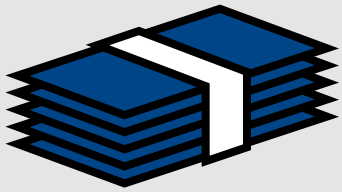
The study on the use of ICT in early detection and response provided evidence of systems change, but also highlighted the need for strengthening institutional capacity further to manage and respond to ICT-driven changes. It was evident that structures, including those for communication and extension services, should be encouraged to explore and understand how social media could contribute more to the provision of agricultural advisory services.

In addition, the economic modelling could be more useful if it was improved through the use of field-based crop loss data and data on the actual costs of pest control. It would also be interesting to understand whether the predicted reduction in economic loss was actually experienced in Ghana, and if the predicted cost savings are sufficient to prompt changes in behaviour towards a more proactive approach to managing pest outbreaks, with a stronger focus on surveillance.

Positive plant clinic impact in Bangladesh

An assessment of plant clinics in Bangladesh on the productivity and profitability of farmers growing cucurbits found that plant clinic users had increased income as well as better knowledge, and further, shared that knowledge with their networks.



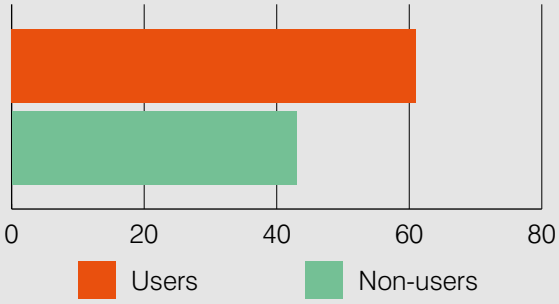


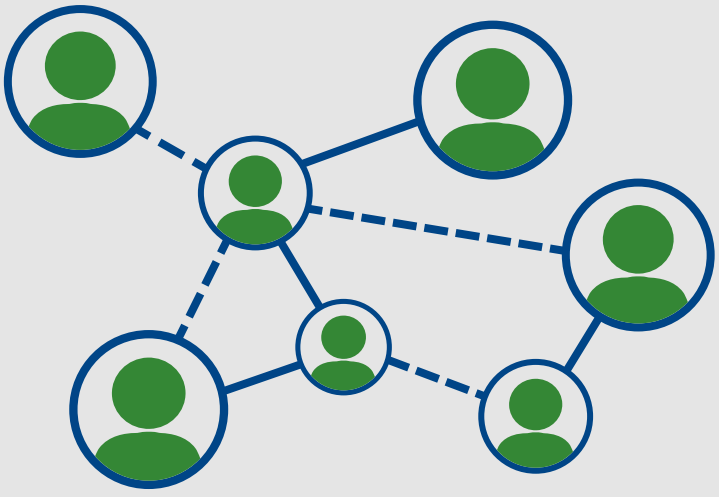
33%

The average income for clinic users was one-third higher than non-clinic users across all crops; amounting to around USD 78.99 each

61%

61% of plant clinic users reported an increase in their problem-solving ability, compared to 43% of non-users.





80%

Around 80% of plant clinic users shared the advice they received with other farmers. With an average of over 4 people informed by each household, a total of 907 persons were informed.

Next steps

In 2020, monitoring, evaluation and learning will focus on two key activities: seeking to provide clear evidence of the changes in farmer practices in relation to pesticide use, and assessing the sustainability of the Plantwise approach in all the countries in which the programme is currently active.

Whereas there is currently much evidence that pesticide use is one of the areas where Plantwise has made a useful contribution, other evidence indicates an increased use of pesticides due to the adoption of plant clinic advice. This is particularly in reference to those crops where pesticide use is traditionally uncommon in smallholder farms: for example, maize in Kenya. It is necessary that priority is given to generating concrete evidence of changes seen in the field, and comparing this against what is reported by farmers through interviews.

Likewise, a focused assessment process is needed that allows countries to determine what they consider important to sustaining Plantwise, backed up with evidence on how they will ensure specific elements of the programme continue in the future. A new methodology will be necessary for this, rather than relying on the CABI-driven sustainability scoring tool, which has been used up to now.

Gender-focused activities

Progress in 2019

In 2019, CABI conducted a gender assessment in five countries (Afghanistan, Bolivia, Ghana, India and Uganda) to understand the measures taken and challenges faced in ensuring equal participation of, and benefit to, women under Plantwise. The assessment was conducted through:

- discussions with country coordinators
- a review of country reports
- a review of reports from other studies, including those from external evaluations of Plantwise

The assessment focused on some of the documented observations that that have formed the basis of Plantwise's interventions in endeavours to increase its gender inclusivity. These are outlined below.

Socio-cultural norms restrict women's access to plant clinics run by male agriculture extension workers, especially in traditional Muslim communities. To address these restrictions, dedicated plant clinics for women were set up in Afghanistan, Ghana and Pakistan, and more women plant doctors were trained to work in these clinics. In Pakistan, in 2019, five women-only plant clinics were set up, with plans to add four more in 2020. In Afghanistan, 28 women plant doctors were trained to work in the five women-only plant clinics already established. Some countries also made efforts to **counter the societal notion that seeking agricultural advice is primarily a man's role**, in the way they crafted their communication messages. In Bolivia, communication messages about the services of plant clinics and plant health information were disseminated using videos that show women participating in plant health activities and advertisements made through public radios with messages tailored to reach women farmers. In India, short video screenings of women farmers participating in Plantwise activities or giving testimonies were produced and disseminated and, in addition, experience-sharing sessions were organized among women farmers to create opportunities for successful women farmers to share their stories.

Timing and access are barriers to women attending plant clinics and plant health meetings, especially for single female heads of households. Countries have started to organize separate and/or additional plant clinic sessions for women farmers, during times that are more convenient to them. In Ghana, they hold separate women-only sessions for women farmers at a time that is most convenient to them. Flexible arrangements have been adopted in some clinics, with

support provided to men one week and to women the next week. **Plant doctors have started conducting clinic sessions in various communities** within their operational areas running clinics to enhance access by women. Plant clinic sessions are held during women's groups meetings, such as saving and loan group meetings, to maximize reach to women farmers. In India, separate plant clinic sessions were held for women farmers, focusing on the type of crops that are produced by women.

Communication channels and messages about plant health services are crucial in influencing the ability of Plantwise to reach women and men farmers equally. Plantwise has adopted diverse communication channels, including radios and mobile services, and religious gatherings in churches and mosques, in order to be able to better reach women farmers. In India and Uganda different farmers' groups – such as women farmers' groups, producers' organizations, farmers in national rural employment guarantee schemes, and women's self-help groups – were directly targeted to reach women with information about services provided by the plant clinics, with village knowledge centres being used to communicate information about Plantwise to farmers in India. In Malawi, Plantwise targeted six women savings and credit groups in plant health messaging.

Training village-level community plant health promoters to work and support plant doctors is another innovative communication method introduced in some countries, with community change agents used in Uganda. In Bolivia, women lead farmers were identified and trained to work as community promotors, passing plant health information to other women farmers and linking them with plant doctors. In India, farmers' peer communication was used, by training women lead farmers to reach out to other women. The lead farmers served as an intermediary cadre at the village level, as plant health monitors who were trained on the diagnosis of pests and diseases and to interact with farmers. Some countries have also tried to influence more young men and women to get involved in extension work. In Bolivia, Plantwise involved young men and women in extension outreach campaigns by working together with technical institutes in universities and colleges to recruit students to participate in plant health campaigns.

The gender sensitivity of extension workers plays a role in strengthening their ability to reach women farmers. In 2019, some extension agents in Uganda ensured they engaged with both women and men in the household during their farm visits, conveying that women are farm managers and are responsible for applying the advice provided by extension agents, despite the limited decision-making role given to them. In India, plant doctors are guided to ask male farmers to come along with their wives to plant clinics, as the women are also involved in the field operations and their participation is crucial. In Ethiopia, training on gender-sensitive extension service provision, was conducted in order to enable them to respond better to the needs and priorities of women farmers.

To overcome challenges related to the affordability of agricultural inputs, Plantwise linked with other programmes providing support on agricultural inputs to farmers. In Ghana, plant doctors linked women farmers with projects that provided credit facilities for the purchase of agricultural inputs, while in Uganda, implementing partners organized women into saving and credit groups, to enable them to access loans to buy inputs and conduct farming as a business. In Afghanistan, Plantwise linked with a horticulture project funded by the United States Agency for International Development to provide women with agricultural inputs, such as improved seeds and pesticides. **To overcome challenges related to literacy levels**, plant doctors were asked to explain, clearly and in detail, to men and women farmers the application of written recommendations, giving step by step instructions. Local language and simple and non-technical terms are now increasingly used by plant doctors while giving advice to farmers.

Only a **limited number of women are employed as extension workers, which** limits the possibility of having an adequate number of women plant doctors. Studies in some Plantwise countries, such as Bolivia, have showed there is a significant positive correlation between plant clinic attendance by women and the number of female plant doctors, which strengthens the argument that having more women-operated plant clinics can improve participation by women farmers in the programme.

Lessons learned

In reviewing progress in 2019 and the performance in regard to integrating gender during the previous years, the key lessons that emerge include the following:

- A gender analysis should be carried out to inform the design of activities, based on an understanding of the gender relationships on the ground. Such an analysis could have helped to design separate plant clinics for women and men farmers in countries where religion and social norms do not ordinarily allow men and women to mix. This would be important, especially if women are significantly involved in crop production activities, as in Afghanistan where they make up over 50% of the agricultural labour force.
- The practice of training a cadre of men and women plant health promotors that live within the community and support plant doctors as agriculture extension workers would be useful in contexts where there are insufficient women extension workers, and where women farmers are not active in seeking agricultural advice. Women plant health promotors can reach out to women farmers and serve as a bridge between them and plant doctors.
- Consulting both men and women community members about plant clinics sites and timings is an approach that can be used to ensure that women-specific needs are taken into consideration in choosing clinic locations and the timing of clinic sessions.
- Understanding which communication channels are most accessible to men and women farmers before extension campaigns are implemented is necessary as it is important not only to use communication messages and channels to counter barriers due to social norms but also to do so in contexts with which women readily identify.
- Gender-sensitive agriculture extension approaches can help facilitate increased access to agricultural services by women farmers; hence, basic gender sensitivity training should be integrated into plant doctor training.
- Involving female college students in plant health campaigns can help to get them interested in training as agriculture extension agents, to increase the number of women in this sector.
- Beyond access to extension advice, several other factors affect women's ability to access and use different agricultural inputs and technologies and it is essential that plant health stakeholder meetings include agenda items on the challenges faced by women in agriculture.

Next steps

In 2020 gender assessment will be completed in five Plantwise countries. This will be followed with an in-depth study in India and Ethiopia in 2020 to better understand the results of in-country gender adaptions, focusing on using the lessons learned so far from Plantwise to build into other areas of CABI's work including new projects.

Many of the lessons were learned based on Plantwise activities carried out in various countries, and hence this points to the need for different approaches to work on gender, with consideration for variations according to country contexts.

Application of these lessons will continue in 2020, with the aim of increasing the opportunities for women in accessing Plantwise products and services. However, since social and gender norms continue to be a challenge for women, CABI will also conduct a study on specific aspects of some of the norms that affect access to and use of plant clinic advice by women, to identify how sustainable positive changes can be realized, in order to inform future work under Plantwise or other projects and programmes.

Plantwise publications in 2019

Published

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Silvestri, S., Macharia, M., Uzayisenga, B. (2019) Analysing the potential of plant clinics to boost crop protection in Rwanda through adoption of IPM: The case of maize and maize stem borers. *Food Security* 11, pp. 301–315. ♂🏅♀

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Tambo, J., Uzayisenga, B., **Mugambi, I.**, **Bundi, M.**, **Silvestri, S.** Plant clinics, farm performance and poverty alleviation: Panel data evidence from Rwanda. *World Development.*

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Bundi, M., **Oronje, M.L.**, **Romney, D.**, **Hunt, S.** Social media and other ICT in early detection of crop pests and rapid response in advisory service delivery. *Agriculture and Human Values.*

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Key

♀ gender ♂ open access 🏅 impact factor > 2

Annex 1: Report on progress against 2019 milestones

General (2019)			
Key milestones	**Timing**	**Status**	**Comments/progress**
Plantwise introduced in a total of 34 countries and active in 29, with at least 16 countries in scale-up and sustainability phases and a further 13 in consolidation phase	Q4	●	Plantwise introduced to 34 countries cumulatively, of which 30 were active by end of 2019 with, six countries in sustainability phase (CN, IN, JM, PE, PK, LK), 14 in scale-up phase (AF, BB, BD, BO, CR, ET, GH, KE, MW, NP, NI, RW, TH, ZM), nine in consolidation phase (BR, BF, GD, HN, MZ, MM, TT, UG, VN) and one in pilot phase (KH); a light version of Plantwise was introduced to Colombia in 2019
40.5 million farmers (cumulatively, as measured through direct and indirect reach, including plant clinics, plant health rallies and other extension campaigns) received plant health information	Q4	●	Cumulative reach by the end of 2019 was 44.1 million farmers. In 2019 alone, approximately 13 million farmers were reached; 268,610 through plant clinics (16% female farmers, but 30% when Pakistan is excluded from data set); 155,187 (41% women and youth) through plant health rallies and similar extension activities; 2.2 million through mass extension campaigns
Private sector plant clinics run in 13 countries (cumulatively), including plant clinics operational for three value chains	Q4	●	Private sector-run plant clinics piloted in 14 countries (cumulatively) (BO, CO, CR, HN, NI, JM, CD, GH, LK, UG, CN, IN, NP, VN); the plant clinics run by farmer producer companies in India and Nepal are linked to numerous different value chains (for example, fruits, vegetables, spices), and clinics established through the Colco project in Colombia serve the cocoa value chain
2018 Plantwise Annual Report submitted to Plantwise donors	Q1	●	2018 Plantwise annual report submitted to donors on time, i.e. 29 March
Annual Donor Forum and core Plantwise implementation team meeting organized	Q2/4	●	Successful annual donor forum in the Hague on 8–9 May; participating donors were DFID and DGIS; summary meeting notes sent to all current and previous Plantwise donors
15 publications (using gender-disaggregated data) submitted/ published, all in open access ,10 of which with a development focus, and five in journals with an impact factor >2	Q4	●	18 published (eight using gender-disaggregated data, 17 in open access, all with a development focus, five in journals with IF>2), two accepted, five submitted for review

Three distinct mass extension campaigns started in nine countries (cumulatively); 3 m-Plantwise service launched (cumulatively) and two services further scoped	Q4	●	11 distinct mass extension campaigns started in nine countries (cumulatively) – MW, UG, ZM, GH, KE, RW, BD, LK, IN– using village-based video screenings, radio (local and national), plant health rallies, SMS, video sharing via mobile phone and social media. Five cases (cumulatively) of mobile service delivery used in MECs: ZM, KE, LK, GH, UG
Analysis of Plantwise data conducted to understand plant clinic coverage for more informed planning of clinic establishment	Q4	■	Analysis of plant clinic catchment area ongoing, with users of nine clinics in Kenya now mapped. Preliminary modelling of optimal/ required clinic coverage to begin assessing influence of factors such as population density and transportation routes
Use patterns in recommendations by plant doctors to design interventions on pesticide risk reduction from analyses of data in POMS	Q4	●	Diverse interventions, mostly involving awareness raising of the issues on red list pesticides with plant doctors and teams within the extension departments initiated in at least 24 countries (11 in Asia, six in Africa, seven in Latin America and the Caribbean), with some countries such as Pakistan agreeing to phase out highly-hazardous pesticides belonging to WHO categories Ia and Ib by 2022. Overall, there was a decrease in the proportion of records containing a red list pesticide, from around 3% of all records for the years 2015,2016,2017 to 2.25% in 2018; this decrease was despite an increase in the overall numbers of plant clinic records in POMS
Knowledge Bank (2019)			
Key milestones	**Timing**	**Status**	**Comments/progress**
Integrate Knowledge Bank funding into Plantwise 2.0 project proposals: incorporate digital innovation to build support for infrastructure in new funding proposals to ensure Knowledge Bank sustainability; continue to seek spin-off projects that contribute to further development of Knowledge Bank products that are essential for effective delivery of Plantwise activities	Q4	●	Through the development of a new global programme, the Plantwise Knowledge Bank will be maintained and upgraded to become part of a toolkit, with other products available on the same platform. For this we have secured funding and the Plantwise Knowledge Bank will continue to be available to all countries in the future
Plant doctors and other relevant stakeholders using ICT (e.g. tablets, POMS, Plant Doctor Simulator, factsheets library app) in 29 countries (cumulative). ICT use integrated into plant health system responsibilities: for example, for diagnosis, with appropriate follow-on plans	Q4	●	Factsheet app used in 30 Plantwise countries in 2019. POMS accessed from 29 Plantwise countries. 3,400 plant doctors trained to use tablets in 1,090 plant clinics in 25 Plantwise countries, of which 749 plant doctors trained in 2019, for 1,456 plant clinics

Tools and training provided to allow greater autonomy in data processing and analysis in 15 countries. Data harmonization occurring in 18 countries, data agreements signed with 29 countries; 620,000 plant clinic records on POMS being analysed in 25 countries	Q4	●	28 Plantwise countries downloading clinic data; data sharing agreement signed with 30 countries (17 closed + 13 open). In 2019, 29 countries harmonized data and seven countries reharmonized over 18,000 records. There are 650,000 plant clinic records on POMS (with an additional 80,000 records on the China system)
High-quality content supplied to all plant health system actors in Plantwise countries using all appropriate means. 14,000 factsheets available on the online Knowledge Bank, leading to 1.9 million visits and 500,000 sessions on the Factsheet app	Q4	●	Content available on the Plantwise Knowledge Bank includes 10,565 PMDGs, PFFFs, videos and photosheets. Plantwise Knowledge Bank online visits have reached 2,116,877 people; 737,178 (cumulative) Factsheet app sessions.
Plant health systems development (2019)			
Key milestones	**Timing**	**Status**	**Comments**
2018 country annual reports and 2019 country plans finalized for all active Plantwise countries	Q1	●	All 2019 country plans were finalized in January; 2018 country annual reports finalized for all countries
Gender-disaggregated reporting and analysis in 29 (all) countries, and gender-specific activities initiated in at least two countries to further increase women and/or youth participation in delivering and accessing advisory services	Q4	●	Women-led plant clinics established in Afghanistan and Pakistan to increase reach to female farmers; explicit efforts made to increase women participation at clinics in BO, CR, NI, PE, ET, GH, MW and RW. An assessment of youth involvement as agricultural service providers in Kenya revealed that farmers are willing to pay for bundled services, rather than just advice alone. A gender assessment to understand the measures taken and challenges faced in ensuring equal participation and benefit of women completed for five countries: UG, GH, IN, AF, BO
Partnership agreements signed with 36 key national partners (cumulatively); national co-ordination units (steering committee and/or national forum) operational in 25 countries (cumulatively)	Q4	●	10 new partnership agreements/MoUs signed with collaborators in nine countries (more than 50 partnership agreements, cumulatively). One example of an important new partnership was that with ICCOA in India for delivery of Plantwise-related training as a fee-based service; held various forms of formal review and planning meetings with national co-ordination units (steering committee and/or national forum) in 22 countries

Plantwise activities included in official governmental documents and/or supported by partners' official budgets in all the 29 countries where the programme is active	Q4	■	Plantwise activities included in different forms of official government documents, such as agricultural strategies and job descriptions, in at least nine countries over the years (BF, CN, ET, KE, MW, MM, PK, PE, UG). Total known budget contributions from partners estimated at GBP 1,117,150, from more than 70 different government departments and other organizations across 23 countries. One very significant achievement in 2019 was getting Plantwise activities incorporated into 2019–2020 provincial plans and budgets in Nepal, following a disruptive decentralization process
Aim to achieve the use of plant clinic data by national stakeholders for monitoring and decision-making in 19 countries	Q4	■	Data use observed in 16 countries in 2019 (AF, BD, BO, CN, GH, IN, JM, KE, MW, PK, PE, RW, TH, UG, VN, ZM); notable examples of new data uses: (1) Nakuru County (Kenya) 'early warning team' developing plan to use clinic data to detect problems and identify training needs for their extension agents; (2) Punjab province (Pakistan) runs plant clinics daily during critical cotton season and uses the resulting clinic data to monitor for pest outbreaks; and (3) partners in Sichuan province (China) began using clinic prescription forms and data as a tool to monitor agro-input dealers
Plant clinic schemes consolidated and expanded, with an additional 200 new plant clinics established (bringing cumulative total to 3,500)	Q4	●	874 new plant clinics established across 21 countries, for a cumulative total of 4,500; this process was initially expected to slow due to continuous reductions in Plantwise support for clinic launch and operation; as well as a greater focus on converting existing paper-based plant clinics to e-plant clinics. The newly secured funding from DGIS contributed to some teams exceeding their targets
800 new plant doctors (11,000 cumulatively) trained in Modules 1 and 2, increasingly through the training of trainers process	Q4	●	1,540 personnel (28% women) trained in Modules 1 and 2 of plant doctor training, 95% of which was delivered by local trainers, for a cumulative total of 11,479. PestSmart Diagnostics e-learning course piloted in Jamaica with 20 users; global roll-out of the course to all plant doctors planned for 2020 to assess accessibility and suitability

150 factsheets/PPMDGs developed and locally validated	Q4	●	481 pieces of content either newly produced or reviewed and updated (314 PMDGs, 161 Factsheets for Farmers, six photo sheets)
Improved measures for quality assurance of diagnoses and advice by plant doctors identified and tested	Q4	■	Ongoing testing of multiple methods for remote training and assessment, particularly through the use of ICT. Formal launch of serious games (PDS and CMS) initiated in mid-2019, with more than 1,000 installs of both games observed in 2019. 17 plant doctor quizzes have been given through SurveyMonkey to test this approach to assessing diagnostic knowledge, while also educating users by providing explanations to the answers. Excel version of automatic validation tool was shared with testers in Kenya and Ghana, with positive initial feedback, but more refinements still necessary. Machine learning tested for validating records and extracting specific info (e.g. chemical names) from the data
Monitoring and evaluation (2019)			
Key milestones	**Timing**	**Status**	**Comments**
Evidence of outcome and impact reported for male and female farmers on adoption of appropriate practices, including sustainable pesticide use, productivity change, crop loss avoided, and income change through: one quasi-experimental study in one country; further 10 CCC-led studies conducted to provide supporting evidence of impact.	Q4 (for all)	●	Quasi-experimental study on impact of plant clinics on FAW management in maize at intrahousehold level in Zambia completed. Analysis underway. CCC-led work, resulting in blogs, impact stories or study briefs: Latin America and the Caribbean: Barbados (2), Bolivia (1), Costa Rica (2), Nicaragua (1) studies in progress, to be finalized 2020. Africa: Ghana (1), Malawi (1), Kenya (1), Mozambique (1), Uganda (1) draft reports completed and under review for all. Two blogs shared from Kenya study. Asia: Afghanistan (1), Bangladesh (1), Cambodia (1), China (3), India (1), Myanmar (1), Nepal (1), Pakistan (2), Sri Lanka (1), and Thailand (1)

Cost-effectiveness of plant clinics and other extension approaches studied and reported: One journal paper addressing cost-effectiveness of different extension approaches. Report on cost-effectiveness of MEC methods in Uganda in 2018. Cost–benefit analysis of clinics concludes from studies conducted in Kenya, Rwanda, Bangladesh, Pakistan	Q3	▲	One paper on effectiveness of MECs in Uganda published by PloS One. Cost element to be introduced for impact study brief – being finalized. Cost–benefit analysis work to be completed in 2020
Publish Plantwise impact report	Q1	●	Print version issued and circulated in April. PowerPoint and 10-page summary document finalized and shared with national partners through Plantwise regional co-ordination units. Complete version (Word) finalized and circulated in October and blog post written
Impact assessment in Pakistan – complete final reports and publications	Q2	●	Quasi Experimental study completed in Pakistan, final report and study brief both published
Complete technical editing of three evidence reports to produce outputs for the CABI series (working papers/ case studies/ research briefs). At least one as a research brief (impact), contributing to indicator 2.3	Q4	●	Four evidence reports (journal papers, working papers, study briefs) published: Three study briefs published: Bangladesh on-farm impact study brief; Ghana FAW economic modelling study brief; Pakistan impact assessment study brief. China 'green incentive system' working paper published. Early Detection and Rapid Response (EDRR) paper resubmitted to new journal
Complete publication of journal paper on Plantwise Impact assessment by AIR in Kenya	Q2	▲	Three draft papers prepared by AIR – two to include CABI co-authors; one (highly technical) on impact
Value for money analysis of a set of CABI KPIs conducted in a number of countries involved in Plantwise implementation; to include comparative value for money analyses reported for one country each in sustainability, scale-up and consolidation phases of sustainability roadmap	Q4	●	Report completed and shared with PWPB, AoI and ASHC teams. Paper drafted for discussion at EMT about the way forward in the introduction of value for money in CABI
Complete bioeconomic modelling FAW study in Ghana	Q2	●	Study brief published

Fund-raising and market development (2019)			
Key milestones	**Timing**	**Status**	**Comments/progress**
Plantwise and Action on Invasives programme funding of GBP 15 million for 2019–2021 secured from existing and new donors (inc. DEVCO-DeSIRA), using new Plantwise 2.0 forward plan	Q4	■	Fund-raising plans agreed during KAM kick-off meeting; top-up funding secured from DGIS (EUR 2.8 million) for Plantwise and Action on Invasives. Won NL Min. of Agriculture project for Action on Invasives project on tomato two biocontrol in Kenya (EUR 100,000). EU DEVCO action document and budget as proof of concept of CABI's new flagship programme submitted to DEVCO (EUR 6 million) for contracting. Secured top-up funding for Action on Invasives from DFID (GBP 1 million), as well as GBP 820,000 bonus payment. Pitched to DFID for two-year extension of multi-year agreement to co-fund proof-of-concept phase of CABI's new global programme. Submitted EUR 2.5 million proposal to the Netherlands Postcode Lottery. AGRA Plantwise proposal Burkina Faso submitted (GBP 714,000). Gates approved a USD 1.5 million ACES proposal, with USD 825,000 to CABI for this Plantwise spin-off project
Plantwise 2.0 model used to secure funding from at least three public or private organizations paying for Plantwise services in existing/new countries	Q4	■	Plantwise services included in pitches to private sector: for example, Koppert and peppercorn companies. E-learning modules pitched to AMEA network through Koppert. Koppert Foundation agreed to fund plant doctor and other specialists training in India (EUR 19,000). COmON Foundation, through African Peace Parks, approved two-year EUR 50,000 proposal to train plant doctors in neighbourhood of Simahala Conservancy in Zambia, contract to be issued in 2020
Awareness raising conducted with donor country desks in Africa and Asia to ensure ownership and linkages to other relevant initiatives, as well as local support to Plantwise collaborators	Q4	●	Donor country desks visited in Kenya, Zambia, Rwanda, Malawi, Ethiopia, Ghana, Bangladesh, Pakistan. EU delegation in Kenya wishes to explore funding beyond 2020, EU delegation to the AU interested in CABI's SPS backstopping in relation to future AU free trade

Annex 2: 2020 milestones

General (2020)	
Key milestones	**Timing**
Plantwise active in 26 out of 34 countries where it was been introduced, with at least 22 countries in scale-up and sustainability phases	Q4
Evidence of uptake of Plantwise or some of its elements to service specific needs of new partners in two to three countries (cumulatively)	Q4
Private sector-linked plant clinics piloted in 14 countries (cumulatively), with evidence of significant engagement in three countries presenting details of linkages to specific crop or input supply systems	Q4
Identify a mechanism and process for selecting what core Plantwise activities will continue to receive backstopping from CABI in countries where **Plantwise+** will not initially invest funding	Q4
Engage with all active Plantwise countries to clarify plans for transition to **Plantwise+** – what Plantwise activities may continue to receive services from CABI and the additional benefits that can be expected from the new programme	Q4
50.5 million farmers (cumulatively, as measured through direct and indirect reach, including plant clinics, plant health rallies and other extension campaigns) have received plant health information	Q4
2019 Plantwise annual report submitted to Plantwise donors	Q1
Annual donor forum meeting organized	Q2
15 publications (using gender-disaggregated data), including one paper on Plantwise impact assessment by AIR in Kenya; submitted/published; all in open access journals, 10 of which with a development focus, five in journals with an impact factor >2	Q4
Knowledge Bank (2020)	
Key milestones	**Timing**
Integrate Knowledge Bank funding into new/affiliated project proposals	Q4
Plant doctors and other relevant stakeholders using ICT (e.g. tablets, POMS, Plant Doctor Simulator, Factsheet library app) in 26 countries (cumulatively). ICT use integrated into plant health system responsibilities – for example, for diagnosis – with appropriate follow-on plans	Q4
Tools and training provided to allow greater autonomy in data processing and analysis in 26 countries. Data harmonization occurring in 26 countries; data agreements signed with 30 countries; 650,000 plant clinic records on POMS	Q4
High-quality content supplied to all plant health system actors in Plantwise countries using all appropriate means. 14,000 factsheets available on the online Knowledge Bank, leading to 2.5 million visits and 800,000 sessions on the Factsheet app	Q4

Plant health systems development (2020)	
Key milestones	**Timing**
2019 country annual reports and 2020 country plans finalized for all active Plantwise countries	Q1
Gender assessment completed in five Plantwise countries. In-depth impact study in India and Ethiopia to understand results of in-country gender adaptions	Q1/Q4
Evidence of Plantwise activities in more than 10 countries included in official governmental documents that can serve as enablers of Plantwise sustainability and implementation of affiliated CABI projects/programmes	Q4
Partners' official budgets contributing to Plantwise activities in all countries where the programme is active	Q4
Plantwise POMS data used by stakeholders in 20 countries to inform resource planning, research, etc.	Q4
Usefulness of two prototype data validation tools (Excel validation tool; machine learning algorithm) evaluated and further analysis undertaken to assess knowledge of plant doctors	Q4
Evaluate use of plant doctor training by tertiary education institutions which have integrated Plantwise training courses into their curricula	Q4
Monitoring, evaluation and learning (2020)	
Key milestones	**Timing**
Conduct assessment of Plantwise sustainability in all countries where the programme is active	Q4
Evidence of outcome and impact reported for male and female farmers, with focus on pesticide use through one field study to assess changes in farmer practices relating to pesticide use post plant clinic advice	Q4
Cost-effectiveness of plant clinics in comparison to other extension approaches studied and reported through cost–benefit analysis studies of clinics concluded for Kenya, Rwanda, Bangladesh, Pakistan and one journal paper/report presenting cost-effectiveness of different extension approaches written/published	Q2
At least three evidence reports to produce outputs for the CABI series (working papers/ study briefs); at least one as a study brief on impact	Q4
Fund-raising and market development (2020)	
Key milestones	**Timing**
Building on proven Plantwise concept, secure funding from public or private organizations paying for Plantwise services in existing/new countries	Q4
Secure GBP 2.5 million from in-country funding sources in Africa and Asia for implementation of Plantwise and affiliated projects	Q4
Engage with donors on Plantwise that will incorporate Plantwise and Action on Invasives to secure new programme funding of GBP 20 million for 2020–2023 from existing and new donors	Q4

Afghanistan

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	46	258 (210*)
Plant doctors trained	130	573 (520*)
PMDGs drafted	10	53
Factsheets drafted	10	66

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Plant Protection and Quarantine Directorate (PPQD), Ministry of Agriculture, Irrigation and Livestock (MAIL)– NRO; also responsible for national data management and provides diagnostic support

National Horticulture and Livestock Project (NHLP), MAIL, Afghanistan (funded by World Bank)– LIO

Department of Agriculture, Irrigation and Livestock (DAIL) – LIO; also supports in data management and M&E

The Danish Committee for Aid to Afghan Refugees (DACAAR) – LIO

Agha Khan Foundation-Afghanistan – LIO

2019 highlights

- Funds (£31,000 and £2,497) allocated to Plantwise activities by NHLP and PPQD respectively
- National trainers conducted 'Module 1' training (Field diagnostics and plant clinic operation) for 130 plant doctor trainees (102 male, 28 female)
- National trainers conducted 'Module 2' training (giving good advice) for 110 plant doctor trainees (102 male, 28 female)
- Facilitated the establishment of 46 new plant clinics by PPQD, NHLP and DAIL, for a total of 210 active plant clinics
- Conducted 'extension messages' training (producing extension materials) for 10 participants (10 male, 0 female), leading to the development of 15 new PMDGs and 10 factsheets (not yet published on the Knowledge Bank)
- CABI trainers conducted 'Data Management' refresher training for 22 participants (22 male, 0 female)
- CABI trainers conducted 'e-plant clinic' training for 13 participants (13 male, 0 female) to enhance data collection and improve access to extension materials
- Conducted data management and use workshops for 25 male participants) from central and provincial departments
- Four plant clinic cluster meetings held with the participation of 135 male plant doctors
- National partners exhibited at 3 local farmer fairs, distributing 1500 of factsheets and PMDGs
- Facilitated the entry of over 4,000 plant clinic queries into POMS
- Local partners using the administrative information in POMS to track activities
- Promoted use of ICTs tools (data collection app, Factsheet Library app, PDS and CMS) for PPQD, NHLP and DAIL
- Promoted gender awareness among partners and the participation of women and youth in the programme through establishment 10 women-led clinics that provided plant health advice to female farmers

Key challenges and lessons learned

- Backstopping of Module 1 and 2 trainings helped to build the technical capacity of the participants to serve as good plant doctors. Regular backstopping activities will continue in the new year
- There is a need for translation of more technical material (plant doctor manual, PMDGs, photo sheets and factsheets) to local language in order to improve accessibility and use
- Precarious security conditions in some areas continue to affect plant clinic operations and feasibility of running plant health rallies. Relocation of clinic sites or stopping clinic activity during insecure times is inevitable
- Poor or no internet connection coupled with power shortages create delays in transmitting the data and connecting to POMS
- Because most plant doctors do not have computers or smart phones to access the Plantwise knowledge bank content, the provision of offline tools such as USB sticks and printed PMDG & Factsheets are an important means of accessing technical information to plant doctors. Continuous updates of the USB and tablets would be useful

Bangladesh

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	30 (30)
Plant doctors trained	–	236 (40*)
PMDGs drafted	10	89
Factsheets drafted	0	50

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of Agriculture (MoA) – NRO

Plant Protection Wing (PPW), DAE – LIO

National Agricultural Technology Program (NATP2) -Project implementation unit, DAE – Supports integration of Plantwise in Farmers Information Advisory Centres (FIACs)

Bangladesh Agricultural Research Council – Member of steering committee and National Forum

Bangladesh Agricultural Research Institute (BARI) – Support collaborative research activities on FAW

Agriculture Information Service (AIS) – Support Plantwise to conduct extension and communication activities in Bangladesh

2019 highlights

- Signed a Partnership Statement with BARI to support collaborative research activities on FAW
- 297 new e-plant clinics established with financial support from NATP2 project for a total of 327 active plant clinics
- Conducted 'e-plant clinic' refresher ToT training for 51 NATP2 officials (37 male & 14 female) to build their capacity as master trainers at FIAC locations
- 51 'e-plant clinic' trainings conducted by NATP2 master trainers for 400 Sub Assistant Agriculture Officers / Sub Assistant Plant Protection officers (male 320 and female 80) from 51 Upazilla FIACs with financial support from NATP2 project
- Conducted 'Extension Messages' training for 15 participants, leading to the development of 10 new PMDGs
- Facilitated the entry of 3,500 plant clinic records into POMS
- Regular harmonisation of POMS data by the data manager from PPW
- With financial support from NATP, piloted the use of digital devices at 297 plant clinics to enhance data collection and improve access to extension materials
- Promoted use of ICTs tools (data collection app and factsheet library) for FIAC SAAO / SAPPO staff
- Facilitated a special M&E study on on-farm impact of plant clinics in Bangladesh
- Together with Action on Invasives programme, conducted a regional workshop to promote the use of Pest Risk Analysis tools for 16 participants (including 2 female delegates) from NPPOs of four countries (India, Nepal, Sri lanka and Bangladesh)
- Conducted FAW communication planning workshop with 18 National stakeholders from DAE, BARI, FAO, Bangladesh Rice Research Institute, Bangladesh Wheat and Maize Research Institute, CIMMYT, BRAC, AAS and USAID
- Conducted a FAO Technical validation workshop on developing FAW communication materials for 10 participants (8 male & 2 female)

Key challenges and lessons learned

- Piloting of e-plant clinics in 51 Upazillas in 10 districts will help streamline data collection and flow into POMS. However, the challenge is on how to enhance efficiency in data harmonisation where currently, only the data manager is responsible for harmonising the huge data set
- A data validation and analysis workshop that will focus on individual plant clinic data from the previous year has been planned for next year and the output from this workshop will be shared with the Deputy Directors and plant doctors at district level
- The integration of Plantwise concepts into FIAC operation and skill building through the module 1 and 2 trainings has shown great potential for both sustainability and outreach of the programme; it will be important to closely follow this activity due to its potential for upscale in other districts

Bolivia

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	2	49 (39*)
Plant doctors trained	3	397 (46*)
PMDGs drafted	0	29
Factsheets drafted	16	162

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Gobierno Autónomo Departamental de Santa Cruz (GAD)-SEDACRUZ (PROFER), DSIA, CIAT – Public Clinic

PROINPA Foundation – Support to the Clinics with the diagnosis of pests and/or diseases.

Technical institutes (Mairana, Tarata, UAGRM) – Public Clinic

Municipal Government of Capinota, SipeSipe – Public Clinic

El Huerto Company – Private sector clinic

ATRIA (Consulting Company contracted by PETROBRAS) – Provide technical assistance to agricultural producers in the areas of gas exploitation

Agrodealer Borda (mobile clinic) and AgroValle – Private sector clinic

2019 highlights

- Signed a Partnership Statement with the Santa Cruz Government and PROINPA Foundation Tecnológico Agropecuario e Industrial de Tarata (ITAIT)
- Facilitated the establishment of 2 new plant clinics by Agrovalle and El Huerto for a total of 39 active plant clinics in the country
- Implemented 1 PDs Clusters meeting in Santa Cruz and 1 in Cochabamba Region sharing data, experiences and reviewing the progress of activities
- National trainers conducted Module 1 and Module 2 training (field diagnosis and plant clinic operation) for 3 plant doctor trainees (2 female, 1 male) from El Huerto Company
- Conducted a special-need training course on the use and ID of Natural Enemies held at Fundación PROINPA with 16 participants (11 male and 5 female).
- Facilitated specific, need-based training on Plant Parasitic Nematodes diagnostic and control for 59 plant doctors (15 female, 44 male) trainees, in order to improve the quality of the diagnostics in the plant clinics
- National trainers conducted a write-shop to review the pest management decision guides and factsheets developed in the country with the participation of 19 plant doctors (7 female, 12 male)
- Received 2,897 queries at plant clinics, of which 2,002 (338 female, 1611 Male) were recorded as data in the Plantwise Online Management System (POMS)
- Developed 16 new factsheets, one banner and 3 photosheets
- Local partners using plant clinic data in the Plantwise Online Management System (POMS) for planning activities and for the development of new technical documents (e.g. factsheets)
- Facilitated 35 plant health rallies, reaching 754 people with targeted messages (192 female and 562 male) and 16 mass extension campaigns in agricultural fairs reaching 627 farmers with targeted messages (173 female, 454 male)
- New pest, Gonadonta pyrgo (Lepidoptera: Noctuidae) identified for first time through plant clinics in Santa Cruz
- Paper on PW programme in Bolivia presented by the Secretary of Agriculture at the Latin American conference on sustainable agriculture
- The Government of Santa Cruz budgets resources for plant clinic activities in its Annual Operational Plan, since clinic activities are included in the Terms of Reference for technicians to be hired
- Facilitated participation of Plantwise in National and Regional Agricultural Fairs
- Active WhatsApp support group with 56 and 65 participants in Santa Cruz and in the Altiplanos region, respectively

Key challenges and lessons learned

- Include a link in the GAD application to the analysis of data from the different clinics; this could help in the decision-making process
- In 2020, special attention will be given to promoting the use of bio-inputs produced by different local companies such as PROINPA, BIOTECH and others. Plant doctors are generally not familiar with commercially available products or how they work

Brazil

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	8 (5)
Plant doctors trained	0	45 (5)
PMDGs drafted	8	30
Factsheets drafted	0	49

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Brazilian Research Corporation, EMBRAPA Mato Grosso – NRO & LIO

Ministério de Agricultura Pecuária e Abastecimento (MAPA) – LIO

Local Government, Municipalities – LIO

EMPAER (Empresa Mato-grossense de Pesquisa, Assistência e Extensão Rural); Instituto Federal de Educação, Ciência e Tecnologia de Mato Grosso, São Vicente; Universidade Estadual do Mato Grosso, Cáceres; Instituto Federal de Educação, Ciência e Tecnologia de Mato Grosso, Sorrizo; Universidade Estadual do Mato Grosso, Alta Floresta – LIOs

Luiz de Queiroz College of Agriculture (ESALQ) and Universidade Estadual Paulista (UNESP) – Technical Collaborator

São Carlos Federal University – LIO

2019 highlights

- Follow up meetings with the Agricultural Secretary in Mato Grosso State to reinforce collaboration and support for implementation of Plantwise activities in Mato Grosso
- Meetings the Agricultural Secretary of Mato Grosso State to explore the possibility of integrating their database with POMS
- Developed 8 new PMDGs

Key challenges and lessons learned

- Political instability resulting in major budget cuts to public institutions; however, EMBRAPA Sinop managed to tap into alternative budgets (through a call from the National Development Bank) to support Plantwise implementation.
- EMPAER plant doctors are only collecting plant clinic data while UFSCar only run plant clinics. In both cases, the introduction of e-plant clinics can serve as an important support to data collection and its use

Burkina Faso

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	56 (11) *
Plant doctors trained	0	131 (22) *
PMDGs drafted	0	11
Factsheets drafted	29	63

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministère de l'Agriculture et des Aménagements Hydrauliques (MAAH) –Mandates its Directorates from the national to provincial levels to work with the Plantwise programme

Direction de la Protection des Végétaux et du Conditionnement (DPVC), the NPPO – NRO

Direction Régionale de l'Agriculture et des Aménagements Hydrauliques (DRAAH) – Supervises plant doctors in their respective DPAAHs

Direction Provincial de l'Agriculture et des Aménagements Hydrauliques (DPAAH) – LIO

2019 highlights

- The fall armyworm was the most dominant pest reported at the plant clinics. It was reported every month of the year.
- Facilitated awareness raising on *Tuta absoluta* after a study conducted by Action on Invasive Programme in 2018 showed that the pest was widespread and yet was not reported at any of the plant clinics. This led the NPPO (which is also the NRO) to prepared a factsheet on the pest
- Conducted two Module 1 and 2 refresher trainings for 64 participants (15 female and 49 male) with financial support from the NRO in partnership with the now-ended BRACED project
- Government funding which was allocated to support FAW surveillance and management was largely used to support plant clinic activities
- Eleven (11) out of 56 clinics operated in 5 of the 13 administrative regions of the country during the year, conducting over 214 clinic sessions. These attracted 6,050 farmers (4,649 male and 1,401 female). Out of these, 353 queries were recorded in POMS
- The DPVC developed 29 new factsheets on frequently occurring pests in the country for distribution to the plant doctors

Key challenges and lessons learned

- Out of the 56 plant clinics already established only 11 submitted monthly reports on clinic operations in the year compared to 36 in 2018. The Plantwise team is aware that some plant clinics are operational but do not submit reports because they are not funded by the PW programme
- From the monthly reports submitted during the year, the active clinics mentioned their inability to diagnose some pests because they lacked reference materials or have outdated ones that do not include current dominant pests. Providing plant doctors with an updated catalogue of dominant pests in the country and their management options will go a long way to address this. Refresher courses focusing on practical identification of new pests that are frequently occurring in the country is also recommended
- Lack of funding from the central government to run existing Plantwise activities has led to logistical issues constraining clinic operations. To address this challenge, some plant doctors are considering returning to the stationary clinic model.
- The inconsistent funding of the programme has contributed to insufficient monitoring and supervision of clinic activities by both the NRO and LIO as well as training new plant doctors to replace those who have either retired or have been transferred. To address this issue, CABI will continue to seek funding opportunities from existing in-country projects and programmes
- The absence of agro-input shops dealing in registered products in the vicinity of plant clinics coupled with the high cost of registered products forces the plant doctors to prescribe what is available and affordable to farmers, some of which are not registered products. The NRO is looking for funds to promote a national strategy of engaging trained and registered phytosanitary brigade (men who operate as spray gangs; women are by law not allowed to sell or apply pesticides). This brigade will deal in and use registered products rendering crop protection services to farmers for a fee

Cambodia

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	34 (3*)
Plant doctors trained	0	79 (6*)
PMDGs drafted	0	65
Factsheets drafted	0	65

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Department of Plant Protection Sanitary and Phytosanitary (DPPSP), General Directorate of Agriculture (GDA), Ministry of Agriculture, Forestry and Fisheries (MAFF) – NRO

Three Provincial Department of Agriculture (PDA) – LIO

IPM-FFS Program, GDA – LIO

Royal University of Agriculture (RUA) – LIO, also provides diagnostic support

Cambodian Agricultural Research and Development Institute (CARDI) – LIO, also provides diagnostic support

2019 highlights

- Held one National Steering Committee meeting with participation of 8 officers (7 male, 1 female) from Department of Agriculture Extension (DAE), DPPSP – GDA, CARDI, ASPIRE and RUA
- Conducted a National Forum meeting on Sustainability of the Plantwise Programme in Cambodia with participation of 34 high-level delegates (6 female, 28 male) from GDA, DAE, CARDI, RUA, GIZ, ASPIRE, Pesticide Co and plant doctors.
- Facilitated the piloting of 3 plant clinics at 3 FFS locations, leading to 6 clinic sessions by 6 trained plant doctors from IPM-FFS program
- Held meeting with DAE to explore the possibility of collaboration with the ASPIRE national IFD funded program to develop strategies for managing crop pests through piloting plant clinics

Key challenges and lessons learned

- With no budget support from CABI and MAFF, it has been impossible to sustain Plantwise activities by GDA and provincial partners There have been various attempts to explore areas of collaboration with various GDA/MAFF departments and private sectors to sustain Plantwise, but these have also not been successful. There have been discussions with ASPIRE (IFAD funded national program run by DAE) which are still under consideration

Caribbean

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	21	184 (101)
Plant doctors trained	22	322 (24)
PMDGs drafted	7	51
Factsheets drafted	3	90

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Jamaica:
Ministry of Industry, Commerce, Agriculture and Fisheries – NRO
Rural Agricultural Development Authority (RADA) – LIO
Research and Development Division – LIO; also provides diagnostic support
Plant Quarantine and Produce Inspection – LIO

Trinidad and Tobago:
Ministry of Agriculture, Lands and Fisheries – NRO
Extension Training and Information Services Division – LIO
National Agricultural Marketing and Development Corporation – LIO

Barbados: Ministry of Agriculture, Food Fisheries and Water Resources Management – NRO & LIO

Grenada: Ministry of Agriculture, Forestry, Fisheries and the Environment – NRO & LIO

2019 highlights

- 20 Agriculture Extension Officers from RADA took the on-line PestSmart e-learning course following the official launch in July
- National trainers conducted Module 1 and 2 training for 22 participants (11 females and 11 males) from RADA, Agriculture Extension Officers (AEOs), Research & Development and Plant Quarantine/ Produce Inspection Branch. With this training RADA completed training for 100% of their AEOs (98 in total)
- Established 21 new plant clinics in Jamaica, including a fixed clinic at Amity Hall Agro Park, St. Catherine that will continue offering service based on needs and interest from farmers
- Citrus Greening symptom-detecting glasses were provided to plant doctors from Grenada, Barbados and Jamaica, aiming to test their capacity of improving plant doctor's capability for early detection of symptoms of the disease in the field
- Conducted a training on biological alternatives for sustainable production for 20 plant doctors (9 females, 11 male) in Grenada
- The Plantwise quality assurance tool was used by data managers and coordinators in Jamaica for identifying weaknesses in their plant doctor's recommendations to define the focus of future trainings and ways to improve the plant clinic service
- In Barbados, the Plantwise local coordinator, Michael James, used PW tools and materials to involve students from the community college in diagnostic activities to reinforce plant clinic actions
- Conducted a refresher training on POMS, the offline data management tool, and use of pivot tables for 24 data managers and coordinators (12 male, 12 female) in Jamaica, Trinidad and Grenada. Pest and disease trends through the year were generated to show potential use of data for planning plant health rallies and preventive actions to reduce pest impact
- Monthly reports on Plantwise in Jamaica with highlights on key observations regarding pest statistics prepared by the Plant Health/ Food Safety Unit of RADA and included in RADA CEO's report
- Manuals for field identification and management of Citrus Greening Disease (Huanglongbing) and hydroponic cropping with gravel were translated for distribution in all PW Caribbean countries
- Plant clinics were showcased in newspaper articles in Trinidad and Jamaica
- Awareness raising events included a presentation on the Plantwise programme during the meeting of the Rotary Club of New Kingston, plant Clinics displays during Parish Open Days and expositions. A total of six (6) PD Plantwise programme displays were prepared this year
- List of priority pest and diseases for Barbados, Grenada, Jamaica and Trinidad & Tobago were made and posters of key problems printed for distribution in plant clinics in all 4 countries
- Plant clinic monitoring visits were made in 13 parishes in Jamaica. As part of the monitoring process, every month, prescriptions per PD were compiled by RADA and sent to all 13 parish managers

Key challenges and lessons learned

- Most of the current plant clinic service in the Caribbean is done under the mobile plant clinic scheme. The service has been incorporated as part of the everyday work of the AEOs, including farmer meetings and field visits. This working scheme is more sustainable for the involved organizations
- Involving youth in plant clinic activities seem to be a good option for some of the Caribbean countries, both in plant clinic operations and contributions to the development of technical materials. Some Plantwise partners in the Caribbean have begun to explore the possibility of forming alliances with educational organisations. For example, RADA in Jamaica has initiated conversations with the College of Agriculture, Science and Education (CASE) for incorporating PW training in the curriculum for students who wish to apply for a job as Agriculture Extension Officer in the future. Follow up on possible alliances with educational organizations will be a priority for 2020
- Despite varying constraints in implementation for each specific Caribbean country, overall, data in POMS increased by 50% and the number of plant clinics increased by 12% compared to 2018 (2973 entries coming from 101 plant clinics from 4 countries. As the major contributor to this progress, Jamaica's working scheme will be taken as a model to find strategies that are adaptable to other Caribbean countries

China

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	33	133 (108)
Plant doctors trained	127	684 (194)
PMDGs drafted	2	55
Factsheets drafted	27	174

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of Agriculture and Rural Affairs (MARA) – Helping to steer the programme

Institute of Plant Protection, Chinese Academy of Agricultural Sciences (IPP-CAAS) – NRO and diagnostic support

Beijing Plant Protection Station (BPPS) – LIO in Beijing area

Sichuan Plant Protection Station (SCPPS) – LIO in Sichuan province

Jilin Agricultural Science and Technology College (JLASTC) – University partner for the pilot of sustainable plant doctor training

China Wisdom City Working Committee (CCIT) – Business middle-man to pilot Plantwise commercialization strategy

2019 highlights

- Funds (GBP 148,000) allocated to Plantwise activities in Beijing and Sichuan province by BPPS and SCPPS mainly for plant doctor trainings, new clinic establishment and operation, data management system maintenance and upgrading
- Facilitated the establishment of 33 new plant clinics by BPPS and SCPPS, for a total of 108 active plant clinics in the country
- Conducted a training of trainers (ToT) for 5 university staff on the plant doctor training Modules 1&2 to facilitate embedding the modules into the national course for plant protection workers in Jilin province
- Plant doctors issued 55,161 prescription sheets; LIOs ensured data entry and harmonisation, and validation of 10% of the records
- 19 of the 63 national trainers conducted Module 1 and 2 training for 127 plant doctor trainees (52 female, 75 male)
- Facilitated the development of 2 new pest management decision guides, 27 new factsheets, and updating of 5 factsheets (all published on the knowledge bank) by local experts
- Facilitated need-based trainings on the Green Control technology of citrus for 145 participants (65 female, 80 male) in Qianwei county of Sichuan province, in order to update Plant doctors' knowledge and skill on recommendations.
- Facilitated a series of mass extension campaigns using social media-Wechat reaching approximately 8,124 farmers (2,160 female, 2,247 male, 3,717 unknown gender) with targeted messages on plant and soil health
- Established the Plantwise China Wechat official account beginning with 118 subscribers, to strengthen dissemination of extension materials to relevant stakeholders with mobile devices
- Established a clinic data-validation-based credit rating system for agri-shops in Qianwei county of Sichuan province to assess the performance of agri-shops in pest diagnosis and recommendations to stimulate rational use of pesticides
- 2 journal papers published in peer reviewed journals; one in Agriculture and the other in The Journal of Agricultural Education and Extension
- 1 CABI working paper entitled 'Implementing agri-policies on pesticide reduction through subsidies and plant clinics in China' published
- 1 technical manual entitled 'Practical Pests Management Technical Manual of Major Pests in Common Crops', which includes124 Plantwise factsheets developed by local experts in Beijing and published by China Agricultural Science and Technology Press in Chinese

Key challenges and lessons learned

- The heavy workload of clinic data validation and data harmonization is the key blocker for the sustainability of data-validation-based credit rating system for agri-input shops in Sichuan province. CABI and SCPPS will continue to embed the pilot into the identified local government project to ensure financial support for this activity beyond 2020
- Private sector stakeholder engagement has been piloted using various approaches such as the fee-based plant doctor training, private sector-run plant clinics, and plant doctor certification agri-product. These activities progressed slowly because the profit creation and sharing mechanism was not agreed. CABI and country partners will continue to explore different business models for proof of the concept

Costa Rica

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	3	28 (25*)
Plant doctors trained	20	87 (67*)
PMDGs drafted	9	46
Factsheets drafted	0	0

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Extension Department, Ministry of Agriculture (MAG) – NRO and LIO

Plant Health Department, Ministry of Agriculture – LIO

APACOOP RL (Farmer cooperative) – LIO

4S Clubs (Clubes 4S), MAG gender and youth division – Support gender and youth outreach

2019 highlights

- Plantwise presented to the new Executive Director (ED) of Clubes 4S with the aim of continuing the joint work initiated with the minority group. An analysis of the current situation will be done and a new action plan set-up by the ED
- Initiated Plantwise activities with the Regional Office of the Ministry of Agriculture
- Conducted 26 plant health rallies (20 of which were paid for by MAG) reaching 825 (445 male and 380 female) farmers
- A MEC to strengthen surveillance for early detection of Fusarium oxysporum TR4 was initiated reaching 320 farmers (60 females, 260 males)
- Showcased Plantwise at the Coffee Fair organized by the Coffee Institute at the Agricultural Centre of Palmares reaching 316 (217 male and 99 female) visitors
- Plant clinics promoted in a TV programme – TV farmer's section by a plant doctor Uriel Mora
- Presented on the experience of Plantwise in Costa Rica and Nicaragua to a women group (of 40 women) who had visited the Tucurrique plant clinic to learn on how to use it
- Conducted an evaluation of damage and losses caused by a prolonged drought at Tierra Blanca plant clinic in Cartago.
- 33 plant doctors (4 females, 29 males) from 12 plant clinics in the Grecian region trained on identification and management of avocado diseases in response to local needs
- A quarantine species of aphid (Greenidea psidii) not known to appear in the Turrialba region was reported by a local plant clinic as attacking guava trees
- Training on sample preparation and microscope mounting for diagnosis conducted for 4 male plant doctors from Turrialba
- Conducted an e-plant clinic refresher training and a data management training for 20 plant doctors (5 females, 15 males)
- A field visit to see the impact of joint actions between Plant Clinics, Clubes 4S, INDER (Rural Development Institute) and the Adventist church was organized by the plant clinic of Turrialba with attendance by the regional Director of MAG-Cartago and the participation of 15 farmers
- Modules 1 and 2 training in collaboration with 1 ToT trainer conducted for 24 extension agents (6 female, 18 male) from the Ministry of Agriculture
- Established 3 new plant clinics
- Analysis of POMS data used to demonstrate the importance of data in decision making to the Vice Minister of Agriculture and Director of Extension
- 24 new plant doctors (6 female and 18 male) trained on data collection and basic analysis using POMS
- 9 PMDGs on rice pests drafted by collaborators from University of Costa Rica and INTA-MoA
- Identification and design of management options for the curculionid Palmelampius heinrichi as a pest causing pejibaye palm fruit abortion

Key challenges and lessons learned

- MAG's regional offices from 3 regions requested for Plantwise training this year, showing a growing interest in Plantwise approach. Budget constraints necessitate that training and implementation costs should be budgeted for by the interested regions in advance. Further, there's need to formalise PW as an extension approach and this will be pursued in 2020 with the National Extension Director
- The mandatory implementation of the integrated information management system of the Extension Agencies of the Ministry of Agriculture negatively affected the flow of data into POMS, however, this system does not yet have a module for analysis of data on the incidence of pests and diseases. A collaboration between the Knowledge Bank and MAG should be established in 2020 to explore possibilities of streamlining the 2 systems
- Plant clinics have proved to be important for reinforcing surveillance through the identification of a quarantine pest (*Greenidea psidii*) through CABI's diagnostics network and by opening plant clinics in the banana production region of the country to increase surveillance capacity for the possible arrival of *Fusarium oxisporum* TR4

Ethiopia

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	52	172 (155*)
Plant doctors trained	80	517 (293*)
PMDGs drafted	0	57
Factsheets drafted	0	10

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of Agriculture (MoA), Plant Health Regulatory Directorate – NRO

Bureau of Agriculture in the Oromia, Amhara, Tigray, SNNP, Benshangul Gumz regions and Dire Dawa Administration council – LIO

Self Help Africa (SHA) – Provides financial support for PCs in some districts in SNNP region

Regional Plant Health Clinics – Provide technical & diagnostic support

National and Regional Research Institutes – Provide technical & diagnostic support

2019 highlights

- A series of discussions were held with the Director of Plant Protection and new State Minister for Agriculture on how to maintain support for Plantwise operations
- Funds (GBP 54,775) allocated to Plantwise activities by MoA and Tigray Region Bureau of Agriculture for training, tablet procurement, clinic facilities and reference materials
- Funds (GBP7,086 allocated to Plantwise activities by Self Help Africa for Module1 and 2 training and purchase of clinic materials)
- A new National Data Manager officially assigned by the ministry, to oversee the data management process
- Three sessions of Module 1 and 2 training conducted by 7 national trainers with backstopping from CABI for 80 plant doctor trainees (18 female, 62 male)
- Facilitated the establishment of 52 new plant clinics, for a total of 172 in the country, of which 155 are active
- The government used its own resources to print and deliver 100 copies of the PMDGs/Fact sheets the Plantwise Field Diagnosis guide, electronic copies of PMDGs, PW FDG, Fact sheets and other relevant materials to PDs and other experts.
- Facilitated revision and updating of 7 existing PMDGs
- Conducted data management training for 18 participants (2 female, 16 male)
- Conducted a two-day comprehensive cluster exchange and refresher training on use of tablets for 46 plant doctors (9 female, 37 male) and 11 localized cluster meetings
- Conducted e-plant clinic training for 64 participants (16 female, 48 male) to introduce use of digital devices at plant clinics
- Procured and dispatched 130 tablets to regions (plant doctors) to promote use of digital devices to improve data collection and transfer to POMS as well as improve access to extension materials
- Facilitated need-based training on selected topics from modules 1 and 2 for 129 trainees (38 female, 91 male), in order to improve knowledge and skills of plant doctors as well as to fill gaps created by high turn-over
- Demonstrated and promoted use of ICTs tools (updated data collection app, factsheet library, and how to access resources in the knowledge bank) to plant doctors and relevant experts in the plant health system
- Finalized data collection for study on the adoption of Plantwise advice in three regions/districts and carried out preliminary data analysis. A comprehensive study report will be produced in early 2020
- CABI, national and local partners carried out several rounds of plant clinic monitoring, quality assurance and technical backstopping
- Promoted gender awareness among plant doctors and relevant partners to increase participation of women and youth in the programme through gender sensitization presentation during cluster exchange meetings, engagement with the gender affairs offices and with women's development and/or self-help groups, increasing the number of female plant doctors and by assessing accessibility and suitability of clinic locations to women farmers
- Revised and re-submitted proposal to GIZ to expand PCs in the Green Innovation Center project areas, awaiting signing of the contract
- Presentation about Plantwise was delivered on a 2-Day Networking event on ''Seed systems, agricultural technology and food security in Ethiopia'', which was jointly hosted by 3 universities; Addis Ababa, Debre Berhan and Royal Holloway

Key challenges and lessons learned

- The rapid expansion and increase in the number of plant clinics has made monitoring and backstopping activities difficult. There is a need to build the capacity of local partners to engage in monitoring, backstopping and quality assurance.
- The process of distributing tablets to plant doctors has been slow, leading to delays in the digitization of clinic data collection and transfer. Language (in recording clinic data) and internet connectivity also remain a challenge. The ministry and CABI will continue to engage and follow up with the regions facilitate timely delivery of tablets and find solutions to the challenges
- Emerging national priorities (such as massive outbreak of desert locusts, widescale irrigated wheat production programme, farm commercial clustering initiative) continue to compete for government resources resulting in a reduction in the funds allocated by the government to PW activities as well as absorbing most of the time and effort of national and regional staff
- Instability and violence in some parts of the country has delayed implementation of activities, as well as affected monitoring and backstopping to plant clinics. CABI and the ministry are closely monitoring the situation and encouraging plant doctors to continue running clinics as possible
- High turn-over of plant doctors and relevant experts has continued to be a major challenge to smooth operation of plant clinics. Efforts were made to secure timely replacements. Refresher courses and exchange meetings were also used to fill information and knowledge gaps

Ghana

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	87	248 (193*)
Plant doctors trained	121	446 (273*)
PMDGs drafted	–	104
Factsheets drafted	–	6

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Plant Protection and Regulatory Services Directorate of the Ministry of Food and Agriculture 9PPRSD/MOFA) – NRO/LIO

GIZ, Market Oriented Agriculture Program (MOAP) – Donor

Modernized Agriculture in Ghana, (MAG) – Donor

Cocoa Rehabilitation and Intensification Program (CORIP) – LIO

International Development Enterprise (Ide), Ghana – LIO

2019 highlights

- Funds (GBP 6,866) allocated to Plantwise activities by Kuapa Kokoo for the training of their field officers in the diagnosis and management of pests and diseases
- Funds (GBP 4,119) allocated to Plantwise activities by PPRSD through the MAG support for the operations of plant clinics, cluster meetings and monitoring in Greater Accra Region
- Funds (GBP 36,230) allocated to Plantwise activities by GIZ/ MAOP for the training of their field officers in module 1 and 2 and clinic set-up in the upper west, central, Northern, eastern and Greater Accra Regions
- Funds (GBP 3,433) allocated to Plantwise activities by Solidaridad MASO project for the training of their field officers in the diagnosis and management of pests and diseases
- Facilitated the establishment of 87 new plant clinics by GIZ/ MOAP and PPRSD for a total of 193 active plant clinics in the country
- 2 of the 14 national trainers conducted Module 1 and 2 trainings for 121 (7 female and 114 male) plant doctor trainees
- Conducted e-plant clinic training for 121 (7 female and 114 male participants to introduce use of digital devices at plant clinics
- Handled 10,000 queries at plant clinics, of which 9,601 were recorded as data in the POMS
- Plant clinic data in POMS used for reporting pest and disease situations in the districts, regions and national level and, for updating the national pest list by the Ministry of Food and Agriculture (extension and PPRSD, GIZ/MAOP)
- Piloted the use of digital devices at 44 plant clinics to enhance data collection and improve access to extension materials
- Participated in the 2019 National Farmer's Day celebration and fair reaching over 100 new people with information on Plantwise with the possibility to 2 new partnerships in 2020
- Conducted a data use and sharing workshop to explore the opportunities for sharing of Plantwise data as well as other relevant data sets

Key challenges and lessons learned

- Some of the funding committed to the program by partners was not released or was reduced leading to the cancellation of some planned activities. It is important to continue to engage with partners to help avoid such situations
- Challenges with the data collection app resulted in the loss of a significant amount of data. The program will continue to encourage plant doctors to submit data as soon as possible to reduce the risks that may be associated with data loss
- Reduction of the transportation and lunch allowance for plant doctors by the program was a demotivator for some plant doctors but this has led to discussion around integration of the plant clinics into their district's budgets and their district and regional directors are being engaged to that end

India

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	11	79 (79*)
Plant doctors trained	38	316 (51*)
PMDGs drafted	20	107 (87)
Factsheets drafted	3	95

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Department of Agriculture, Jammu (DAJ) – RO / LIO

M.S. Swaminathan Research Foundation (MSSRF) – RO / LIO

National Agro Foundation (NAF) – RO / LIO

National Institute of Agricultural Extension IMANAGE) – Financial support for Trainings

International Competence Centre for Organic Agriculture (ICCOA) – Financial support for Trainings

Syngenta Foundation of India (SFI) – Financial support for Trainings

2019 highlights

- Renewed open-term Plantwise partnership agreement with DAJ, Jammu
- Signed a Partnership Statement with ICCOA and with MANAGE for training under DAESI program
- Signed a Partnership Agreement with SFI to explore possibilities of private sector linkages
- Funds allocated to Plantwise activities by MSSRF (£31,500), MANAGE (£2500); SFI (£5500) and ICCOA (£2500)
- Organized a stakeholder consultation meeting with DAJ to review progress and plan for Plantwise activities
- CABI trainers conducted Module 1 and 2 training for 38 (3 female and 35 male) plant doctor trainees from MANAGE and University of agricultural Sciences Bangalore
- 3 national trainers conducted Module 1 training for 78 (65 male, 13 female) plant doctor trainees of MSSRF, DAJ, SFI and ICCOA
- Facilitated the establishment of 11 new plant clinics by MSSRF, for a total of 79 active plant clinics in the country
- Facilitated 1 PMDG write shops with national experts, leading to the development of 20 new PMDGs
- Validation of 3500 plant clinic records in POMS by DAJ and MSSRF
- Handled 32524 queries at plant clinics, of which 7036 were recorded in POMS
- Plant clinic data used for writing of papers, blogs,cluster meetings and tomonitor progress by MSSRF & DAJ
- Conducted 28 plant health campaigns on FAW in Maize, Gall midge in paddy, paddy shoot borer, bacterial leaf blight, jasmine budworm by MSSRF, reaching 16760 farmers (5630 female, 11130 male) in 110 villages in 5 districts
- Conducted 6 Plant health rallies on FAW in Maize by MSSRF, reaching 2400 farmers (1460 female, 940 male)
- Facilitated 5 mass extension campaigns by MSSRF, using voice SMS/ Phone in programme reaching 7500 farmers (2700 of whom were female farmers with targeted messages. 120 posters with content on plant health were also disseminated
- Participated in 6 farmer fair(s) and exhibitions in Jammu and Tamil Nadu, reaching about 2000 farmers
- Initiated a pilot with IFPRI for Picture Based Insurance (Project under Big Data initiative of CGIAR) to explore the possibility of usingf plant clinic networks and data for facilitation of this work
- Pilot with PEAT to use 'Plantix' software for training neural networks to strengthen pest and disease diagnosis. 52,000 pictures were collected, 10,000 pictures validated and 1500 field tests on 18 identified pests
- Facilitated linkage of a private sector organisation- SFI for support for plant clinics to offer value chain advisory for FPOs in horticulture
- Promoted use of ICTs tools (data collection app, factsheet library, serious games) for use by different stakeholders
- Promoted gender awareness among partners and participation of women and youth in the programme through trainings, workshops and cluster meetings, and plant clinic visits

Key challenges and lessons learned

- There is a high interest from partners in promoting & scaling up of plant clinics using their own resources, both human and financial. They have also shown commitment in ensuring that clinic operations are included in other ongoing state or national level programs (Fairs, Back2Village) and in other projects etc to reach the farmers with good advice. New plant doctors were trained and new plant clinics established in new areas. The use of plant clinic data for monitoring, publications etc. has also been on the rise. CABI will continue to promote wider use of plant clinic data by including users from universities, extension service providers etc
- Reviewing of existing extension material in the knowledge bank will be a priority in the new year. Stakeholders have agreed to participate in the review process in a workshop setting
- There have been several issues with the DCA and POMS e.g. issues with uploads to POMS, harmonisation or even data loss and mismatch. In response to these issues, the application is being redesigned, with a new version to be rolled out in 2020
- A follow-up on M&E plans developed in 2018 with the 3 main PW partners will be made to its uptake an implementation in 2020

Kenya

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	55	284 (198)
Plant doctors trained	98	689 (429)
PMDGs drafted	40	266
Factsheets drafted	0	7

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Ministry of Agriculture, Livestock and Fisheries (MoAL&F) – NRO, LIO

Kenya Agriculture and Livestock Research Organization (KALRO) – Member of National Steering Committee (NSC) and of various technical subject matter specialist teams; also provides diagnostic services, supporting clinic expansions

Kenya Plant Health Inspectorate Service (KEPHIS) – LIO; member of NSC and of various technical subject teams

Pest Control Products Board; Agrochemical Association of Kenya (AAK/Croplife Kenya); University of Nairobi (UoN) – Member of NSC and of various technical subject teams

Katoloni Mission Community Based Organization – LIO

Self Help Africa (SHA); GIZ – Support plant clinic expansion

27 County governments – Support clinic expansion; running clinics

2019 highlights

- Funds a (£ 115,720) allocated to Plantwise activities by local governments, SHA, KEPHIS and KALRO
- Plantwise Assistant National Coordinator officially re-assigned to Plantwise by the MoAL&F, to support training, coordination and mobilization of government support for sustainability
- CABI trainers together with four national TOTs conducted Module 1 and 2 trainings for 98 (41 female, 57 male) plant doctor trainees
- Partners facilitated the establishment of 55 new clinics: 18 by SHA, 11 by Nakuru County, 24 by Nyeri County, 1 by KALRO, and 1 by KEPHIS, for a total of 200 active plant clinics in the country
- Partners scaled up Plantwise into 9 new counties – Kwale, Kisii, Migori, Kilifi, Turkana, Baringo, Isiolo, Nyandarua, and Marsabit
- With sponsorship from KEPHIS, CABI conducted a training of trainers (ToT) on Modules 1 and 2 for 9 (6 female, 3 male) KEPHIS staff
- Facilitated one writeshop with national experts, leading to the development of 40 new PMDGs
- Conducted a data management training for 67 (34 female,33 male) participants
- Conducted e-plant clinic training for 98 (41 female, 57 male) participants to introduce the use of digital devices at plant clinics
- Conducted a data quality assurance training for 58 (28 female, 30 male) participants
- Handled queries at plant clinics, of which 2685 (1070 female, 1563 male, 52 unknown gender) were recorded as data on POMS and used as a reference on reported pest and diseases by county governments, KEPHIS and KALRO
- Initiated a half-yearly local level reporting process and template from which two reports were submitted to CABI and the LIO, enabling a better understanding of how counties are integrating the programme into their agricultural system
- Promoted use of ICTs tools (data collection app, factsheet library, serious games) for 223 (84 female, 139 male) to enhance data collection and capacity of plant doctors through game play
- Special case study conducted in Elgeyo Marakwet County to investigate how youth could be engaged in provision of advisory services to farmers in their communities- which found that farmers were willing to pay for a 'bundle of services'. This led to the training 58 (9 female, 49 male) youth on safe use of and professional application of pesticides, of which 48 (3 female, 45 male) will start a related agribusiness
- Finalized report on a study conducted in 2018 on how Plantwise was being integrated into the county agriculture system, which found a correlation between having a champion at ministerial level and formal commitment to sustaining the programme by the local government
- Showcased Plantwise during field days and other official functions in two counties as an integral part of their pest management system; while KEPHIS began to monitor pests reported in clinics by having some of their staff run at least 3 clinics regularly
- Clinics integrated into 8 County Integrated Development Plans enabling for planning and resource allocation into the future

Key challenges and lessons learned

- High turn-over or transfer of staff trained as plant doctors, 42 reported in 2019, without replacement that leads to a continuous need to train new persons. In some instances, there are not enough officers to replace those that have retired. Most counties are seeking to provide advisory services via ICT tools in order to meet this challenge
- Demonstration, by senior government officers to their county budget holders, of how clinics contribute to local agriculture is necessary in order to have an allocation of resources and commitment to upscale clinics at the county level
- Farmers are willing to pay for advisory services when the advice is coupled with actual implementation of the proposed pest management solutions. They are less willing to pay for information that is not supported with manual services because they get such services for free from government employed extension staff. For youth to support farmers as advisory service providers would require them to have skills on how to implement good agricultural practices at farm level such as grafting, pruning, spraying, laying pheromone traps among others

Malawi

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	5	127 (110)
Plant doctors trained	53	470 (250)
PMDGs drafted	0	61
Factsheets drafted	0	7

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Department of Agricultural Extension Services (DAES), Ministry of Agriculture, Irrigation and Water Development (MoAI&WD) – NRO and LIO

Self Help Africa (SHA) – LIO; operates plant clinics in collaboration with DAES

Department of Agricultural Research Services (DARS), MoAI&WD – Provides diagnostic services, diagnostic referral service and national Plantwise trainers

Department of Crop Development (DCD), MoAI&WD – Chair of the NSC; coordinates activities at district level and provides backstopping to plant doctors, United Purpose (UP) – LIO; supports the implementation of plant clinics in Dedza district in collaboration with DAES

CropLife Malawi – Member of the NSC; participates in developing PMDGs

Pesticide Control Board; Agriculture Extension Trust (ARET) – Member of NSC, contributes to developing PMDGs, provides the list of nationally registered pesticides

Lilongwe University of Agriculture and Natural Resources (LUANAR), Bunda and Natural Resources Campuses – Member of the NSC; participates in training of plant doctors and writing of PMDGs,

Green Belt Authority – Provides the National Data Manager and facilitates the data validation by Cluster Coordinators

Agriculture Research and Extension Trust (ARET) – Participates in writing PMDGs

2019 highlights

- Funds (US$ 230,323) allocated to Plantwise activities by Malawi Government through its ASWAP-Sp II project for plant doctor trainings, cluster meetings, PHRs and for putting up a permanent plant clinic structure at Pengapenga in Ntcheu
- Plantwise National Coordinator, National Data Manager and the Deputy National Coordinator officially assigned by partners, to coordinate and oversee Plantwise implementation
- Facilitated the establishment of 5 new plant clinics by DAES, for a total of 110 active plant clinics in the country
- Conducted a training of trainers (ToT) for 15 (14 males, 1 female) local staff on the Plant Doctor training Modules 1 and 2
- Nine (9) of the 28 national trainers conducted Module 1 and 2 trainings for 53 (42 males, 11 females) trainees with financial support from NRO
- Handled 2,291 queries at plant clinics, of which 2,291 were uploaded in POMS
- Plant clinic data in POMS used by a student, Mr Francis Mwale for his MSc thesis
- Facilitated 29 plant health rallies, reaching 2,035 (1,101 males, 934 females) farmers with targeted messages
- Piloted the use of digital devices at 18 plant clinics to enhance data collection and improve access to extension materials
- Promoted use of ICTs tools (e.g. the desktop data collection app data collection app , factsheet library app, serious games) for Cluster Coordinators at districts operating plant clinics, leading to increase in data flow nto POMS
- Special M&E study conducted to investigate the impact of plant clinics on users compared to non-users
- Promoted gender awareness among partners and participation of women in the programme through visiting and creating plant clinic awareness to 6 women groups, reaching 62 women

Key challenges and lessons learned

- The main challenge was inability to upload data from tablets, and also to enter data from paper-based prescription forms. The challenge has since been resolved through the introduction of the new DDCA and the DCA v3.0

Mozambique

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	75
Plant doctors trained	0	88
PMDGs drafted	0	37
Factsheets drafted	0	19

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of Agriculture and Food Security (MASA), PSP (Projecto de Apoio a PRONEA) – NRO

Departamentode Sanidade Vegetal (DSV)-MASA – LIO

FAO – Participation in trainings under FAW program focusing on plant doctors

2019 highlights

- Held a National Steering Committee Meeting in Maputo with participation of 7 members
- Plantwise National team delivered a computer to the Moamba Economic Activities District Services (SDAE Moamba) that was donated under the PSP project to aid in plant clinic data management
- Conducted a ToT on Monitoring Plant Clinic Performance training for 11 trainees (6 females and 5 males)
- Reviewed and submitted 18 PMDGs and 11 factsheets (developed in 2018) by national partners
- MPCP training conducted by national trainers with backstopping from CABI for 9 trainees from MASA to build national capacity for quality assurance and to develop a monitoring plan
- Facilitated a system change study using key informant interviews led by a partner, Julia Morais with support from CABI M&E
- Joint monitoring visits with FAO (Fall Army Worm Project) to Nampula, Inhambane, Zambézia and Manica clinics followed by an MPCP training for 61 plant doctors (11 female and 50 males)

Key challenges and lessons learned

- Constant restructuring resulting in transfer of plant doctors, the recent cyclone, lack of data bundles to enable upload of PC data to POMS, delayed accountabilities from the partner, an extended electioneering period, and incidences of insecurity in certain dstricts all affected Plantwise activities during the year. There's need to hold discussions with the NRO in the new year to agree how to streamline the process of embedding Plantwise in government operations

Myanmar

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	60	92 (* 36)
Plant doctors trained	60	151 (* 37)
PMDGs drafted	0	10
Factsheets drafted	0	19

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Plant Protection Division (PPD), Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation (MoALI) – NRO & LIO

Yezin Agricultural University (YAU) – Provides technical support

Department of Agricultural Research (DAR) – Provides technical support

USAID (United States Agency for International Development) – Collaborative work on FAW

CIMMYT (International Maize and Wheat Improvement Center) – Collaborative work on FAW

MOGPA (Myanmar Organic Growers and Producers Association) – Collaborative work on FAW

Michigan State University (MSU) – Collaborative work on FAW

East West Seed (EWS) – Private sector customer

2019 highlights

- Organised a workshop on fall armyworm in Nay Pyi Taw for 23 participants (11 male, 12 female) to strengthen the National resolve on FAW. The event was covered by Myanmar National TV channels
- Facilitated one mass extension campaign on FAW, reaching 657 farmers with targeted messages
- FAW identified for first time through plant clinics
- Conducted Modules 1 & 2 training for 60 plant doctor trainees (21 male, 39 female) with financial support from the FARM project
- Conducted a training of trainers (ToT) on Modules 1 and 2 for 10 senior staff from PPD and extension
- Established 60 new plant clinics for a total of 36 active plant clinics with support from DoA and PPD
- Conducted e-plant clinics training for 60 KC managers through FARM project in Nay Pyi Taw (21 male, 39 female)
- CABI trainers conducted two cluster meetings with 21 participants (4 male, 17 female), including 16 plant doctors to consolidate plant clinic operations and data management processes
- Initiated the integration of PW training materials into the Plant Protection curriculum of YAU
- Held an awareness campaign on FAW in Key Regions, reaching 657 farmers and extension staff in 5 key regions
- Facilitated the entry of 1,007 plant clinic queries into the POMS
- Conducted an M&E study on Climate Smart practices by farmers in Myanmar
- Promoted use of ICTs tools (Plantwise Knowledge Bank) and CABI's factsheets on Invasives (FAW) for PPD and DoA staff
- PPD promoted the use of the Plantwise-Facebook chat group for their plant doctors to exchange information

Key challenges and lessons learned

- Plant Doctors (60) trained during FARM project (IFAD) will use tablets in 2020.Through surveys conducted with KC managers, understanding of technical and administrative issues has helped to overcome the challenges of opening new Plant Clinics
- Training of 10 ToTs to be involved in running future trainings for new plant doctors thus improving sustainability of the Plantwise programme in Myanmar

Nepal

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	10	68 (35*)
Plant doctors trained	25	363 (50*)
PMDGs drafted	3	33
Factsheets drafted	Nil	41

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Plant Quarantine and Pesticide Management Centre (PQPMC) – {erstwhile PPD) – NRO

Provincial Agricultural Development Directorates (ADD) – LIO

Plant Protection Laboratory (PPL) – LIO

International Development Enterprise (iDE) – LIO

Farmer IPM Associations (FFS-IPM) – LIO

2019 highlights

- High level buy-in of the programme by the newly formed 7-provincial governments under the new federal system of governance
- Funds (GBP 62,500) allocated to Plantwise activities by 5-provincial governments for conducting Module 1 and 2 trainings, and operation of plant clinics; this also included budget for supporting operations through FFS-IPM facilitators
- Facilitated the establishment of an in-country governance system, with setting up of 7 provincial steering committee(s), which will review the annual progress and define action plan for future programme activities in consultation with national forum
- Established a national forum under the new governance system with representation from existing national stakeholders and nominations from provincial level governments
- Up scaling or Plantwise activities by iDE through allocating resources for training more Community Based Facilitators (CBF) to run more plant clinics
- Facilitated the establishment of 10 new plant clinics by iDE, for a total of 45 active plant clinics in the country
- 2 of the 12 national trainers conducted Module 1 and 2 training for 25 (8 female and 17 male) CBF plant doctor trainees
- Facilitated refresher training by national trainers to 25 (8 male and 17 female) CBF plant doctors on Module 1 & 2 to improve their efficiency in diagnosis and giving good advice to farmers
- Facilitated 1 write-shop with national experts, leading to the development of 3 new PMDGs on FAW, parthenium and Tuta absoluta and sharing of print copies of PMDGs with stakeholders in all the 7 provinces
- Conducted a data management training for 3 participants from iDE to monitor, harmonise and upload data on POMS
- Handled about 10,000 queries at plant clinics, of which 8128 were recorded as data in the POMS
- Use of plant clinic data to support a study by a student on internship and by partners to design new research projects and study the climatic effect on pest populations
- Organised workshop to create awareness on red list chemicals and find solutions to reduce their use
- Facilitated specific, need-based training on surveillance, diagnosis and management of 3 important invasive species for 37 (20 male and 17 female) trainees
- Facilitated new interactions between plant health stakeholders (e.g., FAW taskforce) to develop protocols for tackling emerging crop problems and gathering & sharing information to manage the invasive problems like Tuta absoluta and FAW
- Participated as a panellist in FAW workshop on Surveillance and Early warning system
- Regularly supporting and improving the linkage of a private sector entities like CBF Plant doctors (Agri-entrepreneurs) to the programme to run plant clinics for improved advisory and strengthening value chain of agri-produce of smallholder farmers
- 2 papers, one on fruit fly management in Nepal: a case from plant clinic published and another on perception on biological pesticides by various stakeholders in Nepal accepted for publication in peer reviewed journals

Key challenges and lessons learned

- To help foster linkages amongst all stakeholders for better coordination and implementation of Plantwise, approaches such as the national forum and provincial steering committees will continue to be used
- With the new administrative structure in place, and with the high-level buy in, there have been financial and well as human resource allocations to support implementation of the Plantwise programme. CABI together with the NRO will hold discussions with the provincial heads to chat the way forward in terms of resource allocation for the various components of Plantwise
- iDE plant doctors are less keen on the use e-plant clinics due to issues with poor internet connectivity, typing, accessibility and time to fill prescription sheets. This has necessitated the use paper-based prescription forms in some cases and in other cases, encouraging them to use smart phones

Nicaragua

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	2	35(11*)
Plant doctors trained	16	156 (28)
PMDGs drafted	8	137
Factsheets drafted	1	43

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Universidad Nacional Autónoma de Nicaragua (UNAN-León) (University) – NRO and LIO; also provides diagnostic support
Universidad Católica del Trópico Seco (UCATSE) (University) – LIO; also provides diagnostic support
Instituto de Promoción Humana (INPRHU), Norwalk Nagarote, Humboldt Centre (NGOs) – LIOs
Cooperativa de Servicios Múltiples Campesinos Activos de Jalapa (CCAJ), Cooperativa Juan Francisco Paz Silba (JFPS), Cooperativa Santiago, Central de Cooperativas de Pueblo Nuevo (CECOOP), Association of communities for the development of the peninsula of Cociguina (ACODEPEC) (Cooperatives) – LIOs
ABONATURA (agro-input supplier) – LIO
American-Nicaraguan Foundation (ANF) – LIO
Paisaje Urbano (private initiative) – LIO
Martin Luthero University – LIO

2019 highlights

- Norwalk-Nagarote an NGO, extended its plant clinic service to their farm "Seed of Youth", programme whose focus is on training young farmers from neighbouring communities in Nagarote urban agriculture and youth involvement
- A talk on the effect of climate change on coffee production was organized by the plant clinic from Coop. Santiago in El Jicaro, with participation of UNAN Leon and Humbold Centre as speakers
- A 4-day training for 45 farmers (39 male and 6 female) on pest diagnostics and management using module 1 and 2 material conducted by UNAN Leon with support from the NGO Alianza Climática, which covered travel and food costs for the participants
- Module 1 and 2 training of 76 (26 female, 50 male) advanced agronomy students from UCASTE University by UCATSE, Luis Medina and Didier Matey to support running of the University's plant clinic that serves about 60 farmers from the surrounding communities
- Module 1 and 2 training for 44 advanced agronomy students from UNAN León (13 female, 31 male)
- Module 1 training for 11 1(3 male and 8) female advanced agronomy students and lecturers of Universidad Martin Luthero in Jalapa
- Showcased Plantwise at 4 fairs; seed production at La Esperanza-Yalanguila, opening of the production season 2019 by MEFCCA-Quetzalguaque, Alimentary by UCATSE and "Open house" in the farm "Seeds of Youth" from Norwalk Nagarote reaching 521 farmers (354 male, 167 female)
- A workshop organised by Manuel Campos-Humboldt with support from CABI on monitoring of key horticultural pests for 10 promotors from INTA and Humboldt (7 male 3 female) held in Somotillo
- Conducted a mass extension campaign on management of fall army worm reaching 74 farmers (34 male, 40female)
- A video conference on management of plant pathogenic bacteria was conducted for farmers and INTA technicians by a CABI associate Luis Medina and later reproduced in all INTA offices reaching 150 farmers (120 male and 30 female)
- 10 field technicians (promotors) from Humboldt Centre (6 male and 4 female) received training on management of Yellow sorghum aphid and PHR methodology in preparation for a number of rallies in communities of Somotillo
- 12 PHRs on relevant crop management topics were conducted reaching 254 farmers (200 male, 54 female)
- Modules 1 and 2 training for 16 participants (3 female, 13 male) from UCATSE, INPRHU, ACODEPEC, Norwalk Nagarote, Coop. Santiago, Centro Humboldt, COOP. JFPS, PRODESSA and UNA, aiming to reactivate plant clinics that have lost their plant doctors
- 2 new Plant clinics were established in Cosiguina and Jalapa, run by ACPDEPEC and University Martin Luthero
- Active use of ICT and social media to improve diagnostics and information sharing amongst PDs and collaborators
- 8 new PMDGs and 1 factsheet on relevant pests and diseases were developed
- 45 students (18 female and 27 male) from UCATSE started using the online information from Plantwise as a resource for their ecological pest management course work
- Module 1 and 2 training for 16 participants (3 female, 13 male) from UCATSE, INPRHU, ACODEPEC, Norwalk Nagarote, Coop. Santiago, Centro Humboldt, Coop. JFPS, PRODESSA and UNA

Key challenges and lessons learned

- Using the Plantwise modules for training advanced agronomy students continues to be one of the sustainable ways of embedding or integrating Plantwise modules for training future generation of protagonists of the national plant health. Each year between 60 and 80 new students from UNAN and UNCATSE are introduced to the methodology. Other universities like UCC and Martin Luthero are also requesting for this training from the ToT team for their students
- The financial situation due to climate, fluctuating market and political instability continues to be a major constraint. However, cooperatives who have institutionalized the service always try to keep their leading plant doctor. In other cases, the organizations request plant doctor training to the ToT team for new personnel. The development of an internal training on lead plant doctors within their organizations and incorporation of more technicians in the plant clinics has been discussed as an option for sustainability of the clinics since additional free training from the ToT team won't be an option outside the Plantwise programme funding
- Weather information provided by the NGO Humboldt Centre through the WhatsApp diagnostics group has been very useful for plant doctors. This NGO is becoming a strong partner on the implementation of plant clinics investing time and resources to facilitate extension activities. The interest of Humboldt on developing research linking weather and pest abundance in the dry corridor can be considered as a possible spin off project for developing information on crop management and climate change

Pakistan

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	58	964 (*941)
Plant doctors trained	183	1965 (*1910)
PMDGs drafted	10	70
Factsheets drafted	10	86

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of national Food Security & Research – National level coordination

Agriculture Extension department Punjab – LIO

Agriculture Extension department Sindh – LIO

Agriculture Extension department Balochistan – LIO

Agriculture Extension department Khyber Pakhtunkhwa – LIO

Agriculture Extension department Gilgit Baltistan – LIO

Department of Plant Protection Punjab – LIO

2019 highlights

- Obtained a signed Partnership Agreement / MoU and data sharing agreement from Department of Agriculture Extension Gilgit Baltistan and Khyber Pakhtunkhwa
- Funds (GBP 141,406) allocated by national partners to support Plantwise activities
- Established 58 new plant clinics, for a total of 964 of which, 941 are active
- 13 of the 27 national trainers conducted Module 1 and 2 training for 183 (180 male, 3 female) plant doctor trainees
- Conducted MPCP training for 101 participants, leading to the development of a plant clinic monitoring system with support from the MPCP national master trainers
- Conducted 4 data management trainings for 141 participants (31 female, 110 male) to support management of clinic data
- Conducted Data management Refresher trainings for for 164 participants (140 male, 24 female) to support clinic data management processes
- Conducted an e-plant clinic training for 300 (277 male, 23 female) plant doctors, leading to the conversion of 103 paper-based clinics to e-clinics
- Organised a multi-stakeholder data mining workshop for 33 (6 female, 27 male) people
- Local partners using the administrative information on POMS to track activities and identify challenges
- Facilitated the entry of 91,750 plant clinic queries into POMS
- Facilitated 2 writeshop with national experts leading to the development of 10 new PMDGs and 10 factsheets (yet to be published on the knowledge bank)
- Conducted an M&E planning workshop for 28 participants (24 male, 4 female)
- Facilitated 3 plant health rallies reaching 490 participants (481 male, 9 female) with targeted messages
- Procurement of 10 laptops and 153 tablets by Punjab LIO to enhance efficiency in data management and information sharing at plant clinics
- Conducted a mass extension campaign reaching 233 (228 male, 5 female) with targeted messages
- Showcased Plantwise at the Grand Expo on Horticulture crops in Punjab reaching 480 (475 male, 5 female) participants
- Established 10 WhatsApp groups with 120 participants (100 male, and 20 female) to enhance communication amongst plant doctors
- 97 cluster meetings held for 1,537 (1,420 male, 117 female) participants
- Held 47 stakeholder meetings to enhance collaboration and coordinated implementation of Plantwise in all provinces of Pakistan
- AIR-led impact assessment of Plantwise Pakistan completed

Key challenges and lessons learned

- Delay in release of funds allocated by government due to the complex procurement and approval processes in the national system as a result of the new Government Policies in Punjab
- Regular validation and harmonisation of the huge amounts of data from the clinics remains a big challenge, which also affects its use by national partners
- Implementation of monitoring strategy at district level helped to improve local level monitoring; however, the establishment of monitoring and evaluation system at national level remains challenge. CABI will work with local partners to establish a nationwide M&E system
- The only means of communication in rural areas is TV or radio; CABI will utilise these channels to send targeted messages as well as advertise plant clinics to farmers
- There's also need to engage more female clients and plant doctors as well as build the capacity of LIO's on use of ICT tools
- Availability of funds for scale up the program is needed in some areas such as Balochistan

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	1	42 (23)
Plant doctors trained	0	370 (25)
PMDGs drafted	0	34
Factsheets drafted	14	109

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

National Institute for Agricultural Innovation (INIA) – NRO & LIO

National Service for Agricultural Health (SENASA) – LIO

Local Government – Municipalities – LIOs

Regional direction for Agriculture San Martín – LIO

'La Molina' Agricultural University; Entomological Society of Peru; International Potato Centre (CIP); National Program for the Social Inclusion: Tambos – Technical collaborators

2019 highlights

- Continued collaboration with INIA for financial support for plant clinic operations in 4 areas at the national level
- Renewed a Partnership Agreement with INIA, to support Plantwise activities in the 8 areas
- 5 bilateral agreements signed between INIA and public entities (Municipalities, Universities, Local Extension Offices) to support plant clinic operations and scale-up
- 1 new plant clinic established by INIA for a total of 42 of which 23 are active
- Conducted a data management training for 22 plant doctors (6 female, 16 male) to introduce them to the data analysis tool, Quality Assessment tool and reinforce the use of digital devices at plant clinics
- Conducted 28 plant health rallies, reaching 964 farmers (321 female, 643 male) with targeted messages and facilitated development of 6 banners to support plant health rallies
- Organised a cluster meeting for 22 plant doctors (16 male, 6 female) and national coordinators (2 male) to discuss plant clinic data and ways of sharing information and experience
- Conducted 3 specialized needs-based training courses on nematode identification and control for 45 plant doctors (7 female, 38 male)
- Local partners using the administrative information in the Plantwise Online Management System (POMS) to track activities and for the development of new extension material such as factsheets
- Successfully implemented the National M&E plan led independently by INIA in all experimental stations running plant clinics
- Facilitated around 85 broadcasting events via newspapers, local TV and national radio stations, reaching approximately 420,000 people with targeted messages
- Facilitated development of 14 new factsheets by plant doctors (yet to be published on the knowledge bank)
- Produced a blog on 'social organization to decrease the damages of potato weevil in Cajamarca, Peru'
- Facilitated participation of Plantwise in the National Agricultural Fair organized by INIA

Key challenges and lessons learned

- Strong collaboration with Senasa, Local government and national and local universities are leading to the improvement of the plant clinic service in Peru
- Plant clinics are considered as one of the key technology transfer methodology in the country, and is being included in INIA's extension division work plan
- The consolidation and expansion of the e-plant clinics has improved data flow into POMS and its use at the national level

Rwanda

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	66
Plant doctors trained	55	350
PMDGs drafted	0	46
Factsheets drafted	0	43

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Rwanda Agriculture Board, Ministry of Agriculture and Animal Resources – NRO, LIO, provision of diagnostic services,

Various districts, Ministry of Local Government (MINLOC) – LIO. Implementation of plant clinics in collaboration with RAB.

Directorate of Agriculture and Livestock Inspection and Certification Services – Development of extension materials, involvement in PHRs and a member of NSC

National Agricultural Export Development Board (NAEB) – Involvement in the development of PMDGs

Agro-input suppliers – Provision of agro-inputs such as seed and pesticides following recommendation by plant doctors

Farmers and community-based organisations and FFS – Involvement in Plantwise activities including sensitization of farmers on plant clinics

NGOs (Imbaraga, Tubura) – Member of NSC

International organisations (FAO, FIDA) – Member of NSC

University of Agriculture and Technology Byumba (UTAB) – Training and integration of Plantwise modules, in curricula for in-service training of extension staff

USAID/Feed the future – Funding support for plant health rallies on fall armyworm

2019 highlights

- Funds (USD 28,234) allocated by Bugesera and Nyabihu District for module 1 and 2 trainings of sector agronomists
- Six of the 20 national trainers conducted 'Module 1 and 2 trainings for 55 (45 males and 10 females) plant doctor trainees
- Conducted a data management training for 20 (14 male, 6 female) plant doctors with funding support from the districts
- UTAB workshop held leading to the development and validation of a Plantwise based training curriculum for undergraduate students and in-service extension staff
- Conducted 2 steering committee meetings
- Plantwise National Coordinator, Plantwise Officer and National Data Manager officially assigned by partners (RAB)
- Facilitated plant health rallies on FAW reaching 21,254 people (9,897 men, 8,997 women and 2,360 Children) in 14 districts and with support from USAID, reaching 2,047 people (778 men, 1,024 women and 245 children) in 6 districts.
- Piloted the use of digital devices at 12 plant clinics to enhance data collection and improve access to extension materials
- Promoted use of ICTs tools (data collection app and factsheet library app) for 55 (45 male, 10 female) agronomists from local governments
- Promoted gender awareness among partners and participation of women and youth in Plantwise through trainings and FFS/ Twigire Muhinzi group

Key challenges and lessons learned

- The use of plant health rallies is a popular method of disseminating information by partners. It attracts both local and international institutions which have consequently collaborated with CABI and have invested resources to develop targeted messaging to farmers.
- There is need to update existing extension material if they are to remain relevant for use by plant doctors.
- Offering need-based refresher courses will help build the capacity of plant doctors in giving good advice to farmers.
- Cluster exchange meetings complement and re-enforce clinic implementation and monitoring processes. It provides an opportunity for plant doctors to share experience, lessons and information on innovative practices and these will be continued in the new year

Sri Lanka

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	24	820 (392)
Plant doctors trained	90	1321 (572)
PMDGs drafted	32	153
Factsheets drafted	0	19

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of Agriculture (MoA) – Top level programme steering

Seed Certification and Plant Protection Centre (SCPPC) of Department of Agriculture (DoA) – NRO

Provincial & Inter Provincial Department of Agriculture (Extn.) – LIOs

Department of Export Agriculture (Ministry of Primary Industries) – Supports plant clinic implementation

2019 highlights

- Funds (GBP 17,634) allocated to Plantwise activities by DoA, Provincial & Inter Provincial Department of Agriculture Extension
- Facilitated the establishment of in-country governance system by holding one national steering committee meeting
- 24 new plant clinics established by Provincial & Inter Provincial Department of Agriculture Extension, for a total of 392 active clinics
- National trainers conducted 'Module 1' trainings for 122 plant doctor trainees (76 male, 46 female) and 'Module 2' trainings for 90 plant doctor trainees (62 male, 28 female)
- Facilitated 1 writeshop with 17 national experts (8 male, 9 female), leading to the development of 32 new PMDGs (yet to be published on the knowledge bank) and 7 photo sheets; revision of 26 existing PMDGs; translation into Tamil and Sinhala of 58 updated PMDGs
- Conducted 1 ToT on Plantwise module 1 and 2 for 14 trainers (5 male, 9 female) to build a pool of master trainers to be in charge future training activities
- Conducted 2 data entry trainings for 54 participants (30 male, 24 female) on the desktop version of the data collection application
- Conducted 4 e-plant clinic trainings for 52 (34 male, 18 female) participants to introduce use of digital devices at plant clinics
- Conducted refresher trainings for 87 plant doctors (55 male, 32 female)
- The current plant clinic data in POMS for Northern Province validated by one master trainer and results shared during the national forum
- Facilitated 2 plant health rallies reaching approximately 2,000 people with targeted messages on fall armyworm
- Facilitated 3 mass extension campaigns, using TV / newspapers reaching 15, 000 people with targeted messages on fall armyworm and Tuta absoluta
- Facilitated two agriculture exhibitions to increase awareness about the Plantwise programme in the country
- Facilitated linkage of a public sector organisation (Department of Export Agriculture, Ministry Primary Industries) to the programme to provide support to existing plant clinics
- Scaled-up the use of digital devices at 52 plant clinics to enhance data collection and improve access to extension materials
- Promoted use of ICTs tools (data collection app, factsheet library app) for Department of Agriculture
- Facilitated the diagnostic support to the plant doctors through creation of two more telegram groups
- One M&E case study conducted to investigate adoption of plant clinic advice by farmers in Kilinochchi and Mullaithivu Districts
- PW KB material is used as advisory for farmers in Govimithuru mobile app by Dialog (telecom partner)

Key challenges and lessons learned

- Submission of plant clinic data has improved but still requires constant support from LIOs and NRO
- Inadequate capacity of the newly recruited plant doctors in diagnostics requires more focussed training on key pests and diseases. The national partners and CABI will analyse the plant clinic data to identify weaknesses and organise for specific training topics
- Frequent changes in some positions such as District Coordinator of the programme affected implementation of Plantwise activities

Thailand

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	10	29 (24*)
Plant doctors trained	129	406 (52*)
PMDGs drafted	10	34
Factsheets drafted	10	37

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Rice Department (RD), Ministry of Agriculture and Cooperatives – NRO and LIO (Plant clinic operation and diagnostics)

Department of Agriculture Extension (DoAE), Ministry of Agriculture and Cooperatives – LIO (Plant clinic operation and diagnostics)

2019 highlights

- Funds (GBP 12,880) allocated to Plantwise activities by DoAE for trainings of plant doctors, data management, development of extension material, and operation of 12 e-plant clinics.
- Funds (GBP 310) allocated to Plantwise activities by RD for vehicle transport expenses for operation of e-plant clinics
- Facilitated the establishment a national steering committee and holding of its first meeting with participation of 10 members (3 Male, 7 Female) to discuss Plantwise implementation, develop new plans and find solutions for existing challenges
- New Plantwise National Coordinator officially assigned by partners to supervise and coordinate the program
- Facilitated the establishment of 10 new e-plant clinics by DoAE, for a total of 24 active plant clinics in the country
- 33 national trainers conducted Module 1 and 2 training for 129 (74 female, 55male) new plant doctor trainees
- Conducted one Extension Messages training for 19 participants (5 Male, 14 Female), leading to the development of 10 new pest management decision guides and 10 factsheets
- Conducted one training of trainers (ToT) on Data Management for 22 national trainers (6 Male, 16 Female) from DoAE and RD
- Conducted one training of trainers (ToT) on e-Plant Clinics for 22 national trainers (6 Male, 16 Female) from DoAE and RD to introduce use of digital devices at plant clinics. CABI distributed 11 tablets for e-PCs, 2 to RD and 9 to DoAE
- National partners now fully responsible for clinic data management with two National Data Managers assigned from DoAE and RD
- Facilitated entry of 552 plant clinic records into POMS
- Use of plant clinic data by the RD to generate reports for sharing with other stakeholders and to decide a topic for a MEC
- Promoted use of ICTs tools (e.g. data collection app, factsheet library, serious games) for DoAE and RD, improving efficiency in access to and sharing of information and development of new extension material
- Special M&E study conducted to investigate the reason for decrease in farmer attendance at plant clinics

Key challenges and lessons learned

- DoAE uses plant doctor trainings to build capacity of their staff in giving good advice to farmers. The high turnover for the position of the Director General (DoAE) may come with changes in priorities which may also affect implementation of Plantwise activities. For sustainability of Plantwise, there's need to embed it within the National Plant Health System, thus it can be included in the annual government budgets

Uganda

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	79	270
Plant doctors trained	104	937
PMDGs drafted	87	350
Factsheets drafted	2	71

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Department of Crop Protection, MAAIF – NRO; provides leadership in national coordination of Plantwise and funding support for Plantwise trainings and plant clinic operations, data management

Directorate of Agricultural Extension Education, MAAIF – Member of the NSC, provide district local governments with financial support part of what district local governments use to facilitate plant doctor trainings and plant clinic operations.

Makerere University, Kampala – Member of the NSC, provides plant doctor training and offers diagnostic support

Uganda Christian University – Member of the NSC and provides plant doctor training

District Local Government (96 DLGs) – LIO, facilitates training of plant doctors and runs plant clinics

National Agriculture Research and Development Organisation – Member of the NSC provides referral services, supports data validation, development of extension materials and training of plant doctors

Program for Restoration of Livelihoods in Northern Uganda (PRELNOR) – In collaboration with PW, facilitates training of the project plant doctors

2019 highlights

- CABI signed a Memorandum of Understanding (MoU) with MAAIF for purposes of establishing a close relationship of cooperation mechanism in the field of agriculture and as a requirement by the government before signing a Host Country Agreement
- Funds (£105,585.5) allocated to Plantwise activities by MAAIF, DLGs, Makerere and Ugandan Christian Universities for training of plant doctors, procurement of plant clinic kits and operation of plant clinics
- CABI and partners conducted 6 Module 1 and 2 trainings for 104 plant doctor trainees (27 female and 77 male)
- CABI and local master trainers conducted 4 'e-plant clinic' trainings for 99 participants (37 females and 62 males) to introduce the use of digital devices at plant clinics and promote the use of ICT-tools (data collection app, factsheet library app, simulation games)
- Facilitated one writeshop with 24 national experts (18 male and 6 female), leading to the development and review of 87 new pest management decision guides and 2 factsheets
- CABI and DCP facilitated 4 technical backstopping of plant doctors during the launch of some plant clinics
- Facilitated the establishment of 79 new plant clinics in 8 districts
- MAAIF (DCP) procured and distributed 35 plant clinic kits to 8 districts
- Conducted 'Monitoring Plant Clinic Performance' training for 15 district agriculture officers, leading to the development of a plant clinic monitoring plan
- Conducted a data validation and analysis training for 17 participants (4 female and 13 male) leading to a total of 962 validated records

Key challenges and lessons learned

- The government has greatly embraced the plant clinic approach leading to an increase in resource allocation by MAAIF and district local governments for plant doctor trainings, procurement of kits among other aspects. DLGs depend on quarterly disbursements of extension and production marketing grants to run plant clinics, implying that clinics can only run depending on availability of funds
- Based on findings from the MPCP and data validation workshop, there's need to conduct refresher trainings in Modules 1 & 2 for plant doctors to help improve diagnosis and data quality
- The MAAIF, local governments and universities continue to provide a sustainable approach for plant doctor trainings. Makerere and Uganda Christian Universities have developed curricular based on Plantwise trainings for training their under-graduate and in-service courses
- Currently it is part of the District Agricultural Officer (DAO) duties to monitor and supervise plant clinic operations. Although a few DAOs (plant doctor supervisors) have been trained in MPCP and Module 1 & 2, this is an area that needs strengthening for proper supervision. Districts that have the DAOs trained as plant doctors tend to be keen in ensuring plant clinic activities are budgeted for and conducted
- Much as social media platforms have proved to be convenient avenues for sharing information, it is also important to note that the smaller platforms with more specified audience are necessary to address specific issues. For instance, trouble shooting on e-clinic data capture and submission might not be relevant to most of the audience on the main telegram platform

Vietnam

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	0	25 (13*)
Plant doctors trained	19	130 (28*)
PMDGs drafted	0	35
Factsheets drafted	0	63

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Vietnam Academy of Agricultural Sciences (VAAS), Ministry of Agriculture and Rural Development (MARD) – NRO, Data management

Plant Quarantine Diagnostic Centre, Plant Protection Department (PQDC-PPD), MARD – LIO, Lab diagnostic facility, Plant clinic operation

Southern Horticultural Research Institute (SOFRI) – LIO – Plant Clinic operation

Western Highlands Agriculture and Forestry Science Institute (WASI) – LIO – plant clinic operation

Plant Protection Research Institute (PPRI) – LIO – lab diagnostics, review of Plantwise technical material

2019 highlights

- Funds (USD 15,295) allocated by Sustainable Management Services (SMS) Vietnam Co. Ltd. for capacity building of their staff and lead farmers as plant doctors to support coffee growers in central highlands
- Facilitated one national steering committee meeting with participation of 13 officials (5 male, 8 female) to discuss work progress, challenges and prepare a Technology Report as a proposal for government finances
- CABI trainers conducted Module 1 and 2 training and Safe pesticides handling for 19 plant doctor trainees (17 male, 2 female) from Sustainable Management Services Vietnam Co. Ltd.
- Facilitated the operation of existing 13 active plant clinics in the country
- Facilitated the review of 15 existing pest management decision guides and factsheets by national reviewers from Plant Protection Research Institute
- Conducted an M&E planning workshop to introduce concepts for a national M&E system for Plantwise with participation of 12 (6 male, 6 female) officials from different agriculture stakeholders
- National partners taking the lead on clinic data management with some support from CABI on data harmonisation
- Facilitated entry of 354 plant clinic records into POMS
- Use of plant clinic data by VAAS for generating reports and sharing these with other national stakeholders. VAAS also used the data to develop a proposal for scaling up of plant clinics in country.
- Facilitated a specific needs-based training on diagnostics, IPM and good agricultural practices in peppercorn for 14 trainees (11 male, 3 female) from Olam Plantation Vietnam
- Facilitated 2 mass extension campaigns, using TV / YouTube to create awareness on Plantwise, reaching 666 viewers
- Promoted use of ICTs tools factsheet library and knowledge bank for SMS Vietnam and Olam Plantation Vietnam, which led to use of technical material by their staff
- Conducted a special M&E study on Plantwise result monitoring by previously trained enumerators
- Initiated a new research project on 'deploying emerging Artificial Intelligence (AI) technology in agriculture' in collaboration with BOM Software Ltd to develop and test an e-consultancy app for identification and management of dragon fruit problems

Key challenges and lessons learned

- The decrease in the number of active plant clinics due to a reduced funding from Plantwise requires financial commitment from either national or private sectors. VAAS and CABI will finalise and submit the new technology report to MARD to enable securing national funds for scaling up of plant clinics in the country
- Private sector engagement with Plantwise demands crop specific solutions and training courses. CABI will explore collaborations with national experts on those commodities to help develop customised training material to address specific needs of the particular private sector

Zambia

Quick Stats	New in 2019	Cumulative Total
Plant clinics established	17	121 (56 *)
Plant doctors trained	55	352(120)
PMDGs drafted	0	42
Factsheets drafted	0	51

Figures in brackets indicate number of plant clinics and *plant doctors still active in 2019

Partnerships

Ministry of Agriculture (MoA) – NRO, co-financing

Zambia Agriculture Research Institute (ZARI) – LIO, chair to the NSC, finance administrator, data management, provides diagnostic support services, and national trainers

Golden Valley Agriculture Research Trust – LIO

Zambia Environment Management Agency (ZEMA) – Member of NSC

Seed Control and Certification Institute (SCCI) – Member of NSC

National Resources Development College (NRDC) – Member of NSC, supports development of extension materials, and provides national trainers

Self Help Africa (SHA) – LIO; supported training of plant doctors,

Netherlands Development Organisation (SNV) – LIO ; supported training of plant doctors

Mulungushi university – Development of extension materials,

Monze School of Agriculture – Development of extension materials

National Agriculture Information Services – Member of the NSC

Conservation Farming Unit (CFU) – LIO; sponsored training of plant doctors,

World Vision Zambia (WVZ) – LIO; Member of the NSC, , sponsored training of plant doctors

Zambia Environment Management Agency (ZEMA) – Member of the NSC, custodian of the pesticides list

Zambia National Farmers Union – Member of NSC

University of Zambia (UNZA) – Member of the NSC, development of extension materials provides national trainers.

2019 highlights

- Funds (£2,526.44) allocated to Plantwise activities by Green Nature Agro for training 13 plant doctors
- Funds (£5,052.88) allocated to Plantwise activities by World Vision for training 27 plant doctors
- Plantwise National Coordinator and National Data Manager officially assigned by partners to coordinate and monitor Plantwise activities
- Facilitated the establishment of 17 new plant clinics by SNV and World Vision, for a total of 56 active plant clinics in the country
- Conducted a training of trainers (ToT) for 15 local staff on the plant doctor training Modules 1 and 2
- 7 of the 31 national trainers conducted Module 1 training for 79 (59 males, 20 females) plant doctor trainees
- 7 of the 31 national trainers conducted Module 2 training for 55 (42 males, 13 females) plant doctor trainees
- Conducted 'e-plant clinic' training for 28 participants to introduce use of digital devices at plant clinics
- Handled 3,284 queries at plant clinics, of which 3,272 were uploaded on POMS
- Plant clinic data in POMS analysed by ZARI and presented for discussion at the NSC meeting
- Facilitated 1 plant health rally on various plant health problems reaching 151 (96 males, 55 females) people with targeted messages
- Facilitated 2 mass extension campaigns, using radio and sms on fall armyworm (FAW) reaching 859,000 farmers with targeted messages
- Documented new interactions among plant health stakeholders to develop FAW management strategies
- Piloted the use of digital devices at 14 plant clinics to enhance data collection and improve access to extension materials
- Promoted use of ICTs tools (new data collection app, desktop data collection app factsheet library), online quizzes for plant doctors and cluster coordinators leading to increased flow of data into POMS
- Conducted a special M&E study to investigate the impact of plant clinics on farmer practices to manage FAW

Key challenges and lessons learned

- The current proportion of active plant clinics (56 out of 121) may be misleading. There is a backlog of paper prescription forms awaiting upload to POMS, a government ban on gatherings to control cholera outbreak during the main cropping season and afterwards, the involvement of plant doctors in a government led farmer registration, all affecting plant clinic operations. The situation is expected to improve in the new year following the recent development of a new Desktop Data Collection App by CABI and the lifting of the cholera ban

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

Plantwise is supported by:

UKaid from the British people

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

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IFAD
Investing in rural people

Australian Government
Australian Centre for International Agricultural Research

Ministry of Agriculture
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