CABI plantwise

Annual Report 2020

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

Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AIR	American Institutes for Research
CBF	Community Based Facilitator
DAS	Diagnostic and Advisory Service
DCA	Data Collection App
DEVCO	Development Cooperation
DFID	UK Department for International Development
DGIS	Directorate General for International Cooperation of the Netherlands
FAW	Fall Armyworm
FCDO	UK Foreign, Commonwealth and Development Office
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
KB	Knowledge Bank
KIT	Royal Tropical Institute
LAC	Latin America and the Caribbean
MSSRF	MS Swaminathan Research Foundation
NDM	National Data Manager
NER	Named Entity Recommendation
NUFFIC	Netherlands Organisation for Internationalisation of Education
PFFF	Plantwise Factsheet for Farmers
PMDG	Pest Management Decision Guide
POMS	Plantwise Online Management System
PPE	Personal Protective Equipment
PRISE	Pest Risk Information Service
SDC	Swiss Agency for Development and Cooperation
SEO	Search Engine Optimization
UCATSE	Catholic University of the Dry Tropic

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 (KB), a gateway to online and offline actionable plant health information, including diagnostic resources, pest management advice and basic pest data for support to global pest surveillance.

The donors contributing to Plantwise in 2020 included the UK Foreign, Commonwealth and Development Office (FCDO) (formerly the Department for International Development (DFID)), the Directorate General for International Cooperation (DGIS) of 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), the Ministry of Agriculture of the People's Republic of China and the Koppert Foundation. Country-specific support was also provided by the Netherlands Organisation for Internationalisation of Education (NUFFIC) and the Netherlands Embassy in Bujumbura to introduce Plantwise in Burundi for three years, starting in 2020. Other organizations that have supported the programme, for example through the use of tablet computers at plant clinics and/or through spin-off projects specific to the Plantwise KB activities, include Corteva Agriscience and the contribution from the St Andrews Prize for the Environment, which was awarded to Plantwise in 2017.

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

- Plant Heath Systems Development
- Plantwise Knowledge Bank
- Monitoring, Evaluation and Learning, including Gender

This report presents an update on Plantwise implementation activities between January and December 2020. 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 the components, but is presented as a standalone section because of its unique requirements. The report also presents updates on donor engagement and finances taking into consideration that Plantwise is transitioning to a new global programme and adjustments in approaches to implementation that were made to cope with the global health situation resulting from the global COVID-19 outbreak. The report also includes the finalized programme milestones report for 2020 (Annex 1) and one-page country reports highlighting lessons learned and challenges encountered during the year (Annex 2).

Table 1: Plantwise countries by year of programme launch

Pre-2009	2009–2011	2012	2013	2014	2015	2020
Bangladesh	India	Afghanistan	Brazil	Costa Rica	Jamaica	Burundi#
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 since 2019

Country-specific funding

Executive summary

Efforts to enhance the ownership and self-sustenance of Plantwise beyond donor funding involved setting activities to cover six priority areas of work:

- an in-depth assessment of the sustainability of Plantwise interventions in the implementing countries
- further strengthening evidence of the outcomes and impact of the programme
- detailed, country-focused assessment of the requirements for gender inclusivity in the programme, with Ethiopia and India as focus countries
- further exploring the value of Plantwise for private sector organizations
- enhancing the capabilities of ICT tools and applications
- promoting in-country use of plant clinic data

In the course of conducting these activities, the reach of the programme continued to grow during the year to a cumulative total of over 54 million farmers, of whom 10 million were reached in 2020. This high annual reach, despite the restrictions occasioned by COVID-19, was possible because of the quick adaptation by CABI and implementing partners in the use of innovative approaches that largely relied on virtual means to conduct programme activities. As a result, 1441 plant doctors were trained and 359 new plant clinics were established, bringing the cumulative total to more than 13,000 and 5000 respectively. In 2020, the Plantwise Diagnostic and Advisory Service (DAS) supported the identification of five new pest cases in two countries, in addition to providing diagnostic and advisory support through a number of social media plant doctor groups.

There were several major digital development activities in 2020. The Data Collection App (DCA) account administration tool was redesigned to enable partners to self-manage and create accounts without CABI support, thus ensuring sustainability of the data collection processes. The building of future-proofed tools continued, resulting in the launch of a mobile responsive Plantwise Online Management System (POMS) to enable increased data flow and access to online information resources in the KB. A PowerBI dashboard was also incorporated into the POMS to allow users to drill down on metrics such as the most common pest problems and recommendations given to farmers by plant doctors. Improvements were also made to the search engine optimization (SEO), which resulted in an increase in visits to the Plantwise information resources – a cumulative total of 2.4m visits, 288,964 of them in 2020.

The use of plant clinic data by partners was reported in 22 countries, the most common uses being pest reporting, monitoring plant doctor performance, identifying topics for research and information resource materials, and identifying content for administrative institutional reports. Adequate use of plant clinic data by countries has remained an area that needs attention. The desired improvements include easing the processes of harmonization and the validation of data; two prototypes – an Excel-based validation tool and a machine learning tool – are in development for this purpose.

The Pest Risk Information Service (PRISE) project, which is affiliated to Plantwise, has been introduced in Kenya, Ghana, Zambia and Malawi since its inception in 2017. Outputs from PRISE modelling have now been extended to extension workers and farmers, informing them of the most appropriate time to act on specific pests. In 2020, six pest species were covered by the early warning messages, with 59% of farmers who received alerts changing their farming practices based on message recommendations and 85% of farmers who received alerts preferring to continue receiving such messages in the future.

A review of Plantwise engagement with the private sector conducted in 2020 found 105 linkages with such organizations, mainly agro-input traders (including manufacturers, distributors and retailers) and trade hubs (farmer and trade associations and farmer cooperatives). Despite private businesses having shown some interest in Plantwise, feedback from most of them revealed that the programme was too rigid in its design to address their needs. This was particularly the case for the Plantwise training content, which is not sufficiently tailored for their business needs, such as information resources for specific crop value chains. Some of these needs will be addressed in PlantwisePlus.

Evaluations of the impact of Plantwise on the reduction of different aspects of household food insecurity in Rwanda further confirmed the positive impact of the programme in reducing the overall food insecurity by 15%. Food insecurity scores improved by 29% for female-headed households and 11% for male-headed households. Adoption of plant clinic advice was also shown to lead to increased maize yields (86%) and increased income (89%) for farmers in Zambia. Clinic users in Rwanda (15%) and Zambia (20%) were also found to use more pest management interventions besides pesticides compared to non-users. An external evaluation of Plantwise and the Action on Invasives programmes conducted by the **Royal Tropical Institute (KIT)** further affirmed the positive impacts of the programme in implementing countries.

Regarding work on gender, activities in 2020 consisted of in-depth studies in Ethiopia and India, both of which have been delayed due to travel restrictions caused by COVID-19. Preliminary results from India show that engagement with Plantwise has resulted in an increase in women's knowledge of plant health and knowledge-seeking behaviours, as well as higher levels of female empowerment, thereby increasing their participation in pest management decision making within the households. Other evaluations on gender have shown increases in maize yields (18% for men, compared to 8% for women) for clinic users in Zambia; and decreases in food shortage in female-headed households (22 days) compared to male-headed households (17 days) for plant clinic users. These gender-focused studies are among a few studies conducted under Plantwise as part of an endeavour to understand how best to ensure gender inclusivity in the programme. Their findings will inform CABI regarding what it needs to consider in order to strongly embed gender in its future development projects.

In 2020, Plantwise continued to receive international recognition through the International Integrated Pest Management (IPM) Award of Excellence (Team). This brings the total number of awards won by the programme since its inception to six. As most of these awards relate to innovation, it is essential for CABI that any future outlook building on lessons from Plantwise should maintain a focus on the innovation of both processes and tools as areas distinguishing the programme from other similar initiatives by other organizations.

As the year 2020 marked the end of all major funding contracts for Plantwise, a thorough sustainability assessment was conducted across all active countries. Evidence from the assessment indicates that, in most countries, elements such as plant clinics and plant doctor training are likely to continue running after 2020, as are adapted data management systems in a few countries. The use of social media apps to support advice delivery on plant health is also likely to remain an essential activity within plant health systems in Plantwise countries. The open access Knowledge Bank is seen as a valuable resource by stakeholders, and its use in seeking information on plant health – especially the use of pest management decision guides (PMDGs), factsheets and photo-sheets – is also likely to continue and will be further enhanced under PlantwisePlus. The potential for sustainability is demonstrated by annual funding commitments by partners, which often embeds some of the Plantwise concepts – such as plant clinics – into agricultural strategies, development plans or staff job descriptions.

The transition of Plantwise to PlantwisePlus has been designed to further support, as well as mainstream, strategic elements of the former programme into the latter. It is worth noting that, in 2020, new country-specific funding was secured from NUFFIC and the Netherlands Embassy in Bujumbura to introduce Plantwise in Burundi. The transition also recognizes that opportunities may continue arising in the future to introduce the programme in its entirety, to introduce some of its elements to new countries or to continue some of its elements in current countries. CABI has therefore set arrangements to enable responses to these needs as they arise, and also to provide backstopping to strategic elements of Plantwise under the new programme.

Programme highlights

Programme level

- Plantwise won the International IPM Award of Excellence, bringing the number of awards won by the programme to six
- There is evidence of the sustainability of some elements of Plantwise in several countries, such as plant clinics and plant doctor training sessions, as demonstrated by annual funding commitments and the embedding of some programme concepts into agricultural strategies and development plans
- A further external evaluation of Plantwise (led by KIT) has reaffirmed the reported benefits of the programme in implementing countries
- Plantwise was launched in Burundi with new funding from NUFFIC and the Netherlands Embassy in Bujumbura

Plant health systems development

- Due to the challenges caused by global COVID-19 restrictions, Plantwise partners persevered through innovation that enabled continued delivery of services to smallholder farmers
- Plantwise innovations/processes have been written into official strategies, development plans and/or job descriptions in 15 countries
- Plantwise activities are increasingly being written into partners' annual budgets: a total contribution approximated at £1.05m was committed by partners in 2020 to support programme activities, bringing the cumulative total to £5.47m between 2016 and 2020
- A study was conducted on Plantwise engagement with the private sector. The results showed over 105 linkages, mainly with agro-input traders and trade hubs
- Under the programme, 1441 plant doctors (34% female) were trained across 17 countries and 359 new plant clinics were established in nine countries
- The CABI Academy Crop Pest Diagnosis e-learning course was piloted (in English and Spanish), attracting 4650 users from 103 different countries (83% from developing countries, most notably Plantwise countries)

- Local partners and National Plant Protection Organizations were supported through the UK-based DAS to identify five new pests in two countries: (1) the Golden Apple Snail (*Pomacea canalculata*); (2) Dodder (*Cuscuta reflexa*); (3) the Yellow Sugarcane Aphid (*Sihpa flava*); (4) mealybug (*Heliococcus summervillei*); and (5) New Guinea flatworm (*Platydemus manokwari*).
- The programme handled 275,308 plant health queries through traditional and adapted plant clinics (12% from women farmers); 69,151 farmers (52% women) were reached through plant health rallies; and 1.7 million farmers were reached through mass extension campaigns

Knowledge Bank

- A total of 709 Plantwise-derived factsheets were written or updated; there were 288,964 visits to the online Knowledge Bank, bringing the cumulative total to 2.4m to date, and over 878,105 sessions on the Factsheets Library app
- Nearly 720,507 plant clinic records are now available on the POMS (plus an additional ~241,065 in the China system), with evidence of POMS data being used by partners in 17 countries
- An improved DCA account administration tool was released to enable country partners to self-manage their accounts
- The PowerBI dashboard was incorporated into the POMS to increase the accessibility of clinic data analytics to a wide range of users
- The diagnostic tool and species distribution maps were improved with the release of CABI's new distribution database
- Prototypes for automating harmonization and validation in data management were developed and tested, providing foundations for future improvements to efficiency and quality using machine learning
- Of smallholder farmers in Kenya who received PRISE alerts, 85% said they would opt in to receive messages in the future and 59% changed their farming practices based on message recommendations

Monitoring, evaluation and learning

- Some county governments in Kenya have included plant clinics into their integrated development plans and performance contracts of senior staff
- Plantwise has enabled the MS Swaminathan Research Foundation (MSSRF) in India to fill a gap in their extension services by providing field-based plant health information and farmer-centric plant health diagnosis and advisory services
- The use of plant clinic advice in Rwanda has been shown to contribute to a one month decrease in the months of household food insufficiency, with a 15% reduction in food insecurity overall, of larger magnitude (29%) for female headed households compared to 11% for male-headed households)
- Clinic users in Rwanda and Zambia adopt 15% and 20% more Fall Armyworm (FAW) management interventions respectively and are more likely to use other pest management techniques besides pesticides
- Increases in maize yield (86%) and in income (89%) for adopters of plant clinic advice compared to non-adopters was associated with the full adoption of plant clinic advice in Zambia

Gender

- In India, women's knowledge of plant health and their knowledge-seeking behaviours have increased, raising their level of empowerment due to engagement with Plantwise
- Male clinic users in Zambia increased their maize yield by about 18%, compared to 8% for women clinic users
- The seasonal food shortage in female-headed households in Zambia was reduced by 22 days for plant clinics users, while it was reduced by 17 days in male-headed households attending plant clinics
- Adoption of plant clinic advice in Zambia was reported to reduce food insecurity in both female-headed households and for women spouses, although the reduction was greater in female-headed households

Monthly highlights

MARCH

The CABI Academy Crop Pest Diagnosis e-learning course, based on plant doctor training, is piloted (in English and Spanish)

FEBRUARY

PowerBI dashboard incorporated into the POMS to allow users to drill down on important metrics such as the most common pest problems and recommendations given to farmers by plant doctors

JUNE

Article published on frequency of antibiotic recommendations against crop pests, gaining significant scholarly and media attention

JULY

Open access PWKB linked to the BioProtection portal, starting with links to individual country pages for Kenya, Brazil and Peru

SEPTEMBER

External evaluation of Plantwise and Action on Invasives by KIT completed, further re-affirming the positive impacts of the programme in implementing countries

NOVEMBER

New funding secured from NUFFIC and Netherlands Embassy for introduction of Plantwise in Burundi

DECEMBER

Plantwise wins the IPM Team/Group category at the 2021 International IPM Achievement Awards

Plant health systems development

Progress in 2020

In spite of challenges due to the COVID-19 pandemic, Plantwise partners in implementing countries continued delivering services to farmers, in particular the provision of plant health advice. In 2020, Plantwise activities continued in 28 countries, 26 of which were supported through funding from traditional programme donors, while CABI's support to Honduras and to Colombia was driven exclusively through separate projects specific to these countries (note that Colombia is not a Plantwise country). To a large extent, conducting Plantwise activities that had been planned at the start of 2020 was still possible despite COVID-19; however, this required innovating the approaches needed for these activities to take place, particularly with respect to training and farmer outreach. CABI provided strategic and technical support for these activities, mainly through remote means due to travel restrictions. Similarly, most country partners experienced a period where domestic travel and large gatherings were not possible. For activities that were not possible under these circumstances (e.g. stakeholder meetings; face-to-face training; plant clinics and other outreach activities), alternative activities that could be undertaken virtually or through local travel were introduced.

Introduction of Plantwise in Burundi, with funding from NUFFIC and the Netherlands Embassy in Bujumbura, was one of the major achievements in 2020. CABI is partnering with the Institut des Sciences Agronomiques du Burundi (ISABU, the Department of Plant Protection (DPV) and the Provincial Directorate of Agriculture and Livestock Extension Services (BPAE as well as with some non-governmental organizations, to build capacity needed in delivering best-practice advice to farmers and to increase information exchange within and among the plant health stakeholders. Initiation of field activities and training was delayed due to COVID-19 and will take place in 2021.

As a complement to Plantwise donor funding, in-country partners contributed approximately £1m to implementation costs for activities such as training and plant clinic operations. This figure excludes contributions in terms of staff time (e.g. plant doctors, trainers, data managers, etc). Availing of these funds by partners for Plantwise activities depends on needs and is usually affected by competing priorities. As an example, more than £54,000 was allocated by the Department of Agriculture in Sri Lanka to Plantwise activities in 2020 under its national Permanent Crop Clinic Programme. However, due to the government's actions to slow the spread of COVID-19, these funds for Plantwise activities never materialized. Nevertheless, the overall programme performance in the country remained consistent with that of previous years. In addition

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).

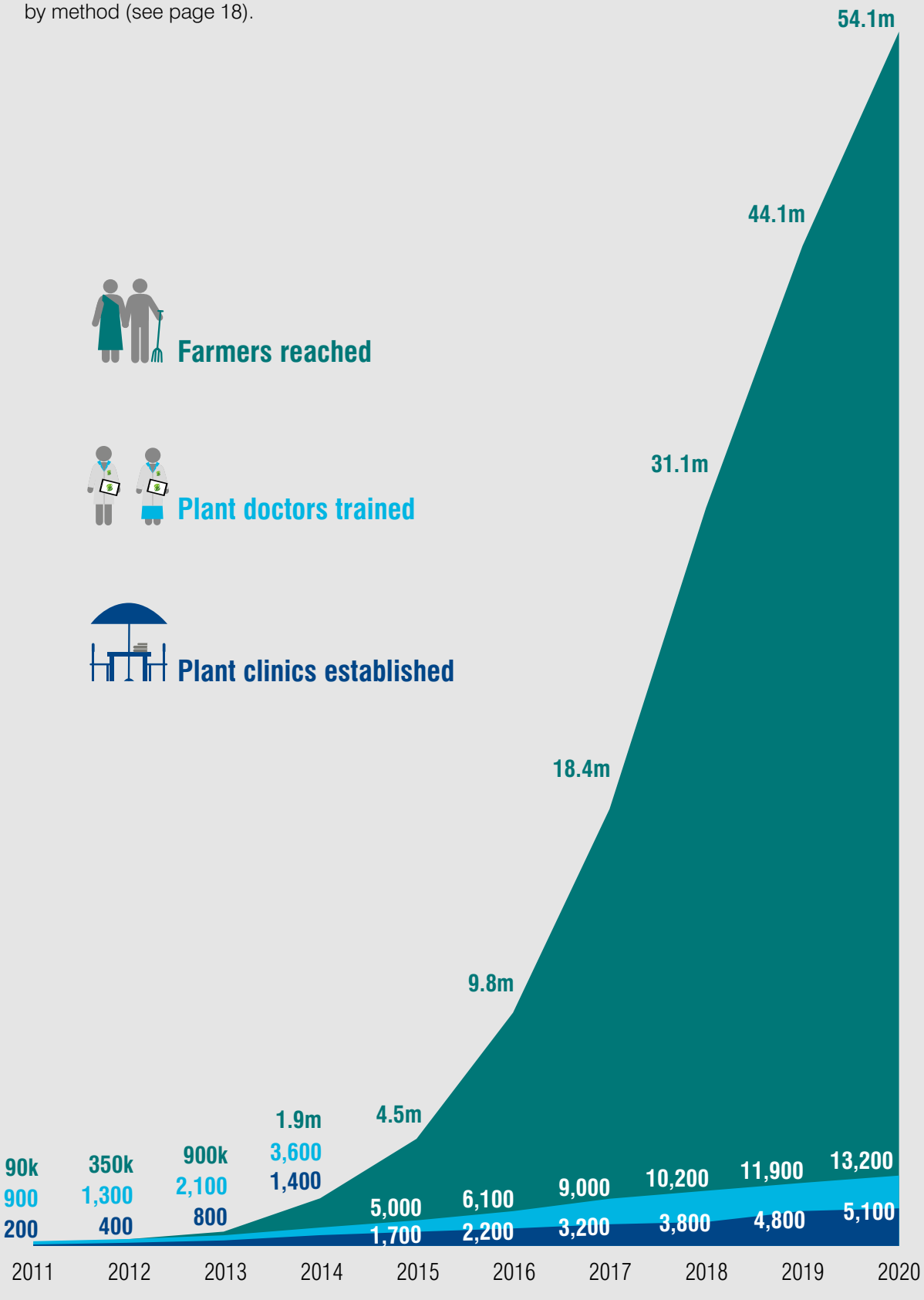


Diagram not to scale.

to annual funding commitments by partners, 15 countries demonstrated Plantwise's potential for sustainability by embedding some of its concepts, such as plant clinics, into their agricultural strategies, development plans or staff job descriptions.

The year 2020 saw at least 210 Plantwise training events conducted to build capacity for in-country partner staff in diagnostics, giving good advice, working with digital devices, data management and analysis, developing extension materials and monitoring plant clinic performance. Women made up 34% of the 3460 participants trained as part of these events. This gender ratio was consistent for the plant doctor training, as well as for the Modules 1 and 2 training of trainers. The strong inclusion of women in plant clinic operations has been shown in previous years to have a positive effect on the number of women seeking consultations with plant doctors. Since the start of the programme, more than 13,200 advisory staff have taken part in the Plantwise plant doctor training.

In 2020, nine countries in Africa and Asia were able to establish a total of 359 new plant clinics, making a cumulative total of more than 5000 plant clinics since the inception of Plantwise. Of this total, approximately 3700 were reported to be active in the past year. Due to COVID-19, much of the outreach by plant doctors had to be done through remote means rather than through the classic plant clinic approach. The most common approach across countries was to increase communication by telephone; in some cases, partners even established special telephone hotlines. In a few countries, most notably India, plant doctors were able to conduct online consultations with farmers, such as virtual plant clinics. In Latin American countries such as Bolivia and Peru, radio served as an important medium for communication and CABI saw its partners producing radio broadcasts on diverse plant health topics. In the Caribbean, partners resorted to holding webinars and creating instructional videos that were posted online as a way of disseminating information to farmers.

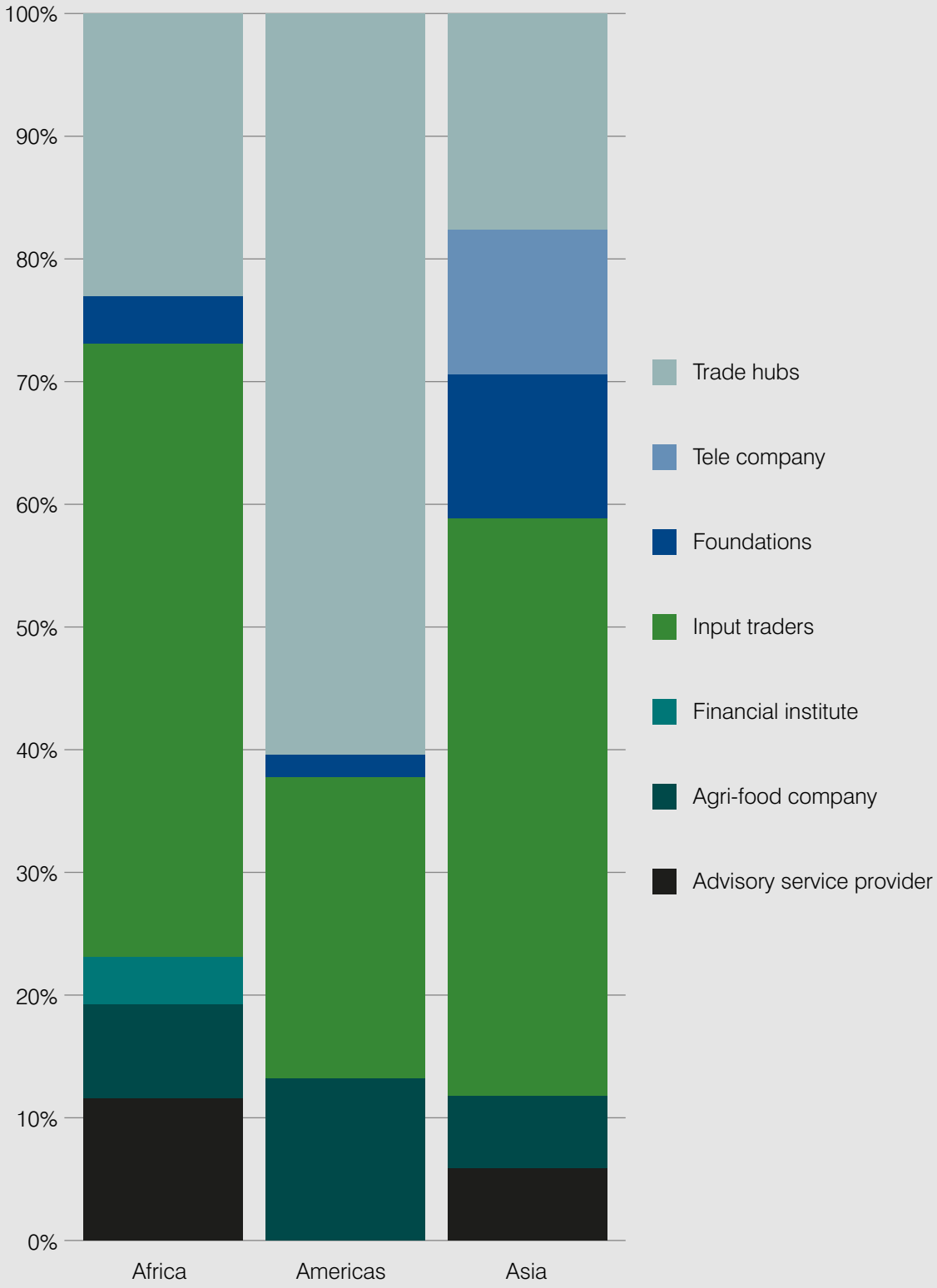
While these changes in approach were effective in enabling advisors to stay in contact with their farming communities, it posed a challenge in terms of measuring the reach of Plantwise in 2020. It is estimated that over 2 million farmers were reached directly through Plantwise-supported activities in 2020. In spite of the reduced plant clinic activities during the pandemic, clinics still reached over 275,308 farmers (12% of them women). Approximately 69,000 farmers (52% women) were reached through plant health rallies and similar activities. Finally, mass extension campaigns were conducted in 14 Plantwise countries, some by merging resources with the Action on Invasives programme. These campaigns reached an estimated 1.7 million farmers with actionable plant health advice. It is estimated that about 8 million additional farmers were reached through farmer-to-farmer sharing of information. In sum, the total number reached directly and indirectly by the programme in 2020 was approximately 10 million, forming a cumulative total reach of 54.1 million for the programme since its inception.

Table 2: Plantwise farmer reach in 2020, segregated by extension method

Extension method	Farmers reached
Plant clinics	275,308
Plant health rallies and other face-to-face advisory activities	69,151
Mass extension campaigns	
Radio	312,390
Television	635,747
Mobile messaging	115,626
Social media	562,178
Print media	3722
Village-level video screening	13,704
Field days/training	12,352
Subtotal (direct reach)	2,000,178
Farmer-to-farmer sharing (indirect reach)	8,000,712
Total (direct and indirect)	**10,000,890**

Private sector engagement

Plantwise engagement with private sector organisations is mainly with agro-input traders (including manufacturers, distributors and retailers) and trade hubs (farmer and trade associations and farmer cooperatives) of which 53 linkages are in the Americas,20 in Asia and 32 in Africa.



Although there were plenty of enquiries regarding assistance through the Plantwise Diagnostic and Advisory Service (DAS in 2020, relatively few physical samples were sent by the requesting organizations. The DAS team provided technical support on 88 queries from 31 countries, of which 60 came from 17 Plantwise countries across Africa, Asia and the Americas. This included 33 requests for diagnosis or identification based on photographs. Of these, 17 were raised through social media platforms where the DAS team is connected with plant doctor chat groups. Through this support, the DAS team identified five new pest cases in two countries: the Golden Apple Snail (*Pomacea canalculata*); Dodder (*Cuscuta reflexa*); the Yellow Sugarcane Aphid (*Sihpa flava*); mealybug (*Heliococcus summervillei*); and the New Guinea flatworm (*Platydemus manokwari*).

The use of plant clinic data by partners was reported from 22 countries in 2020, the highest number of countries using this unique resource since this assessment started in 2017. As in previous years, the most common data uses were for pest reporting (eight countries), monitoring plant doctor performance (seven countries), identifying topics for research (six countries), identifying topics for resource materials (six countries) and administrative reporting (six countries). Eight countries used the data for more than one purpose, and countries demonstrating more than one type of use tended to have more than one organization using the data.

Data validation and the associated use of plant clinic data to assess plant doctors' diagnostic and advisory performance remains a highly valued benefit for many partners. However, the validation process is often reported to be too time-consuming and therefore unsustainable. As a result, CABI has been exploring ways to automate the process of data validation. Initially, an Excel-based validation tool was developed to assist validators by flagging up the more obvious errors made by plant doctors. This also created a framework for an artificial intelligence tool, which could predict the outcomes of plant doctors' diagnoses and recommendations. As a starting point, a machine learning validation tool was designed to assist with validation, focusing on symptoms, pesticide names and quantities. A first test of the tool against human-validated datasets found it was accurate in 65% of cases, a reasonable starting point from which the tool can be further improved. Inconsistent spelling of key terms by plant doctors, such as names of pests and pesticides, occurs quite commonly in the free-text parts of the clinic prescription form. This poses a substantial challenge for any attempts to automate data analysis and is a major lesson to take forward in further digital development under PlantwisePlus.

Lessons learned

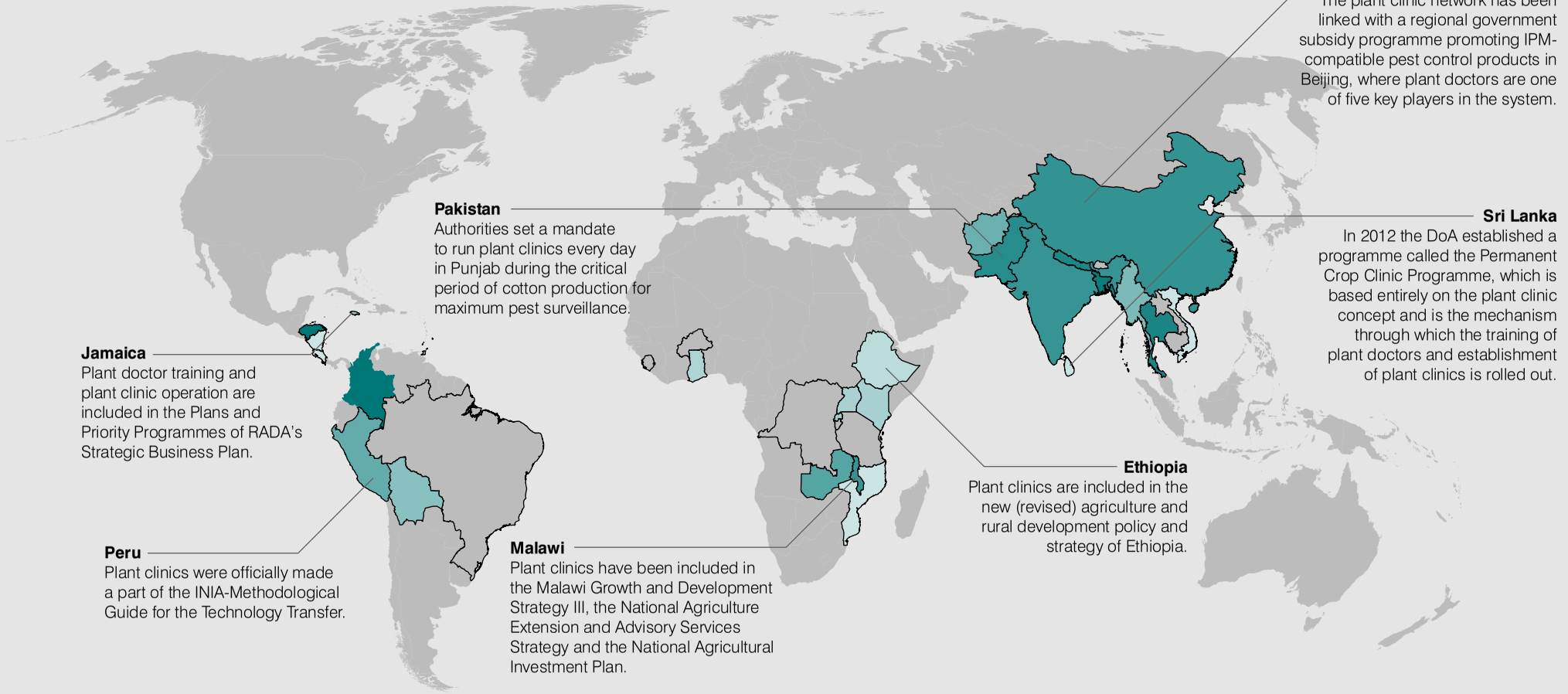
A review of Plantwise engagement with the private sector was conducted in 2020. The outcome has been captured in **a separate report** that presents a number of cases more closely to understand the value the collaboration was meant to provide to the private sector partners, and – ultimately – what was achieved. The review found 105 linkages with the private sector across all Plantwise countries over the lifetime of the programme. The majority of the linkages have been in the Americas (53 cases), compared to 20 in Asia and 32 in Africa. The main kinds of private sector linkages included agro-input traders (including manufacturers, distributors and retailers) and trade hubs (farmer and trade associations and farmer cooperatives). Other, less common, private linkages were with advisory service providers, research institutes, financial institutions and agri-food businesses.

Despite private companies from different sectors having shown some interest in Plantwise, feedback from certain private sector organizations revealed that the programme was too rigid in its design to address their needs. This was particularly the case with the Plantwise training content, which was not sufficiently tailored to their business needs, such as focusing on specific commodities. Nonetheless, while several engagements involved one-off interactions that failed to progress, there have been a number of success cases. Some examples are outlined below:

- Embedding plant clinics in farmer associations in Latin America has been relatively successful, with sustainability achieved by farmers paying a membership or levy to the association. This in turn provides technical support to the farmers. Farmer groups that depend partly or entirely on donor funding are more likely to change priorities and suddenly divert funds away from plant clinics and other Plantwise innovations

Sustainability of Plantwise in implementing countries

Evidence of sustainability of some elements of Plantwise such as plant clinics and plant doctor trainings in several countries as demonstrated by annual funding commitments and examples of programme concepts embedded into agricultural strategies and development plans.



- Syngenta Foundation's agri-entrepreneur model in India follows a decentralized approach to empowering young people in rural areas to play an active role in local agriculture development. Agri-entrepreneur mentors were trained as plant doctors to enable them to transfer their new skills on to the agri-entrepreneur. This has increased the quality of interactions with farmers and farmers' overall satisfaction with the service
- In Nepal, iDE entrepreneurial farmers have become Community Based Facilitators (CBFs), who act as last-mile input supply chain actors and earn a commission on sales of agricultural inputs. The plant doctor function was recognized as a powerful complement to the CBF model, increasing farmers' trust in these local service providers and thereby increasing sustainability
- In China, the Beijing Plant Protection Station (China) has been using plant clinic data since 2017 to help manage "Green Control" subsidies for agro-input dealers who sell less toxic plant protection products to farmers. This partnership was achievable due to policy developed by the national government, where linking the plant clinic concept to input supply enabled them to reach large numbers of small-scale farmers

In addition to the traditional training of advisory staff as plant doctors (Modules 1 and 2), CABI has also been working with numerous partners to integrate the Plantwise course content into existing programmes of institutions of higher education. The aim is to make plant doctor training a standard part of the curriculum for future personnel in agricultural support services. As at the end of 2020, the plant doctor training has been integrated into the curricula of eight university/college programmes in Bolivia (three), Nicaragua (two), Uganda (two) and Nepal (one). Collectively, these institutions have already trained hundreds of undergraduate/graduate students using Plantwise materials (not included in counts of "plant doctors" trained presented in this report). Discussions on similar integrations are ongoing in a further nine countries, involving 19 higher education institutions. Integration takes different forms: sometimes it is a standalone subcomponent, sometimes it is a practical course and sometimes it is part of the main curriculum unit. The process of formal integration into the curriculum can be long, spanning many years, as it requires internal institutional approval.

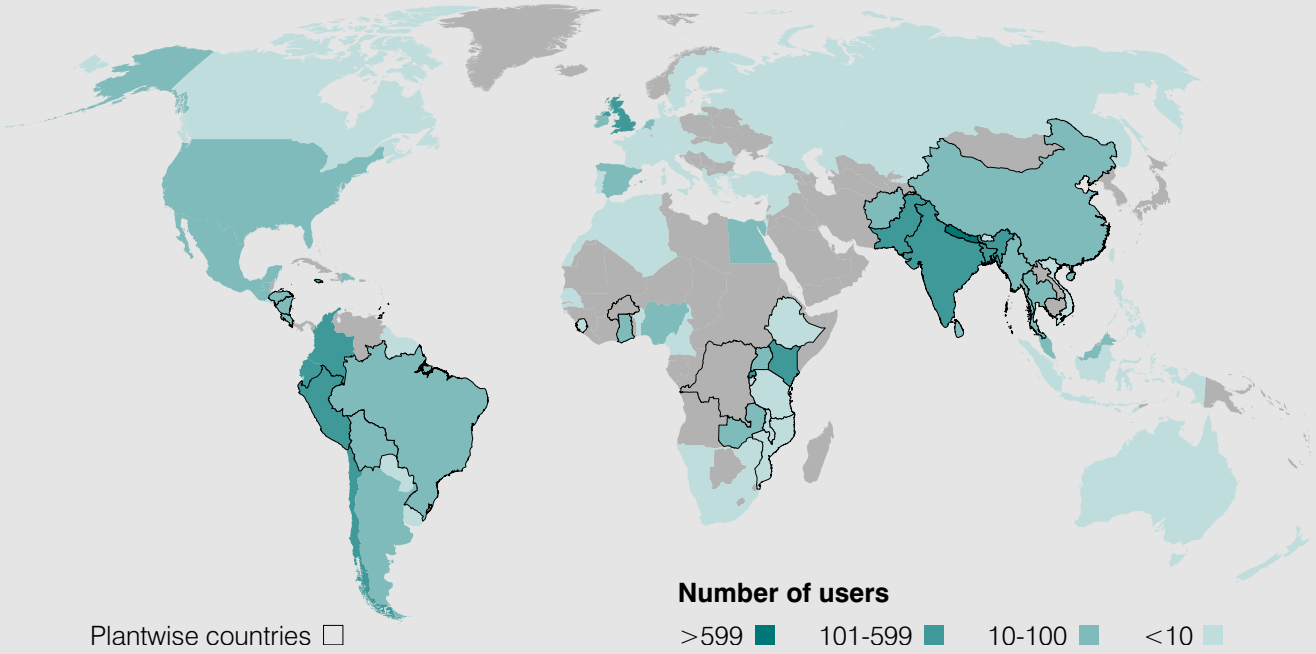
In Uganda, CABI held meetings with representatives from six universities and agricultural colleges to gather and share experiences on integrating Plantwise training content into their undergraduate programmes. The success of the plant doctor training for students, coupled with community satisfaction, helped ensure institutional commitment and funding to continue the plant doctor training as part of the curriculum. It was also evident that using Plantwise training makes graduates more marketable where the plant doctor function is included in the official job description for government extension workers. Plantwise training content not only enriches the studies of faculty and students through very practical and interactive training experience; it is also a community outreach tool that increases the visibility and impact of these institutions in the surrounding communities. This observation is consistent with experiences from Bolivia and Nicaragua, where universities/colleges set up plant clinics in local communities to serve farmers while providing practical experience for the students.

In 2020, all Plantwise partners were invited to take the CABI Academy Crop Pest Diagnosis e-learning course, which was offered in English and Spanish. There was a three-month window to register; thereafter, each user was given three months to complete the 15-hour course. This was a pilot for CABI's first digital learning course. It coincided with a more general, but shorter, release of the course to the general public. Of the 4650 users who registered from 103 different countries, 83% were from developing countries, most notably those implementing Plantwise. Categorizing the users according to job profile revealed that students made up the largest group, followed by users in advisory, scientific, technological, training, administrative, compliance and farming categories. The course completion rate for developing countries was 52%, compared to the 5% completion rate typical of such free online courses. Completion required users to pass a final exam, created through the random selection of 20 questions from a question bank. The post-course exam scores were, on average, 32% higher than similarly-generated pre-course exams. While the exam questions were not fully validated for a rigorous assessment of change in knowledge, the results suggest a learning impact.

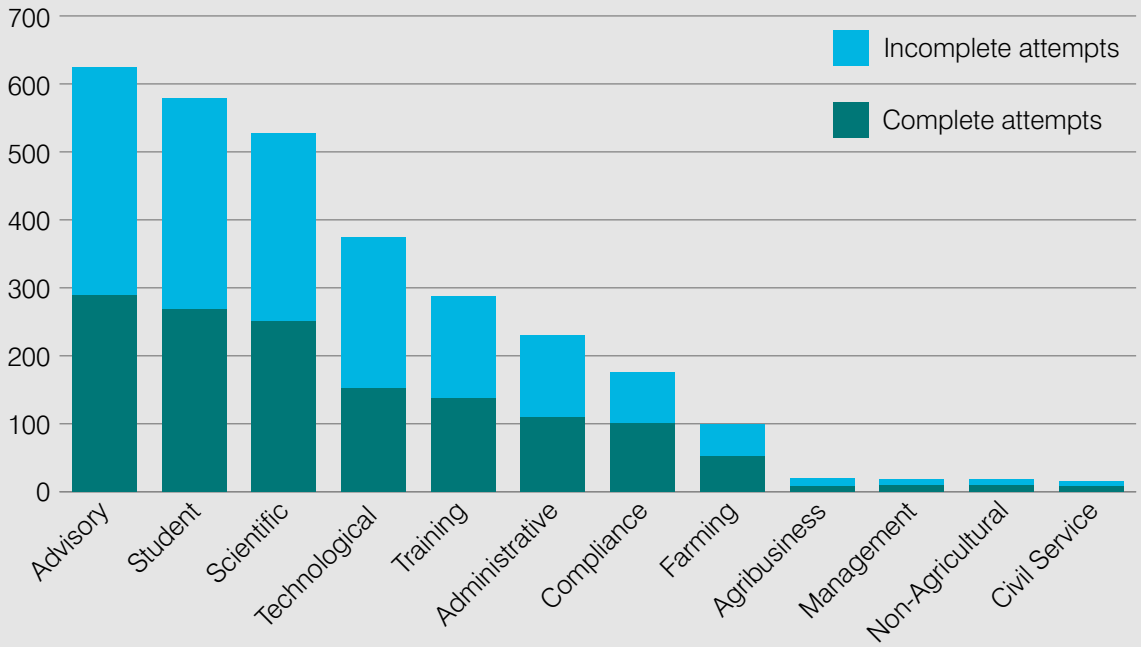
e-learning pilot

CABI Academy Crop Pest Diagnosis e-learning course in English and Spanish was piloted attracting more than 4,500 users of various occupations from 103 different countries, 83% from developing countries, most notably Plantwise countries.

Uptake by country

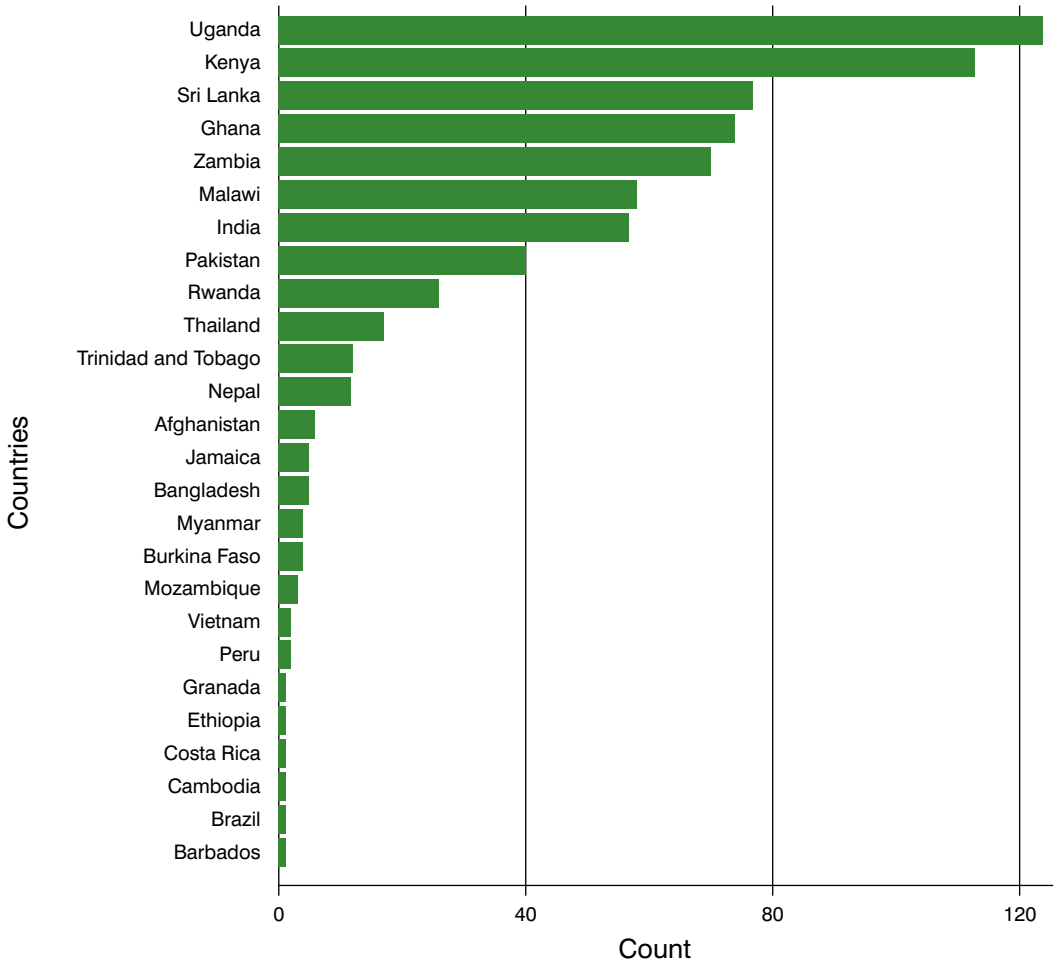


Occupational breakdown of users



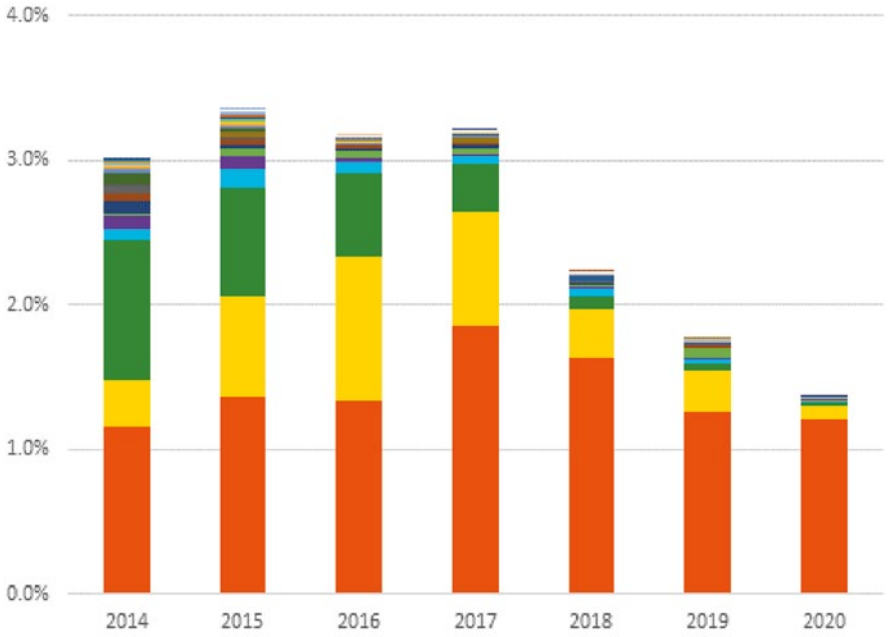
CABI produces a monthly "plant doctor quiz" on SurveyMonkey, which has been in operation since 2018. The quizzes are intended to provide engaging, cost-effective and continuous professional development on the topic of plant health for Plantwise-trained plant doctors, while also providing a mechanism to monitor knowledge on specific topics. The learning from this exercise is particularly relevant as Plantwise transitions into PlantwisePlus, under which CABI's support to plant doctors will need to take on more remote approaches. As at January 2021, there were 30 plant doctor quizzes with more than 730 plant doctors attempting at least one quiz. Quiz users were recorded from all 26 active Plantwise countries, although the numbers and extent of participation vary considerably. Uganda and Kenya were the heaviest users and also showed the highest fidelity to the quizzes. Most other countries had a high "churn" rate, meaning there was very poor consistency in use. A survey of plant doctors in Uganda and Rwanda in 2020 found that possible reasons for lack of uptake included lack of awareness of the quizzes; challenges regarding internet access and stability; and lack of time. Due to the inconsistent participation by individual users over time, the entry of new users into the quiz scheme at a late stage and the relatively small sample size, it has not been possible to detect changes in performance (i.e. learning) over time.

Figure 1: The total number of individuals per country who have ever attempted a quiz, in descending order



Regarding the quality of recommendations given to farmers by plant doctors, an updated analysis of the plant clinic data on pesticide recommendations shows a further decrease in the frequency of red-list pesticides (most toxic active ingredients) in 2020. Overall, red-list pesticides accounted for more than 3% of all pesticide recommendations between 2014 and 2017. Following major awareness-raising interventions by CABI since 2017, there has been a continuous drop in recommendations containing red-list pesticides of 2.3%, 1.8%, and 1.4% in 2018, 2019 and 2020 respectively. This is an excellent development in the contribution of Plantwise interventions to pesticide risk reduction.

Figure 2: Proportion of recommendations by active ingredient containing red-list pesticides



* The colours represent different red-list pesticides. The three most recommended red list pesticides were carbofuran (red), Triazophos (yellow) and Beta cyfluthrin (green)

As a result of another piece of research using plant clinic data, CABI published a paper in 2020 on the occurrence of antibiotic recommendations in advice given by plant doctors. The paper showed that agricultural advisors in at least 11 countries are promoting the use of antibiotics for pest management on over 100 crops, most frequently on rice. In general, antibiotic use in crop production is poorly studied and poorly regulated. Of particular concern is that two of the most commonly recommended antibiotics for crop pests are also important drugs in human medicine, which may pose the risk of increased resistance. This example shows that resources such as the plant clinic data in POMS can be used to improve the understanding of interactions between advisors and farmers, in turn guiding decision making at multiple levels.

CABI has been using plant clinic data since 2019 to understand what the optimal plant clinic coverage might be. A key observation made earlier was that several countries have both a large number of plant clinics and farmer location descriptions in the clinic data that are possible to map. Kenya was selected as a focal country for clinic coverage research. A random sample of clinic records in POMS was taken from each of the 25 randomly selected plant clinics and mapped so that the distance between farmers' homes and the plant clinics could be calculated. Overall, from 2352 records analysed, the median distance travelled by Kenyan farmers to plant clinics was 4.0 km; however, this varied considerably from clinic to clinic.

This analysis also considered factors influencing the distances farmers travel to clinics. From the 11 variables analysed, population density, proximity to other clinics and clinic location were among those found to have significant effects on average travel distances. Contrary to expectations, farmer gender and farmer age did not have significant impacts on distance travelled. Overall, these findings provide a basis for determining the spatial optimal plant clinic coverage in Kenya, and may inform decisions on optimal clinic numbers and placement.

Next steps

In 2021, under the remaining core Plantwise funding, the major focus will be on finalizing all programme-level and country-level reporting and on ensuring that the current status of Plantwise sustainability is well understood and documented. This will be important for decisions under PlantwisePlus. In 2020, all Plantwise partners were informed of the transition from Plantwise to PlantwisePlus and what this would mean for further CABI support.

CABI will maintain a backstopping role to advise on strategic, technical and operational matters as a component of PlantwisePlus. This will entail occasional country visits by CABI staff to sustain existing partnerships and share updates and outputs from developments under the new programme. In addition, CABI will provide limited budgetary support to some of the strategic in-country activities based on strongly justifiable country requests for issues such as the evaluation of elements of the programme, establishing new partnerships or testing new innovations.

Knowledge Bank

Progress in 2020

The key focus in 2020 was to continue the sustainability work of previous years, building robust and future-proofed Knowledge Bank tools and processes. The ICT developments focused on:

- releasing a redesigned DCA account administration tool
- releasing a mobile responsive POMS
- incorporating a PowerBI dashboard into the POMS
- machine learning investigations for automating data harmonization and validation
- improvements to the KB diagnostic tool and species pages following upgrades to the CABI Distribution Database

In addition, activities were conducted to augment the Knowledge Bank library with relevant plant health material. Such materials include PMDGs and Plantwise Factsheets for Farmers (PFFFs) written by in-country partners, e.g. those by EMBRAPA SOJA and INIA Chile. The number of visits to the KB continued to be closely monitored. A collaboration with UNESCO's "Wikimedian in Residence", plus search engine optimisation SEO improvements during the year, contributed to an uplift in the number of visits. Although Google Analytics is a useful service for tracking and reporting website traffic, a bespoke survey (English and Spanish) was launched in August for a deeper dive into KB users. The responses will be used to inform future marketing campaigns and to improve understanding of user requirements.

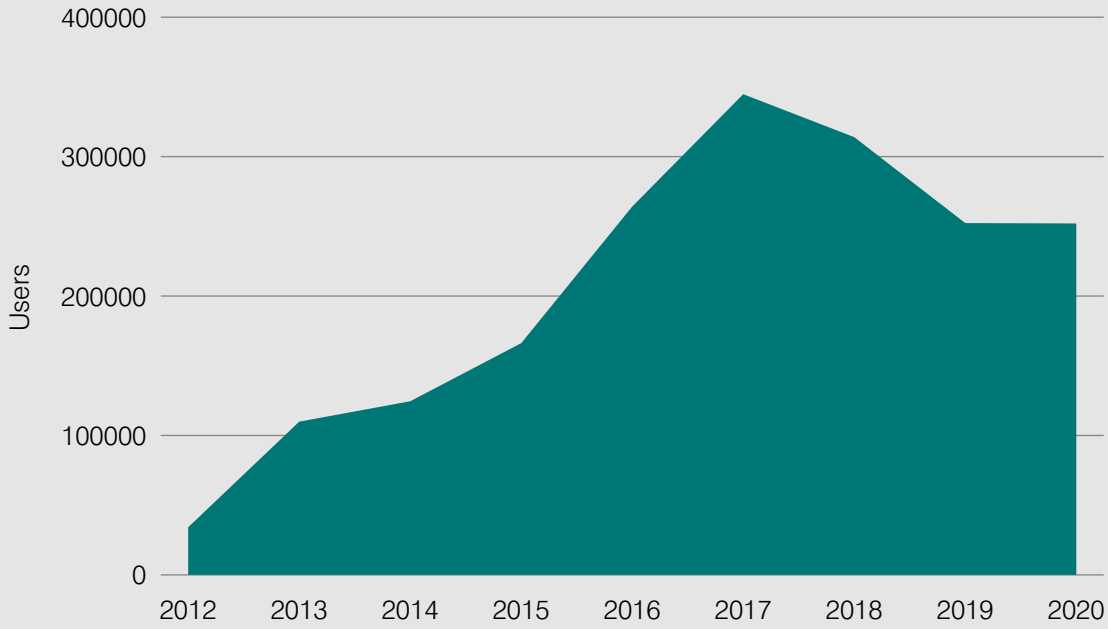
The **Data Collection App (DCA) account administration tool**, used to create and manage the accounts, was redesigned to:

- enable country partners to self-manage accounts
- streamline the account management system for all users
- improve security

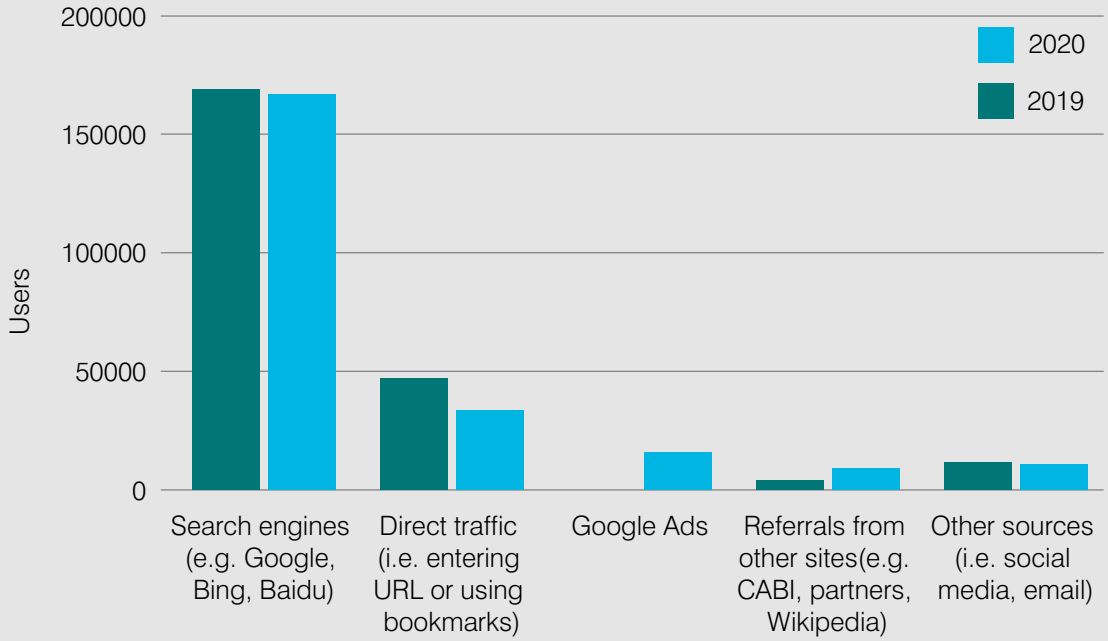
Diversifying promotion channels to enhance Knowledge bank use

The Plantwise Knowledge Bank has served over 18.6 million users since its launch. As a mature product, annual usage has decreased since a peak in 2017. While the bulk of users still come to the PWKB search engines (70%) or directly (14%), these segments are decreasing. A mixed-channel approach of maintaining up-to-date, actionable and best-practice content on the Knowledge Bank, marketing campaigns targeting existing and prospective users, continuing improvements to SEO and seeking further content collaborations, can maintain visits of ~70%, while encouraging new and return visits.

Annual Plantwise Knowledge Bank users



Plantwise Knowledge Bank users by source



The redesigned tool allows administrators from in-country partners to create and manage DCA accounts for plant doctors. Globally, the number of accounts required is anticipated to continue increasing beyond the scope of current funding; therefore, release of the self-service tool ensures sustainability of the data collection process. The tool was built using a human-centred design approach, with early engagement from CABI Country Coordinators in Asia, Africa and Latin America and the Caribbean (LAC), creating buy-in and identifying prospective in-country administrators from all regions. Administrators were specifically identified among National Data Managers (NDMs), coordinators and cluster coordinators in Kenya (two), Malawi (16), Mozambique (three), Rwanda (two), Uganda (two) and Zambia (13).

Cumulatively, 3953 plant doctors have been trained on the use of tablet computers at plant clinics in 28 countries, with 911 e-plant clinics running in 25 countries. In 2020, training took place in 11 countries; three in LAC (Costa Rica, Jamaica and Nicaragua); five in Asia (Bangladesh, India, Myanmar, Nepal and Sri Lanka); and three in Africa (Malawi, Rwanda and Zambia). The training workshops were held virtually instead of face-to-face due to COVID-19 restrictions. Virtual training turned out to be less costly and easier to organize compared to face-to-face training. However, it involved less hand-holding and lacked group support; therefore, it did not allow for the same level of interaction, making it difficult to gauge the level of trainee understanding on how to use the DCA and the Factsheets Library app. Several respondents stated that the lack of personal contact with trainers also meant they were less likely to seek support after the training, as there was a lower level of comfort and familiarity with the trainer. Another challenge with virtual training was the reliability of internet connections. Some of the trainees' bandwidth was too low to allow full participation. It is still unclear whether the change in training format has resulted in any changes in the use of the DCA due to lack of POMS data from the trainees at the time of writing this report.

The cumulative total number of clinic queries on the POMS exceeded the key milestone of 650,000 and stands at nearly 720,000 (plus over 241,000 in the Chinese system). More than 40,000 plant clinic records and just over 6600 photographs were submitted through tablets in 2020, with over 20,000 records submitted from the desktop version of the DCA. The most clinic queries were submitted from Pakistan (>52,000). The considerable drop in the number of clinic queries in 2020 (~76,000) compared to 2019 (~148,000) can be attributed to effects of COVID-19 plant clinic operations. In many countries, plant doctors used alternative methods, such as mobile phones and social media platforms, for consultation and sharing plant health information with farmers. However, this seemingly did not ensure the upload of all plant clinic data to the POMS. Some harmonization, validation and data analysis also continued in countries.

Continuing the build of future-proofed tools, a **mobile responsive POMS site** was launched in January 2020. Just over 20 POMS accounts were created during the year, representing a sharp decrease from the number created in 2019 (101). Of the 27 countries that accessed the POMS, activity was highest in Sri Lanka (476) and India (422), representing 34% of all login cases. Of the 110 partners who accessed the POMS, the highest numbers were seen from Kenya (17) and Ghana (12). Repeat visitors in 2020 made up 34% of the total number of visitors Overall, a similar number of countries accessed the POMS in 2020 (27) compared to 2019 (29); the number of partners accessing the POMS and the number of logins by partners showed a 27% and 22% decrease respectively compared to 2019. This drop possibly reflects the effect of COVID-19. Some of the challenges included weak connectivity and access to internet, where under normal circumstances these would have been provided by employers at the office, which was not possible under COVID-19 restrictions. However, the downloads of clinic data by partners continued in 2020, particularly in Bangladesh (105), Kenya (61) and Malawi (60).

The POMS is a repository that continues to house a large body of data that has several potential uses, such as assessment of plant doctor performance and monitoring trends of pests in farmers' fields. Data workshops pulling together prospective beneficiary stakeholders to identify and resolve barriers to data sharing were intended to continue in 2020 after successful workshops in Bangladesh, Pakistan and Ghana in previous years. In Kenya, Zambia and Malawi, conventional workshops were not possible under government travel restrictions during the pandemic, but activities resumed at a later date with an adapted implementation methodology, including online surveys, conference calls and telephone calls. Stakeholders were chosen from various organizations with a mandate for plant

health and from departments within the Ministries of Agriculture in the countries, as well as from local and international non-governmental organizations, most of which are Plantwise programme partners and stakeholders. There were 13 respondents in Kenya, 12 in Malawi and 21 in Zambia. One of the main barriers to data sharing was identified as a lack of trust regarding the intended use of the data. It is evident that that a significant amount of effort and time will need to be invested to build trust and engagement among in-country stakeholders in order to enhance sharing of data.

A **PowerBI dashboard** was incorporated into the POMS in 2020, allowing users to drill down on metrics such as the most common pest problems and the most common recommendations given to farmers by plant doctors. The already established advanced analysis tool remains part of the POMS, and Google Analytics shows it has been viewed more or less at the same level as the new dashboard (2327 views versus 2213 views respectively, since the launch of the dashboard). The offer of both tools is intended to reach a wider audience with a broad range of technical abilities. Usage of the dashboard in Plantwise countries was highest in India (24%), followed by Kenya (13%). Of the 2213-page views on the dashboard, 98% were from desktop devices, 0.95% from mobiles and 0.72% from tablets.

In 2020, 27 countries harmonized data and 10 countries re-harmonized data, exceeding the key milestone of data harmonization in 26 countries. Investigations into automating the harmonization of plant clinic data using **machine learning** were initiated in 2018 and led to further investigations in 2019 and 2020 to include validation. National Data Managers (NDMs) from Africa (Ghana and Malawi), Asia (India and Sri Lanka) and LAC (Bolivia and Jamaica) provided feedback on a harmonization prototype. The results showed that machine learning could save time and improve quality in terms of using geographical variants, language variants and historical data. COVID-19 restrictions made testing challenging, as NDMs were unable to reach their offices to carry out testing and did not have internet connections at home. Some key testers were missing, testing took longer and, in Africa, only two out of four testers were able to complete the work. Nevertheless, the feedback received was invaluable for improving the prototype. In developing a validation model records that had previously been manually validated were used to train on how to allow new records to undergo computer-assisted validation. This was found to enable faster validation. In time, more frequent validation and improved quality can be expected with the release of a machine learning-enabled tool.

A technical proof of concept was carried out in collaboration between CABI's Digital and Innovation team, a data scientist and a third party specializing in data analysis. The aim was to build CABI's skills in data analysis tools, libraries and techniques. The business case was to analyse group messages between plant doctors for trends in pest occurrence and mentions of restricted pesticides. An analysis of group messages between plant doctors showed that 69% of terms were automatically identified by a Named Entity Recommendation (NER) model compared to manual identification. Of these messages, around 95% were assigned the correct labels and 86% of crops were successfully detected. The results show that the approach has merit. The identification of terms and the accuracy of the labelling were good for a first iteration, but could be improved. The models built and the skills acquired will be used to explore whether these can help CABI efficiently monitor social media, blogs and news for relevant information.

Of the ~289,000 **visits to the Plantwise KB**, the highest came from India (~94,000). The number of visitors arriving from desktops in non-Plantwise countries was 62%, while there were 70% visits from mobiles and tablets in Plantwise countries. This is a 7% increase in visits from mobiles and tablets in Plantwise countries compared to 2019. A report exploring the effects of the global pandemic, prepared in July 2020, found a best-estimate percentage increase in unique views of PFFFs (36%), PMDGs (157%) and the diagnostic tool (7%) between February and July 2020, compared to the same period in 2019. The reasons for this increase are unclear, and may not be directly linked to the needs occasioned by COVID-19. During this period, there was also a marketing campaign for the KB. Some effects of the **SEO** may also have contributed to the increased number of visits. It is recognized that the SEO is a key driver of users and visits to the KB. In 2020, ~73% of all KB visitors arrived via the organic search channel (eg Google or Yahoo), which was similar to 2019 (75%). With this in mind, SEO improvements were implemented across the KB in April to increase the volume of traffic and (equally important) to uplift the quality of traffic (e.g. the average length of visit; the number of pages viewed per visit). The results were

mixed: although there was an uplift in the average time spent on a page (02:43) compared to 2019 (01:59), there was a slight decrease in the average visit duration (01:35) compared to 2019 (02:07). Improvements to the SEO are required on a regular basis and in tandem with marketing campaigns and content refreshes to maintain site traffic.

Over 11,000 factsheets are now available through the online KB, with 3740 specifically developed within Plantwise and available through the Factsheets Library app. Three hundred and five new (207 PMDG and 98 PFFF) Plantwise-derived content was published in 2020, and 404 updates (183 PMDG and 221 PFFF) were completed by partners and published. Of the 207 new PMDGs, 33 were written by students following the Masters of Advanced Studies in Integrated Crop Management course. The countries that published most of the new PMDG /PFFF content on the KB were Kenya (45 PMDG) and Sri Lanka (40 PMDG). The countries that published the most updated content were China (142 – 28 PMDG and 114 PFFF) and Bolivia (50 PFFF). The Factsheets Library app was used in all 34 active and non-active Plantwise countries in 2020, with the most active devices in Ghana (704). Overall, there were >57,000 sessions across all Plantwise countries in 2020. Despite not reaching the key milestone for the cumulative number of factsheets on the KB (14,000), the cumulative number of visits (2.4m) came close to the target (2.5m), and the number of Factsheets Library app sessions (878,000) exceeded the target of (800,000).

The most commonly viewed factsheets in 2020 were the PFFF on the management of Brown Planthopper in rice (2600 unique page views) and the PFFF on the management of the Rice Gundhi Bug (2589 unique page views). The most commonly viewed PMDG was the Chilli Root Knot Nematode on chilli (322 unique page views). The Plantwise PMDG model remains an attractive information resource that is continuously used to develop spin-off projects, supporting the development of more PMDGs for priority pests for countries or regions. For example, two new PMDGs were created under the Action on Invasives programme and nine new PMDGs were created under the PRISE project. As part of PRISE, seven PMDGs were used to build models and associated advisory messages; 20 were used for bulletins to plant doctors and wider messaging campaigns; and nine new ones were created to fill gaps in the PRISE pest coverage. The PRISE team reviewed the 20 PMDGs used for bulletins to bring them up to date.

Plantwise teamed up with UNESCO's "Wikimedian in Residence" to update 19 pest species on **Wikipedia**. PMDGs and PFFFs were used to update Wikipedia, increasing the reach of the pest diagnostic and management advice. The species were chosen for their appearance in plant clinics, popularity in international news and those with only basic information on Wikipedia compared to the Plantwise-derived materials. Referrals from Wikipedia showed an increase in 2020 compared to 2019 after the exercise. This exercise was a catalyst for reviewing existing **copyright and Creative Commons licence statements** on donor-funded, open access CABI sites, including the Invasive Species Compendium. The new guidance is intended to ensure CABI's work is credited where used and to provide a clear procedure where attribution is given. Individual copyright statements have been applied to all Plantwise-derived KB content for the first time.

A total of 1523 users responded to a **KB survey** set up for a deeper dive into understanding who visits the site, with the highest percentage of responses coming from Asia (48%). Most respondents were return visitors and identified their main occupation as student (24%), followed by researcher (16%) and farmer/grower (14%). Factsheets were the most valued resource (36%), followed by the diagnostic tool (30%). Maps were the least valued resource (6%) and would benefit from promotion now that they have been improved with the release of the CABI distribution database. Maintaining and updating country resources with the latest, best-practice and actionable pest management advice, and ensuring that the content library continues to grow for increased crop and pest coverage relevant to our audience, will help retain and attract users. This, together with regular improvements to the SEO and targeted promotions, will maintain the Plantwise KB and Factsheets Library app as key CABI products.

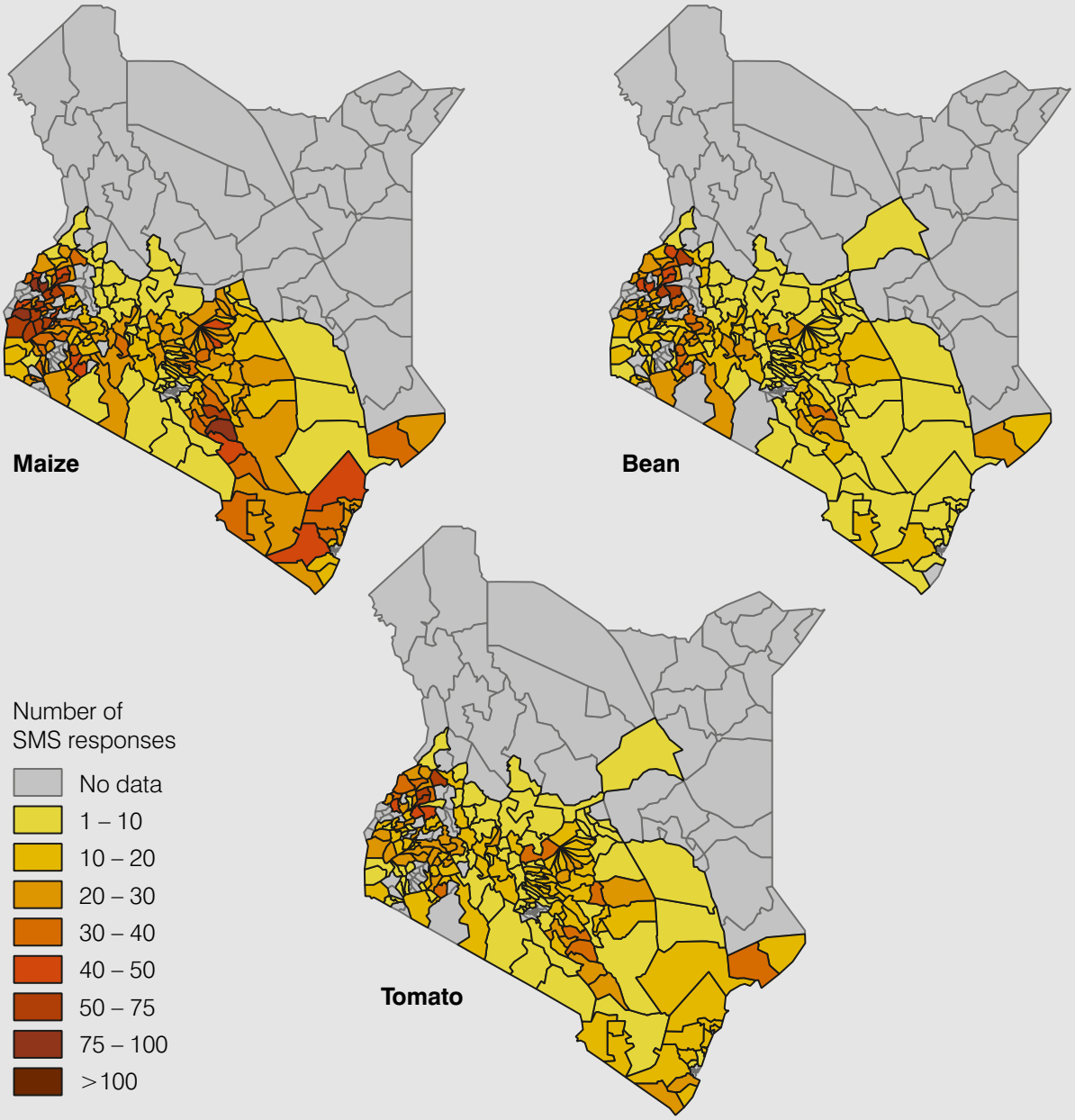
In 2020, there were 476 new subscribers to the **pest alert service**. This represents a slight decrease from 2019 (507) and brings the total number of subscribers to 2444. The service is available from both the Plantwise KB and the Invasive Species Compendium.

CABI's new **distribution database** was released in 2020. It draws together CABI's location data

Crowdsourcing crop data

PRISE is collaborating with Precision Agriculture for Development (PAD) in Kenya to send pest alerts to farmers through SMS. Farmers can sign up to PRISE-PAD services for maize, beans and tomatoes. 31% of users responded to at least one SMS question about pest presence resulting in over 9300 records of pest observations from the field.

Uptake by country



from Compendia products, CABI projects and Plantwise activities. A user interface allows CABI staff to search, add and manage location data within a database, ensuring users have access to the most up-to-date distribution information. The Plantwise **diagnostic tool** now draws on the new database, including at least 40,000 records that are new to the KB. Enhanced filtering tools allow greater interactivity, along with the ability to view different attributes and to filter the enhanced polygon map view to meet specific criteria.

The UK Space Agency-funded **PRISE** project is closely aligned with Plantwise. Since its inception in 2017, PRISE has been introduced in Kenya, Ghana, Zambia and Malawi. Outputs from PRISE modelling have been extended to extension workers and farmers, informing them of the most appropriate time to act on specific pests. In 2020, the number of species covered by the early warning messages expanded from *Spodoptera frugiperda* (FAW) and *Tuta absoluta* (tomato leafminer) to include *Busseola fusca* and *Chilo partellus* on Maize, *Bemisia tabaci* (whitefly) on tomato and *Ophiomyia phaseoli* (beanfly) on beans. An impact study on PRISE messaging to smallholder farmers in Kenya showed that 85% of farmers who received alerts said they would opt in to receive messages in the future; 59% of farmers who received alerts said they had changed their farming practices based on message recommendations. New modelling approaches have been introduced for several key pests to link advisory messages to action thresholds described in PMDGs.

Lessons learned

Cumulatively, 3953 plant doctors have been trained on the use of tablet computers at plant clinics in 28 countries. With the Plantwise programme coming to an end this year, there is a need for a more sustainable approach to creating DCA accounts for countries that will continue running the programme beyond support by CABI. This is why the DCA administration tool has been redesigned for self-service by partners.

Augmentation of the KB content library continued in 2020 with sustained use of the PMDG model for content creation and the formation of new collaborations with content partners. In addition, partners were encouraged to update existing content, some of which had been written in 2013–14. The library of content and the KB tools will be maintained under funding for PlantwisePlus. Continued monitoring of traffic to the site, plus regular improvements to the SEO, are needed to maintain and increase the number of visitors and the quality of visits. A number of factors in play in 2020 culminated in an increase in visitor numbers to the KB. The COVID-19 pandemic restrictions across the globe has meant that online resources, such as the KB, became the only sources of plant health management advice. The KB was also used to develop resources for remote training. Changes in behaviour due to the pandemic, plus SEO improvements, marketing campaigns and work to improve referrals, meant that the number of KB visitors was maintained at approximately 70% from mobiles and tablets in Plantwise countries. There were 14% return and 86% new visits to the KB in 2020, compared to 15% return and 85% new visits in 2019. As a result of a mixed-channel approach maintaining up-to-date, actionable and best-practice content on the KB, as well as marketing campaigns targeting existing and prospective users, continuing improvements to the SEO and further content collaborations, it will be possible to maintain visits of ~70%, while encouraging new and return visits.

The POMS continues to be a valuable source of plant health data and is continuously uploaded with data on plant clinic queries from the field. The tool will be maintained under funding for PlantwisePlus. Like the KB, activities in the POMS can be monitored using Google Analytics, as well as the inbuilt reports for user login, upload, submitted queries, records pending harmonization and download. The level of use of plant clinic data is mixed across Plantwise countries. Some users cite challenges regarding timely analysis of data and sharing data with others who might benefit. Despite the challenges, data collection under the Plantwise programme is seen as filling a gap in the extension service to inform pest monitoring and assessment of plant doctor performance. Data is currently dispersed among institutions and individuals and is rarely hosted in databases that would facilitate sharing. The POMS was built to facilitate sharing of plant clinic

data in the plant health systems of countries. However, significant effort is still needed to create awareness on the existing data, its usefulness and how stakeholders can access it for their use. Assurances will also need to be provided about the intended use of data and its benefits for organizations or countries. CABI's expertise in implementing data sharing practices and frameworks (e.g. FAIR data and open data principles), in tandem with establishing fit-for-purpose data policies and protocols, should continue to be leveraged to develop national roadmaps that identify blocks to sharing plant clinic data.

Investigations into the automation of the data management process have shown positive potential, and foundations have been laid for further automation in the future. Data harmonization and validation will benefit from improved efficiency and quality using machine learning. Further iterations of an NER model built to analyse plant doctor chats could be used against other data sources such as Twitter, blog posts or news articles.

Next steps

In Q1 2021, CABI will continue to roll out the new DCA administration tool and publish content on the KB. Major activities will include:

- rolling out the DCA administration tool to in-country partners (Q1)
- publishing all the remaining Plantwise-derived content submitted by country teams in 2020 (Q1)
- advances in machine learning:
  - reusing the NER model to investigate the value of using the current model against other data sources such as Twitter, blog posts or news articles
  - enhancing the model to improve results for accuracy and discovery
  - automating the process and expanding it to more regions

The suite of Plantwise digital tools developed under Plantwise and Action on Invasives will be enhanced under PlantwisePlus so that the information and learning is easily accessible for use in plant health monitoring and management.

For PRISE, 2021 activities will include:

- implementing two further pest models into the data cube
- disseminating and evaluating extension messaging through bulletins and third-party disseminators in Kenya, Ghana, Malawi and Zambia
- continued validation of pest and pathogen models through fieldwork in Kenya (in collaboration with KALRO)
- evaluation of appropriate data sources to enable the integration of pathogen models into the PRISE system
- scale-up and assessment of in-country partnership engagement and piloting to test the best sustainable models for PRISE
- endline surveys in Kenya, Ghana, Zambia and Malawi

Monitoring, evaluation and learning

Progress in 2020

A major programme activity in 2020 was an assessment of the sustainability of Plantwise country interventions. The assessment took into consideration the context within which the interventions were implemented in the countries. It therefore focused on using country-specific perspectives to get a good understanding of:

- changes that have occurred for the different stakeholders due to Plantwise activities
- whether the changes are likely to have a lasting impact
- the reasons why changes are considered sustainable beyond the question of "who is going to pay"

The key questions in the assessment regarded **what elements of Plantwise are operating within the country and the likelihood of continuity beyond donor funding.** The assessment focused on four main areas.

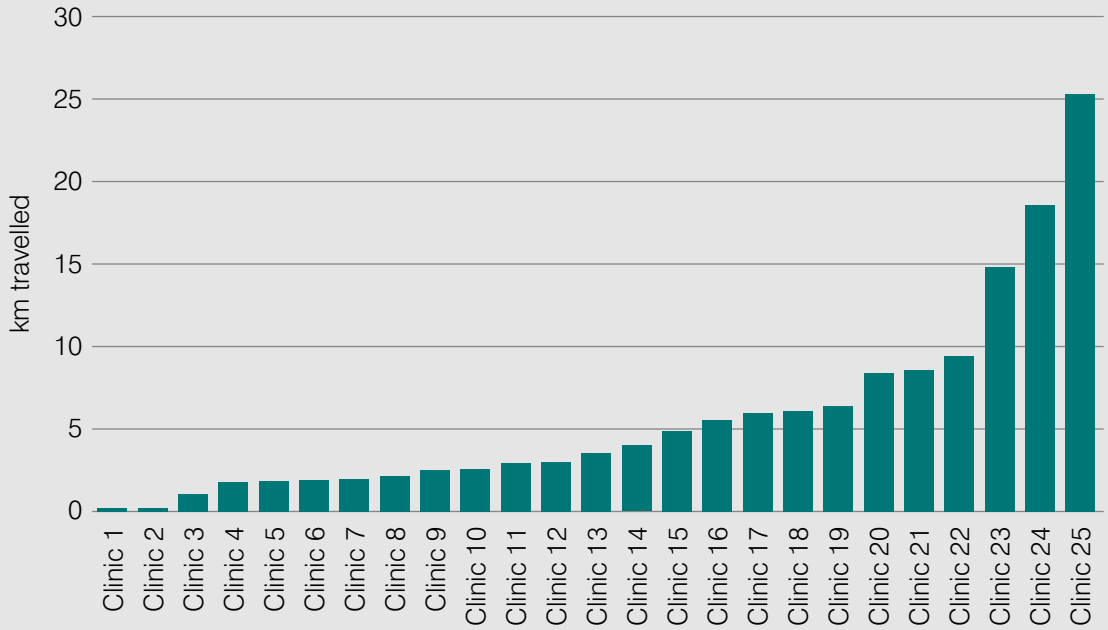
1. How are Plantwise **interventions** being implemented at present (including adaptations, innovations, scaling out or scaling up/down, being copied by other institutions and the reasons for these choices, funding from government and other sources)?
2. What **value** do countries place on these interventions, including the benefits they believe accrue (alongside this, determine the interventions deemed not to be of value, and why)?
3. What interventions do partners want/see as **desirable to sustain** after the funding/technical support phases out? What are the drivers for sustainability (if any)?
4. What are the **challenges and risks** to sustainability, and what do partners do/plan to do to **mitigate** these?

The sustainability assessment involved a document review (strategies/action plans, progress reports, evidence of impact, etc); key informant interviews; focus group discussions; and workshop(s). Initially, it was assumed much of the engagement would be carried out through face-to-face meetings, with some use of remote methods. However, due to COVID-19 restrictions, remote methods had to be deployed. This increased the challenges, as lack of group discussions limited the opportunities to delve into questions in-depth. It also created limitations in terms of the time available for discussions, as long, detailed online discussions with partners were not possible. As a result, either several interviews were held, which meant losing the flow of the

Distances farmers travel to Plant clinics in Kenya

An analysis of a sample of POMS records based on 25 randomly selected plant clinics showed that the median distance travelled by Kenyan farmers to plant clinics is 4.0 km. However, this varies considerably from clinic to clinic. This kind of analysis provides a basis for determining the spatial optimal plant clinic coverage.

Median distance farmers travel to clinic



Distance farmers travel to clinic 16-KEAUBO

conversation, or fewer, shorter and less substantial discussions were conducted. Some of the assessments were not as comprehensive as they might have been, but it was still possible to gain a good understanding of the elements of Plantwise that are likely to be sustainable in the implementing countries. A summary report is available **here**, and detailed country reports shared with our partners are available on request. The results indicate that elements such as plant clinics (in BD, BO, CN, CR, ET, GH, ID, KE, NP, NI, PK, PE, RW, SL, UG, MZ, MW and ZM), plant doctor training (in CN, ET, GH, NP, PK, TH, UG, MW and ZM) and, in a number of countries, adapted data management systems (in CN, BD, MZ, SL, NE, ID, GH, CR, BO, PK and KE) are likely to continue after 2020. The use of social media apps to support advice delivery on plant health is also likely to remain as an essential activity within the plant health system. **The open access KB is seen as a valuable resource** by stakeholders, and its use to seek information on plant health – especially the use of PMDGs, factsheets and photo-sheets – is likely to continue.

An underlying issue for the sustainability of every intervention is funding. There are indications that funding is likely to be available for some Plantwise interventions through government exchequers (national or local) and/or donors (either through affiliated projects or direct support). Examples of what countries are already doing that may sustain some elements of Plantwise are indicated below.

- **In Kenya, some county governments have included plant clinics in their integrated development plans and performance contracts of senior staff.** This will ensure that plant clinics are eligible for funding and that the responsible staff assigned these functions are held to account for the performance of the clinics
- **In Pakistan**, some provincial governments have appointed project managers to oversee Plantwise activities going forward. In two of the provinces (Punjab and Sindh), all Plantwise operating costs are solely covered by the government, with funding also allocated for scaling up the programme in Sindh, where the **implementation of plant clinics has been incorporated into staff key performance indicators** and where all expenses of running weekly plant clinics are covered by the local implementing organization. In addition, the extension department has applied for provincial funding to scale up Plantwise activities in Balochistan
- **In Malawi, plant clinics have been included in the National Agriculture Policy and the National Agriculture Extension Strategy,** with funding for plant clinics provided for in the Agriculture Sector-Wide Approach Support Project II
- In China, the sustainability of Plantwise is most likely in the Beijing area, where Plantwise has been integrated into the Beijing Green Control Product Subsidy Policy "*Work Program for Extensive Application of Green Control Products in Beijing (Trial)*". **An annual government budget of CNY 100m for subsidies will include contributions to support plant clinics**
- In Jamaica, Plantwise is included in the Plans and Priority Programmes of **RADA's 2018–22 Strategic Business Plan**, with plant clinics and plant doctor services mainstreamed within extension services
- In Uganda, plant clinic management and supervision roles are now specifically included in the job descriptions of Directorate of Agricultural Extension Education (MAAIF)– Department of Crop Protection (DCP) and District Local Government (DLG) extension staff, which were revised in 2018. **Plant doctor training modules have also been integrated into the curricula of universities to** provide a platform for continued training of new plant doctors
- In Nicaragua, **a three-month diploma course for plant doctors** has been developed and launched by the Catholic University of the Dry Tropic (UCATSE), based on the Plantwise training modules and supported by the training team from UNAN Leon and UCATSE
- India provides a different model for sustainability, where Plantwise has been integrated into the Village Knowledge Centres run by MSSRF. This has enabled MSSRF to fill a gap in their extension services by providing field-based plant health information and farmer-centric plant health diagnosis and advisory services. The model has built and sustained linkages with relevant stakeholders for running plant clinics and knowledge management through the KB platform

Impact of plant clinics on food security

Further evidence of the impact of Plantwise was gained through a study conducted in Rwanda to assess the effect of clinics on five food security indicators critical to Sustainable Development Goal 2 (zero hunger). Data was generated from 637 smallholder maize-producing households (263 clinic users and 374 non-clinic users) in three provinces (Northern, Southern and Western). Regression analysis shows that participation in plant clinics is associated with a reduction in different aspects of household food insecurity (Table 3). In general, plant clinics contribute to a one-month decrease in the months of household food insufficiency, reducing food insecurity by 15% and severe food insecurity by 88%.

Table 3: Treatment effects of plant clinics on food insecurity of households

	Mean outcome		
Outcome	**Clinic participation**	**Non-participation**	**Difference in mean outcomes (%)**
Months of household food insufficiency	2.32	3.43	−32.36
Food insecurity score (8 = least secure)	3.15	3.73	−15.55
Severe food insecurity score (1 if food insecurity score = 7 or 8; 0 otherwise)	0.03	0.25	−88.00

Note: all differences significant at 1% level

A comparison of female-headed and male-headed households indicates that users of plant clinic advice in female-headed households are likely to benefit more in terms of a decrease in the duration of the hungry season (fewer months with inadequate food provisioning). Food insecurity scores improved by 29% for female-headed households, compared to 11% for male-headed households. Female-headed households also saw a reduction in the likelihood of being severely food insecure by 87%, compared to 83 % for male-headed households (Table 4). This finding suggests that enhancing access to plant clinic services for women with decision making power can result in greater improvements in household food security.

Table 4: Differential impacts by gender of household head on food insecurity of households

	Mean outcome		
	Clinic participation	**Non-participation**	**Difference in mean outcomes (%)**
Months of household food insufficiency			
Female-headed households	2.13	3.35	−36.42
Male-headed households	2.37	3.45	−31.30
Food insecurity score			
Female-headed households	2.93	4.13	−29.06
Male-headed households	3.22	3.61	−11.08
Severe food insecurity score			
Female-headed households	0.03	0.30	−86.67
Male-headed households	0.03	0.24	−83.33

Note: all differences significant at 1% level

Analysis by poverty level shows that participation in plant clinics significantly improves household food security, irrespective of the poverty status of the participating household (Table 5). **Using plant clinic advice is associated with about 10%, 14% and 20% reductions in food insecurity for households with non-poor, moderately poor and extremely poor poverty likelihoods respectively.**

Table 5: Differential impacts by poverty likelihood on food insecurity of households

	Mean outcome		
	Clinic participation	Non-participation	Difference in mean outcomes (%)
Months of household food insufficiency			
Non-poor	1.96	2.97	−34.01
Moderately poor	2.33	3.43	−32.07
Extremely poor	2.55	3.77	−32.36
Food insecurity score			
Non-poor	2.71	3.01	−9.97
Moderately poor	3.08	3.59	−14.21
Extremely poor	3.63	4.54	−20.26
Severe food insecurity			
Non-poor	0.02	0.17	−88.24
Moderately poor	0.03	0.25	−88.00
Extremely poor	0.05	0.31	−83.87

Note: all differences significant at 1% level

Pesticide use

An assessment on whether plant clinics enhance the appropriate use of pesticides was conducted in Rwanda and Zambia. Data was collected from a sample of 638 (264 clinic users, 374 non-users) and 837 (444 clinic users, 393 non-users) smallholder maize-growing households affected by FAW respectively. Measurements were based on the intensity of pesticide use, the adoption of alternative and more environmentally friendly pest management practices, safe pesticide use practices and the incidence of pesticide-related illness.

The results showed that **plant clinic users are 14% and 66% more likely to spray pesticides for FAW control relative to matched non-users** in Rwanda and Zambia respectively (Table 6). Farmers tend to visit plant clinics when their crops are highly infested; plant doctors are thus likely to recommend pesticide usage as part of the control options. However, there are **no statistically significant differences between clinic users and non-users in terms of per hectare expenditure on pesticides and the number of pesticide applications during the cropping cycle** in the two countries.

Table 6: Estimates of the impacts of plant clinics on selected pesticide-related outcomes

Outcome	Difference in mean outcomes (%)	
	Rwanda	Zambia
Use of pesticides	14***	66.28***
Pesticide cost (US$/ha)	-4.66	-17.28
No. of pesticide sprays per season	5.72	-9.82
No. of FAW management practices used	19.20***	14.99**
Use of banned/restricted pesticide	-42.59	18.26
Used at least one personal protective equipment (PPE) item	24.95***	4.02
No. of PPE items used	51.61***	14.35*
Experienced health symptoms	4.58	2.22
No. of acute pesticide symptoms	23.46	-3.24

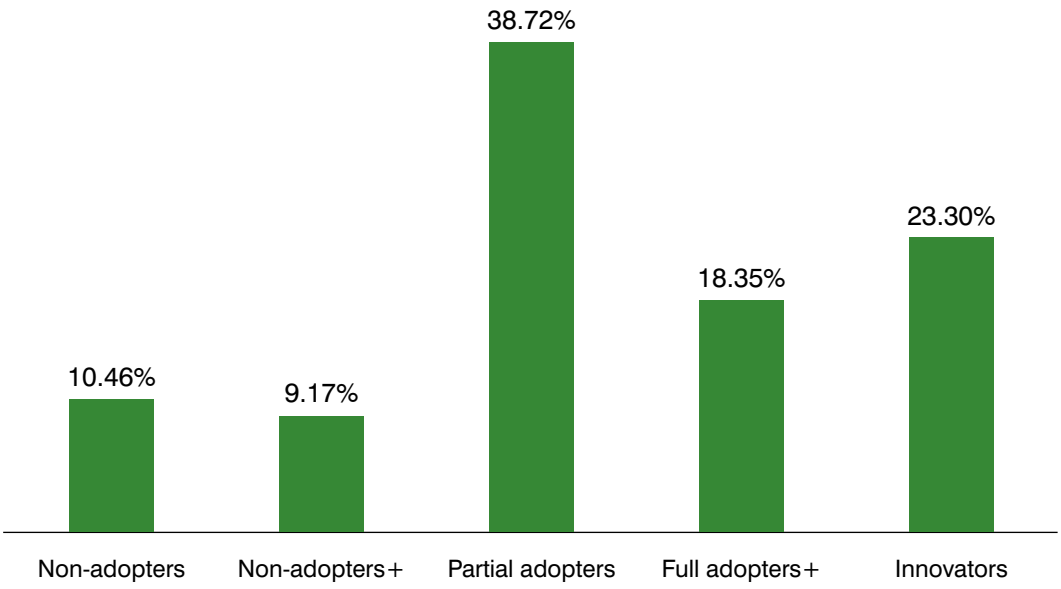
Note: *** p<0.01, ** p<0.05, * p<0.1

Table 6 also shows that clinic users have a significantly higher probability of adopting multiple FAW management practices. **Clinic users adopted nearly 15% and 20% more FAW management interventions** in Zambia and Rwanda respectively than non-clinic users. This is expected because plant doctors are trained to make IPM-based recommendations to their clients that encourage multiple options, including cultural control. Overall, this study showed that **clinic users are more likely than non-users to use pesticides in combination with other non-chemical methods**. This suggests that scaling the plant clinic extension approach would be important in efforts to promote IPM adoption and, by extension, sustainable pest management in smallholder agriculture.

Further analysis of adoption of plant clinic advice by farmers in Zambia was conducted using data from the same Zambian study. Data from the POMS on 420 plant clinic users from the 2018/2019 agricultural year, including the recommendations given, were merged with the survey data from the same clinic users. This dataset was used to enable a comparison of the personalized plant clinic advice given to each farmer, with their reported field practices. Results showed significant differences between the proportion of farmers who were advised by plant doctors to use a particular FAW management practice and the proportion of farmers who actually used the advice, suggesting that many farmers did not follow the exact recommendations given. Five categories of adopters were defined:

- non-adopters: clinic users who did not implement any of the advice
- non-adopters+: clinic users who implemented non-recommended practices – for instance, a clinic attendee who was advised to apply a certain biopesticide against FAW, but instead applied detergents
- partial adopters: those who adopted only components of the recommended practices – for example, a farmer who adopted only one recommended practice when he/she was advised to combine two or more practices
- full adopters: clinic attendees who accurately implemented all the recommendations
- innovators: users who accurately adopted the recommended practices (just like the full adopters), but also adopted extra practices beyond the recommendation

Figure 3: Percentage of adopter categories of plant clinic recommendations



The results showed that more than 80% of the sample farmers adopted some or all of the personalized IPM recommendation received from plant clinics (Figure 3). Detailed analysis showed that approximately 38% of farmers adopted some of the recommended practices, 18% of farmers followed the advice received precisely, while 23% implemented additional practices beyond those recommended by plant doctors. These results confirm that partial adoption of IPM is prevalent, and they imply that high uptake of IPM practices is possible through provision of personalized extension through plant clinics. The analysis also showed that male clinic users are significantly more likely than women clinic users to adopt all the recommendations they receive. In addition, receiving FAW information from peers was significantly correlated with a higher likelihood of adopting plant clinic recommendations, as was receiving FAW-related information from the media.

The results in Table 7 show that **full adopters experienced the greatest increase in maize yield (86%) and maize income (89%) compared to non-adopters**. The innovators increased their yield by 38% and income by 54% compared to non-adopters, less than the full adopters. This suggests that some of the non-recommended practices are counterproductive when implemented in combination with the recommended practices. Finally**, partial adopters still experienced increases in yields (26%) and income (37%) compared to non-adopters,** implying that plant clinic users should be encouraged to implement components of the personalized IPM recommendations even if full adoption is not possible.

Table 7: Effect on maize yields of adopters and innovators compared to non-adopters

	Increase in maize yield (kg/ha)	Percentage change	Increase in maize income (Zm Kwacha)	Percentage change
Partial adopters	308.76**	26.34	696.71**	37.10
Full adopters	970.69***	85.77	1733.66***	88.89
Innovators	458.36**	37.78	963.86**	54.21

Notes: ***p<0.01, ** p<0.05, *p<0.1

Lessons learned

Sustaining interventions introduced through donor-funded projects in most countries depends on ownership by beneficiary organizations and end users. In the case of Plantwise, such ownership would involve integration of the innovation or some of its elements into the national systems for managing plant health. The extent to which this has been achieved varies greatly across Plantwise countries. In countries with devolved governance, ownership has been shown to be higher at subnational (district, county or province) levels. For example, in Kenya, there has been significant uptake of Plantwise since the devolution of most agriculture functions to county governments in 2013. Incorporating the Plantwise approach in national systems has also been possible in countries such as Ghana.

The scale of Plantwise operations within a country has a bearing on the level of sustainability. Where Plantwise is limited to a small number of plant clinics operating in just one area (e.g. Vietnam) or through just one value chain (eg Thailand), there is a low level of adoption and integration into country systems, and thus a low likelihood of sustainability. However, in countries where plant clinics have a wide geographical spread, there is a higher degree of adoption and integration into provincial or national governments and therefore a higher likelihood of sustainability. Generally, it is apparent that sustainability of Plantwise is not correlated to the level of donor funding provided to support the programme in a country.

Sustainability of Plantwise is also dependent on the programme's ability to address current national and local priorities. Where Plantwise provided a solution to a current problem (e.g. FAW; Banana skipper; tomato leafminer), there was easy acceptance and adoption of the Plantwise approach. Overall, the flexibility of approach and adaptability to local contexts were the main contributors to uptake by countries.

Further work has continued to reinforce the already demonstrated evidence of impact of Plantwise through the adoption of plant clinic advice, resulting in increased yields and income. Evidence from a study in Zambia has shown this to be the case when farmers adopt the recommendations they receive in full. For those farmers who are unable to apply all the recommendations as provided by plant doctors (possibly due to financial constraints), there are still some yield and income gains. These findings suggest that the continued promotion and provision of tailored plant health advice for farmers can contribute towards realizing the zero-hunger goal set out in Sustainable Development Goal 2. In addition, farmers who receive advice from plant clinics tend to integrate several options (IPM) for managing pests. Generally, farmers tend to opt for chemical control methods when faced with new/emerging pest threats with no known control methods. This emphasizes the need to put measures in place for early warning and emergency response.

Next steps

In 2021, all studies that were delayed due to COVID-19 – including an assessment of the willingness of farmers to pay for plant health advice, farmer practices in relation to clinic advice and a further assessment of the impact of mass extension campaigns in Rwanda – will be concluded. In transitioning Plantwise into a new global programme, lessons learned will feed into learning for implementing the new programme

Gender-focused activities

Progress in 2020

An investigation into whether the use of plant clinics has had a similar impact on pest management, agricultural productivity and food security for men and women was conducted in Zambia. The study also sought to determine whether female-headed households and women spouses received the same benefits as men from participating in plant clinics. The analysis was based on a survey of 837 smallholder households, focusing on maize as the main food crop and on FAW as the major pest.

Men and women clinic users have an 18% and 13% higher probability of adopting multiple FAW management options respectively, compared with non-clinic users. **Male clinic users increase their maize yield by about 18%, compared to 8% for women clinic users**, with the estimated increase only being statistically significant for male clinic users. The data shows that **more men than women clinic users reported being able to fully implement the plant health advice received at the clinics** (Table 8). Male clinic users are also more likely to adopt multiple and capital-intensive control options than women clinic users, pointing to a possible gender inequality in access to productive resources.

Table 8: Gender-differentiated effects of plant clinic participation

	Male clinic users versus non-users		Female clinic users versus non-users	
	Difference in mean outcome	Difference in mean outcome (%)	Difference in mean outcome	Difference in mean outcome (%)
Regular monitoring (1/0)	0.01	2.94	0.03	8.09
Cultural control (1/0)	-0.03	-4.68	-0.02	-3.45
Mechanical control (1/0)	0.14***	33.66	-0.01	-2.43
Chemical control (1/0)	0.39***	109.57	0.26***	68.52
Adoption of FAW management practices (#)	0.57**	17.96	0.38**	12.61
Maize yield (kg/ha)	271.58**	17.80	121.13	8.47
Net maize income (ZMW/ha)	704.17**	28.54	544.17	24.08
Food insecurity score (0–8)	-0.88***	-18.70	-0.57**	-10.99
Severely food insecurity score (1/0)	-0.10**	-25.79	-0.10**	-22.94
Months of household food insufficiency	-0.55**	-19.91	-0.72***	-21.24

Note: *** p<0.01; ** p<0.05; * p<0.1

Women clinic users reduced the number of months of food insecurity by just under one month (about 22 days) compared to non-users, and men by 17 days.[1] Thus, although female participation does not significantly increase productivity, it results in improved food security. It is possible that the small positive maize yield and income effects of female users of clinics helped cushion short-term food shortages.

The results also indicated that, among the female clinic users, the benefits of using plant clinic services are larger for female-headed households (with a 21% yield increase) than for women spouses (with a 3% yield increase), indicating the advantage of women having decision making power (Table 9). **Using plant clinic advice improved all three food insecurity indicators for both female-headed households and women spouses**, although the difference in the food insecurity indicator was not significant for women spouses.

1 Given that a month contains about 30 days, an ATT of 0.62 months = 0.62 × 30 days per month = 18.6 days.

Table 9: Differential effects of female plant clinic users versus non-users

	Women heads versus non-users		Women spouses versus non-users	
	Difference in mean outcome	Difference in mean outcome (%)	Difference in mean outcome	Difference in mean outcome (%)
Regular monitoring (1/0)	0.09	23.34	-0.01	-3.25
Cultural control (1/0)	0.05	10.42	-0.08	-14.38
Mechanical control (1/0)	-0.11*	-20.74	0.07	17.36
Chemical control (1/0)	0.31***	82.31	0.22***	58.53
Adoption of FAW management practices (#)	0.49*	16.44	0.32	10.99
Maize yield (kg/ha)	275.65	21.09	38.89	2.62
Net maize income (ZMW/ha)	827.13	41.07	383.10	16.03
Food insecurity score (0–8)	-0.83***	-15.09	-0.33	-6.78
Severely food insecurity score (1/0)	-0.10*	-20.41	-0.11**	-27.50
Months of household food insufficiency	-0.81***	-22.50	-0.65**	-20.50

Note: *** p<0.01; ** p<0.05; * p<0.1

A study in Tamil Nadu, India, to assess whether women farmers had become more empowered through their engagement with Plantwise (including accessing plant health advice through plant clinics) was carried out using the Women's Empowerment in Agriculture Index. Over 400 households were interviewed, and focus group discussions were used to obtain the point of view of both women and men regarding women's empowerment and the ability to engage in agricultural decision making, information seeking and practices, as well as other empowerment indicators such as group participation, ability to travel, etc.

Preliminary results from the study showed that **engagement with Plantwise by women farmers has increased their participation in pest management decision making within the household**. This was particularly evident in Pudokkottai District, where women are highly engaging in farming due to the feminization of agriculture. They have formed a self-help group to support each other in field operations and in the provision of financial support. Their main crop was groundnut, which can be affected by stem and root rot and requires preventative, rather than curative, control. The women farmers stated that the information they had received from plant doctors through their mobile phones had enabled them to save their crop. They learned the correct preventative strategies, including sowing certified seeds, seed treatments and the soil application of bioagents in early growth stages. **Women's knowledge of plant health and their knowledge-seeking behaviours have also increased**, as evidenced by a local agro-dealer. He stated that the women farmers in his area now have a better understanding of plant health problems and management methods. They demand the chemicals recommended by the plant doctors in the prescribed quantity, and no longer simply accept his suggestions. All this has been achieved by ensuring that clinic timings and locations are decided through consultation with women farmers, by running women-only plant clinics and by women plant doctors conducting special plant clinics targeting women farmers. Community plant health promoters have been used to reach women farmers with targeted messaging about success stories from women who have used plant clinic services. The messages have focused on shifting the following social norm: "*It's not a woman's role to seek agricultural extension advice*."

Lessons learned

The gender assessments and studies carried out in 2020 have demonstrated that women farmers do benefit from the tailored advice given by plant doctors at plant clinics. However, it is recognized that they do not benefit to the same extent as male farmers, partly due to external factors such as the lack of necessary resources (eg access to finance and credit facilities to implement the advice provided). Despite these smaller benefits in terms of crop yield and income, women benefit more than men in terms of reducing food insecurity, possibly because female-headed households are generally more food insecure than male-headed households. In addition, the preliminary results indicated that using plant clinic services is starting to empower women through an increased knowledge base and increased ability to seek out information and make on-farm decisions.

These changes have been brought about through small but significant changes in the way Plantwise has been implemented. The key step is to think about female as well as male farmers when making decisions on extension approaches such as Plantwise. It should be recognized that female and male farmers have different levels of control over different crops and access to information. Social norms and women's unpaid care work responsibilities affect their access to plant clinic services.

Next steps

Future projects building on Plantwise should consider gender aspects in their design and implementation to ensure inclusivity by priority crop, access to productive resources and tailored information, and the observance of social norms. Gender assessment reports for India and Ethiopia to be finalized in 2021 should provide more information on the gains from Plantwise to ensure better inclusivity.

Plantwise publications in 2020

Published

Journal papers

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Key

♀ gender ♂ open access ♂ impact factor > 2

Annex 1: Report on progress against 2020 milestones

General (2020)			
Key Milestones	**Timing**	**Status**	**Comments/Progress**
Plantwise active in 26 out of 34 countries where it has been introduced with at least 22 countries in scale-up and sustainability phases	Q4	●	Plantwise active in 26 countries with core budget support in 2020. In addition, PW activities were continued in Honduras using small funds from a local source (Ayuda en Accion); PW was also officially launched in Burundi in 2020 with new donor funding (see below under Fund Raising and Market Development). Based on the in-depth sustainability assessment conducted during the year, various elements of the programme will be sustainable in more than 22 countries. Short summaries of the findings are captured in the country reports further below, with more comprehensive reports being finalised in 2021
Evidence of uptake of Plantwise or some of its elements to service specific needs of new partners in 2-3 countries (cumulative)	Q4	●	Colombia – Plant clinics and associated data collection/use are being introduced through the COLCO project with cocoa industry, funded by Innovate UK. Burundi – PW launched officially in 2020 with funding from NUFFIC and Netherlands embassy in Burundi India – The government of Andhra Pradesh State is commissioning CABI to introduce parts of the Plantwise programme to the state as part of a scheme called "Rytu Bharosa Kendra", meaning "Farmer Service Centre" (details of implementation to be agreed). This significant development in a new state of India was delayed due to COVID-19, with hopes of initiating activities in 2021.
Private sector-linked plant clinics piloted in 14 countries (cumulative) with evidence of significant engagement in 3 countries presenting details of linkages to specific crop or input supply systems	Q4	●	Private sector-run plant clinics piloted in 15 countries (cumulatively); An assessment of private sector engagement in Plantwise found 105 cases of engagement since programme inception; the types of private sector engagement tended to differ by region but mainly consisted of: (i) input trade sector in Asia, (ii) trade hubs (farmer associations) in the Americas, and (iii) a mix of input trade sector and trade hubs in Africa.

General (2020)			
Key Milestones	**Timing**	**Status**	**Comments/Progress**
Identify a mechanism and process for selecting what core Plantwise activities will continue to receive backstopping from CABI in countries where CABI's new global programme will not initially invest funding	Q4	●	Activities to be supported were broadly identified but will be prioritized depending on how strategic they are to CABI and the country, as well as availability of funds
Engage with all active Plantwise countries to clarify plans for transition to CABI's new global programme, what Plantwise activities may continue to receive services from CABI and the additional benefits that can be expected from the new programme	Q4	●	The transition of Plantwise to PlantwisePlus was officially communicated to all in-country partners, stipulating CABI's continued role and the services and products that will be freely accessible
50.5 million farmers (cumulative, as measured through direct and indirect reach including plant clinics, plant health rallies and other extension campaigns) received plant health information	Q4	●	By end of 2020, approximately 54.1 million farmers (cumulative) were reached, segregated for the year as follows; plant clinics 275,308 (12% from female farmers),69,151 farmers (52% female) through plant health rallies and similar activities and 1,655,719 through mass extension campaigns.
2019 PW Annual Report submitted to PW donors	Q1	●	Annual donor report (2019) produced and shared with donors at the end Q1-2020.
Annual Donor Forum meeting organised	Q2	●	A virtual donor forum was held on 7 May, with representation from 7 donors and a second one was held on 13-14 Oct at CABI's CH centre with in-person participation of SDC and virtual participation of other donors.
15 publications (using gender disaggregated data); including 1 paper on Plantwise impact assessment by AIR in Kenya; submitted/published; all in open access journals,10 of which with a development focus, 5 in journals with impact factor >2	Q4	■	15 publications (eight journal papers – all open access with a development focus, two with an impact factor >2, four using gender-disaggregated data – six book chapters and one working paper) published; one book chapter and one journal paper accepted; three journal papers submitted
Integrate KB funding into new/affiliated project proposals	Q4	●	Plantwise KB to be maintained and upgraded through funding from the new global programme and other projects to become part of a toolkit with other products available on the same platform. With this, the Plantwise KB will continue to be available to all countries in the future
Plant doctors and other relevant stakeholders using ICTs (e.g. tablets, POMS, Plant Doctor Simulator, Factsheets Library app) in 26 countries (cumulative). ICT use integrated into PHS responsibilities, e.g. for diagnosis, with appropriate follow-on plans	Q4	●	POMS accessed from all active Plantwise countries (26); Factsheet app used in 21 Plantwise countries; e-plant clinics running in 25 Plantwise countries, with training offered to 180 participants in Bangladesh, Costa Rica, India, Malawi, Nicaragua and Sri Lanka; DCA training offered to 15 participants in India and Nepal

General (2020)			
Key Milestones	**Timing**	**Status**	**Comments/Progress**
Tools and training provided to allow greater autonomy in data processing and analysis in 26 countries. Data harmonisation occurring in 26 countries, data agreements signed with 30 countries; 650,000 plant clinic records on POMS	Q4	●	Data harmonization in 27 countries; data sharing agreements signed with 30 countries (cumulative); 719,507 clinic queries on the POMS
High quality content supplied to all PHS actors in PW 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	■	11,139 factsheets on the online KB (2022 PMDGs and 1709 PFFFs), leading to 2,378,829 visits to the online KB and 878,105 sessions on the Factsheet app
2019 country annual reports and 2020 country plans finalised for all active PW countries	Q1	●	2020 country plans finalized; 2019 country annual reports have all been finalized
Gender assessment completed in 5 Plantwise countries. In-depth impact study in India and Ethiopia to understand results of in-country gender adaptions	Q1/Q4	■	Gender assessment completed in five countries (Ghana, Uganda, Afghanistan, India and Bolivia); India and Ethiopia in-depth study reports to be completed in Q1
Evidence of Plantwise activities in more than 10 countries written in official governmental documents that can serve as enablers of Plantwise sustainability and implementation of affiliated CABI projects/ programmes	Q4	●	Plantwise innovations/processes have been written into official strategies, development plans and/or job descriptions in 15 countries: BO, BF, CN, CR, ET, JM, KE, MW, MM, NP, PK, PE, RW, LK and UG
Partners' official budgets contributing to Plantwise activities in all countries where the programme is active	Q4	●	Budget contributions from in-country partners estimated at £1.048m in 2020, for a cumulative total of £5.47m between 2016 and 2020
Plantwise POMS data used by stakeholders in 20 countries to inform resource planning, research, etc.	Q4	●	Clinic data use was reported from 22 Plantwise countries in 2020: nine in Asia, six in Africa and seven in the Americas; no changes to the types of data use by partners: pest reporting, planning extension/ plant protection materials and activities, data validation, general activity reporting, planning research and the input subsidy programme (China only). Based on country annual reports, the most intensive use of clinic data appeared to be in Pakistan, China, Malawi, Peru and Bolivia.

General (2020)			
Key Milestones	**Timing**	**Status**	**Comments/Progress**
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	●	Excel-based data validation tool was tested in India and Afghanistan The Indian validators rated the current accuracy at approximately 50%–60% and recommended the need to raise its efficiency The machine learning version of the validation tool has been tested against human-validated datasets, showing approximately 65% accuracy 30 plant doctor quizzes were developed and administered to more than 730 plant doctors, with participation from the 26 active Plantwise countries
Evaluate use of plant doctor training by tertiary education institutions which have integrated Plantwise training courses in their curricula	Q4	●	Plant doctor training has been integrated into university/college programmes in four countries (UG, BO, NI and NP); in UG, BO and NI, this involves multiple institutions in each country. Further discussions on integration are currently ongoing in nine more countries. The method of integration takes on different forms, sometimes as a standalone add-on and sometimes truly integrated into the curriculum. CABI is also engaging with universities to consider using the CABI Academy Crop Pest Diagnosis e-learning course in their programmes
Conduct assessment of Plantwise sustainability in all countries where the programme is active	Q4	●	Sustainability assessment conducted in all active Plantwise countries; reports, including a summary, are being finalized, to be ready by the end of Q1
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	●	Evaluations of impact, with a focus on pesticide use and the adoption of plant clinic advice by male and female farmers, conducted in Zambia and Rwanda
Cost effectiveness of plant clinics in comparison to other extension approaches studied and reported through cost-benefit analysis of clinics studies concluded for Kenya, Rwanda, Bangladesh, Pakistan and 1 journal paper/report presenting cost effectiveness of different extension approaches written/published	Q2	■	Cost–benefit analysis of Kenya and Pakistan completed; brief presented at the May Donor Forum. Comparison of costs and value-add of different extension approaches showed that both cost efficiency and cost-effectiveness vary widely for a given approach, due to (inter alia) the suitability of the approach for a complex message; influence from external factors that affect adoption, e.g. cost and availability of inputs; and poor audience targeting. Publishing the comparison with other extension approaches yet to be finalized

General (2020)			
Key Milestones	**Timing**	**Status**	**Comments/Progress**
At least 3 evidence reports to produce outputs for the CABI series (working papers/ study briefs); at least 1 as a Study Brief on impact	Q4	●	Working paper on systems assessment in Kenya published; paper on effectiveness of plant clinic cluster meetings in Pakistan drafted; working paper on plant health rallies in Uganda being finalized (expected Q1 2021); manuscript on effects of plant doctor training in Ghana submitted; paper on use of plant clinic advice in Ethiopia published; working paper on the use of ICT to support plant health services submitted to IFAD working paper series; chapter on use of chat-groups revised and final version submitted for Knowledge, Technology and Innovation KTI book; revised paper on early detection and rapid response under review by partners before resubmission.
Building on proven Plantwise concept, secure funding from public or private organisations paying for Plantwise services in existing/new countries	Q4	●	Koppert Foundation paid for plant doctor training on biocontrol in India (Feb); proposal for Plantwise introduction into Burundi approved by NUFFIC (€400,000); Common Foundation through African Peace Parks (Simalaha Conservancy) is paying for Plantwise training in Zambia (€50,000); some Plantwise training courses included into proposal to Dutch public–private partnership scheme for potato value chain development in Kurdistan
Secure GBP 2.5m from in-country funding sources in Africa and Asia for implementation of Plantwise and affiliated projects	Q4	■	FCDO Malawi is paying £34,000 for plant doctor training of Conservation Farming Unit lead farmers; the state government of Andhra Pradesh is contributing £30,000; complementary funding for Plantwise roll-out in Burundi secured from the Netherlands Embassy in Burundi (€1.5m)
Engage with donors on CABI's new global programme that will incorporate Plantwise and Action on Invasives to secure new programme funding of GBP 20m for 2020-2023 from existing and new donors.	Q4	●	FCDO approved £10.7m in funding over two years (largely for plant health CABI projects); DEVCO €6m contract for PlantwisePlus secured (Sep 2020–Dec 2023); DGIS approved PlantwisePlus full proposal (£9m); the SDC approved PlantwisePlus proposal from 2021–23 (£3m), plus in-principle support until 2030

● – on track ■ – minor delay ▲ – major delay

Annex 2: Country reports

Afghanistan

Partner name	Role
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 data management and monitoring and evaluation (M&E)
The Danish Committee for Aid to Afghan Refugees (DACAAR)	LIO
Agha Khan Foundation Afghanistan	LIO

Sustainability outlook

- CABI facilitated an assessment of the sustainability of Plantwise in Afghanistan in 2020. This involved discussions with programme partners to capture their views on how the various Plantwise elements would carry on post-2020 as core programme funding is scaled down. In Afghanistan – as in many other countries – plant clinics have been the focus of the Plantwise intervention, and this extension tool has been strongly adopted by national partners. Plantwise partners feel confident that the plant clinics are effective in changing farmers' knowledge and behaviour on pest management, leading to a decrease in complaints from farmers about pest problems
- Plant clinics will continue to operate under government resourcing, with PPQD at MAIL providing oversight and coordination. The Deputy Minister had assigned a Plantwise National Coordinator, a National Data Manager and a National M&E Manager, all of whom help with Plantwise coordination. These functions are included in the national budget system
- Data collection by plant doctors through the prescription form has remained a fundamental part of plant clinic operations. PPQD uses clinic data for pest management planning. The data from plant clinics provides intelligence on the importance of specific pests based on the locations where they have been reported and the boundaries of infestation. For emergency pests, the Emergency Pest Control Department takes action. For more common pests, PPQD establishes a management plan for the coming year, including raising awareness of the pest risk in communities – for example through IPM Farmer Field Schools
- PPQD also has the capacity to train new plant doctors, thanks to the training of trainers conducted by CABI. Further training is expected; however, this also depends heavily on the security situation in the remaining districts. National partners have also developed Plantwise factsheets for farmers and pest management decision guides (PMDGs) for major pests, which are used by plant doctors in the field. The capacity and interest is there to produce more of these kinds of resource as the need arises

2020 highlights

- COVID-19 has affected certain aspects of Plantwise implementation in Afghanistan. Restrictions imposed in March 2020 led to a temporary shutdown of all government departments. The pandemic also impacted the government budget available for Plantwise activities. The NHLP, a key programme partner, was forced to cancel the plant doctor training they had planned. The plant clinics were forced to stop completely at periods of high COVID-19 incidence. This reduction in operations resulted in the clinics reaching about one-third of the usual number of farmers as many farmers as seen in the previous few years. CABI was able to conduct training of national plant doctor trainers, as well as training on M&E and data management for MAIL/PPQD staff to sustain the Plantwise programme in the country. Gender-related activities were affected by the pandemic because the government put stronger restrictions on aged people and women, meaning they could not conduct their activities as normal
- Two national steering committee meetings were held. The first was in January, while the second had to be delayed and was only possible in December 2020. The steering committee chairman deputy minister decided to connect the Plantwise programme with Afghanistan's SPS programme, a further step in integrating Plantwise innovations within the existing system. The steering committee chairman also decided that new plant doctor training will target agro-input dealers, who will also run plant clinics. This private sector engagement is seen as a further step towards increasing sustainability
- Funds (£35,000) were allocated to Plantwise activities by PPQD for (among other things) plant clinic materials, monitoring, cluster meetings and training
- CABI trainers conducted training of trainers on Modules 1 and 2 of plant doctor training (plant clinic operation, field diagnosis and giving good recommendations) for 14 plant doctor trainers (all male)
- "Extension Messages" training was conducted (producing extension materials) for 14 participants (all male), leading to the development of 20 new PMDGs, 20 factsheets for farmers and five photo-sheets (not yet published on the Knowledge Bank)
- One additional write-shop with national experts was facilitated, leading to the development of 10 new PMDGs and 10 factsheets for farmers
- "Monitoring Plant Clinic Performance" training was conducted for 14 participants (all male) to introduce ideas for plant clinic monitoring and to assure a quality service for farmers
- E-plant clinic training and data management training were conducted for 12 participants (all male), plus further data sharing and use workshops for a total of 30 participants (28 male, two female) from central and provincial departments
- Two plant health rallies were facilitated, reaching 850 people with targeted messages about summer and winter pest management
- Seven plant clinic cluster meetings were held, with a total of 177 plant doctors participating (172 male, five female). The purpose of these meetings was to discuss sustainability, particularly how the participants could continue their work after the end of the NHLP

Quick stats

	New in 2020	Cumulative total
Plant clinics established	–	258 (150)
Plant doctors trained	14	587 (534)
PMDGs drafted	30	83
Factsheets drafted	30	96

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Bangladesh

Partner name	Role
Ministry of Agriculture (MoA)	NRO
Plant Protection Wing (PPW), Department of Agricultural Extension (DAE)	LIO
National Agricultural Technology Program Phase II (NATP2) Project Implementation Unit, DAE	Supports integration of Plantwise in Farmers' Information Advisory Centres (FIACs)
Bangladesh Agricultural Research Council (BARC)	Member of steering committee and national forum
Bangladesh Agricultural Research Institute (BARI)	Supports collaborative research activities on Fall Armyworm (FAW)
Agriculture Information Service (AIS)	Supports Plantwise to conduct extension and communication activities
Syngenta Foundation Bangladesh	LIO
FAO Bangladesh	Provides training and conducts plant clinics as e-surveillance tool

Sustainability outlook

- A Plantwise sustainability assessment was conducted through focus group discussions, key informant interviews and a stakeholder workshop (national forum) involving multiple organizations, particularly representatives from government research and extension. Overall, all key elements of the Plantwise approach are considered sustainable to some extent in Bangladesh. Senior officials indicated their interest in adopting the Plantwise model throughout the country by appropriately integrating it within their existing delivery/outreach systems
- During the national stakeholder workshop, the Director General of DAE expressed appreciation for the current operations of plant clinics and declared DAE would own and operate at least one clinic in each of the 64 districts of Bangladesh as a pilot to countrywide scale-up. However, the key informants also revealed a sentiment that capacity building support would be required (eg from CABI) to further scale up the cadre of plant doctors
- Data collection is much appreciated as partners finally recognize the value of data in providing relevant information to inform decisions. Recently, in the case of FAW, DAE acknowledged that clinic data has been very helpful in monitoring the pest. They look forward to collecting more data with increased use of digital tools, such as the Plantwise Data Collection App. The e-plant clinic concept was the first of its kind in Bangladesh, providing diagnostics and advisory on digital platform. It has therefore been integrated into the World Bank-funded NATP2 under DAE. The FAO has also integrated e-plant clinics into its e-surveillance programme with DAE. One data-related aspect for which partners felt more backstopping was needed is data validation. An automated data validation tool is much sought after
- The development of new pest management decision guides (PMDGs) and factsheets for farmers is expected to continue, for example by private sector partners such as Syngenta Foundation Bangladesh, who needs quality advisory materials to enable their farmer hubs to produce quality food
- Monitoring and quality assurance of plant clinics is automatically done by Union Agricultural Officers at union level. They are thus not dependent on the clinic monitoring training imparted in the country. Similarly, the concept of clinic cluster meetings was appreciated but it can be built into weekly departmental meetings at both union and district level

2020 highlights

- The COVID-19 pandemic in Bangladesh has had a significant effect on the implementation of Plantwise activities. In view of this, the coordination team, including DAE, has spent the second quarter in adjusting or finding alternative ways to achieve the objectives of the year. Some of the adjustments/alternatives have included:
  - plant doctors switching to virtual consultations with farmers
  - virtual training of extension officers through alternative partnerships with FAO and the private sector (Syngenta Foundation) using the new CABI Academy Crop Pest Diagnosis e-learning in place of the traditional face-to-face plant doctor course
  - decentralizing meetings to local level, with results-sharing in the national forum through interactive zoom sessions
- It was also possible for plant doctors from the NATP FIAC centres to operate plant clinics, send SMS subscriptions to farmers and submit data to the knowledge bank, as these personnel had already been equipped with CABI's digital platform
- In-country partners contributed a total of £236,071 in funding to support Plantwise activities in 2020, £5500 from DAE PPW, £187,000 from NATP2 and £43,571 from FAO Bangladesh
- A Partnership Statement was signed with the AIS and Syngenta Foundation Bangladesh to support expansion of Plantwise activities
- One national forum was conducted with DAE and other government participants (16 male, four female) to discuss Plantwise implementation during the pandemic and its sustainability post-2020
- Twenty new e-plant clinics were established with financial support from the FAO Technical Cooperation Programme (TCP) on e-surveillance and five clinics were linked with Syngenta Foundation Bangladesh farmer hubs, for a total of 352 active plant clinics
- Online training was organized for 160 participants (137 male, 23 female) using the CABI Academy Crop Pest Diagnosis and Crop Pest Management e-learning courses. This training, supported through the FAO TCP, included 10 facilitators (eight male, two female) who provided backstopping for the 150 other participants as they progressed through the courses. In addition, a further seven plant doctors (all male) participated in these e-learning courses with support from Syngenta Foundation Bangladesh
- E-plant clinic training was conducted for the 167 new plant doctors (137 male, 23 female) to ensure they were in a position to collect data on crop problems using the Plantwise Data Collection App
- A social media (Facebook) campaign platform was established on FAW, with 119 members
- Extension messages training was virtually conducted for national experts, leading to the development of 10 new PMDGs and the review of 25 previously published PMDGs
- Twenty cluster meetings conducted in various upazilla agriculture offices to monitor performance of plant clinics during the pandemic
- Two data validation workshops conducted with six male and three female participants from DAE
- A mass extension campaign conducted as a joint initiative with CABI's Action on Invasives programme and the Agricultural Information Service to create awareness on identification and management of FAW

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	25	352 (340)
Plant doctors trained	167	403 (114)
PMDGs drafted	11	100
Factsheets drafted	0	50

Figures in brackets show number of active plant clinics and plant doctors in 2020

Bolivia

Partner name	Role
Secretaria de Desarrollo Productivo de Santa Cruz (SEDACRUZ), Gobierno Autónomo Departamental de Santa Cruz (GAD)	LIO
Dirección de Sanidad Agroalimentaria (DSIA)	LIO
Centro de Investigación Agrícola Tropical (CIAT)	LIO
PROINPA Foundation	Diagnostic support to clinics
Tecnológico Agropecuario de Tarata	LIO and integrated Plantwise training into curriculum
Universidad Autónoma "Gabriel Rene Moreno"	LIO and integrated Plantwise training into curriculum
Tecnológico de Mairana	LIO and integrated Plantwise training into curriculum
El Huerto Company	LIO (private sector clinic)
Agro Horticom	LIO (private sector clinic)
AgroValle	LIO (private sector clinic)
BASF, Global Sustainability, Agricultural Solutions	Development partner, donor

Sustainability outlook

- In collaboration with in-country partners, CABI conducted a sustainability assessment involving interviews with 53 stakeholders. These included farmers, plant doctors and decision makers from key partner institutions to discuss the sustainability of Plantwise after 2020
- Feedback showed that farmers and other stakeholders (coordinators, plant doctors, decision makers) recognize Plantwise as key to reaching more farmers and improving the extension service, and they are looking forward to seeing this continued in the future. There is a high appropriation and ownership of the Plantwise programme, especially in the Santa Cruz Department. In the Cochabamba region, the coordination among the different institutions will be key to maintaining the activities in the long run
- Numerous linkages among the national partner institutions were strengthened through collaboration in the plant clinics and these collaborations are expected to continue. Other activities that will continue include the Training of Trainers group formed by specialists from different institutions and the use of social media communication among the coordination group and plant doctors
- Plant clinics are now part of the institutional workplan and pressure from farmers on local government to keep the service could be a crucial factor in maintaining plant clinics. Clinic data in the Plantwise Online Management System and factsheets and other information provided by the Plantwise Knowledge Bank are considered by partners to be important, but partners are concerned about if and how CABI will sustain these elements going forward
- Finally, although there is no solution yet in place to support monitoring and evaluation (M&E), for instance through a dedicated M&E coordinator, partners indicated they could allocate their own budget and human resources, as quality control is considered so important

2020 highlights

- National partners and the CABI team worked together to adjust Plantwise activities in response to the pandemic situation and restrictions. Communication was maintained with coordinators, plant doctors and farmers through the use of virtual social media platforms. The Government of Santa Cruz created a technical assistance line to enable remote consultation between farmers and plant doctors. The diagnostics support to plant doctors was reinforced through a dedicated WhatsApp group and via phone. Face-to-face activities resumed during Quarter Two of the year, following relaxation of some of the safety protocols imposed by the government at the onset of the pandemic. However, these were restricted to areas of the country with low incidence of COVID-19. A series of international webinars was organized for delivering technical information to plant doctors and other collaborators from multiple Plantwise countries in the region
- The Plantwise Partnership Statement has been renewed with the Government of Santa Cruz and PROINPA Foundation
- Funds (£10,277) have been allocated to Plantwise activities in 2020 by the Government Department of Santa Cruz
- A collaboration was initiated with BASF to implement plant health rallies about rational pesticide use in Bolivia. The target farmer associations were contacted and the required materials were developed, including factsheets and posters. The rallies could not be conducted due to COVID-19-related restrictions, but everything is in place to proceed in 2021
- Eighteen plant health rallies were conducted, reaching 380 people with targeted messages on rational pesticide use and sustainable pest management in key crops
- Around 20 radio programmes were held to give farmers specific technical messages on phytosanitary measures in food production
- Refresher training was conducted for 40 plant doctors (14 female, 26 male) on data analysis using the Spanish version of the Plantwise offline data management tool and on production of maps with GPS coordinates
- Virtual training was implemented with 20 plant doctors (eight female, 12 male) on development and use of Plantwise technical documents and the importance of remote technology transfer and advisory service to farmers during COVID-19 restrictions
- Several remote training sessions were conducted for 178 plant doctors and experts (82 female, 96 male) from different institutions (eg SENASAG, Plagbol, Swisscontact, PROINPA) on how to organize technical information from the Plantwise Knowledge Bank into PDF booklets by crop. Ideas were discussed for keeping up engagement and reaching farmers despite the restrictions generated by the pandemic
- A series of technical materials in digital format (video and PDF) were made available to plant doctors via WhatsApp groups to support consultations with farmers, as well as to improve networking among the extension service providers
- Training was delivered on data management for 22 coordinators (eight female, 14 male) from SEDACRUZ and DSIA in Santa Cruz, Bolivia
- A practical training session was conducted for six plant doctors (two female, four male) on a special need topic on integrated pest management in greenhouse tomato production
- Specific, needs-based training was facilitated on the diagnosis and control of plant parasitic nematodes for 59 plant doctor trainees (15 female, 44 male)
- Fourteen new factsheets, one banner and two photosheets developed
- Two webinars delivered as part of the International Year of Plant Health contribution from CABI Plantwise, in conjunction with CIAT and Embrapa Brazil

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	0	99 (70)
Plant doctors trained	0	397 (46)
PMDGs drafted	0	29
Factsheets drafted	16	178

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Caribbean

Partner name	Role
Jamaica Ministry of Industry, Commerce, Agriculture and Fisheries Rural Agricultural Development Authority (RADA) Research and Development Division Plant Quarantine and Produce Inspection	NRO LIO LIO; also provides diagnostic support LIO
Trinidad and Tobago Ministry of Agriculture, Lands and Fisheries Extension Training and Information Services Division (ETIS) National Agricultural Marketing and Development Corporation	NRO LIO LIO
Barbados Ministry of Agriculture, Food Fisheries and Water Resources Management	NRO & LIO
Grenada Ministry of Agriculture, Forestry, Fisheries and the Environment	NRO & LIO

Sustainability outlook

- CABI conducted a sustainability assessment involving interviews with coordinators and plant doctors from local implementing organizations in Jamaica, Trinidad and Tobago, Grenada and Barbados. The findings showed that:
  - **Jamaica** is ready to adopt all components of the programme and will continue operations under RADA's budget, with oversight by the Jamaican Plant Health Coordination Committee. The programme objectives and components were considered to fully fit into the mandate and mission of RADA's extension services; plant clinics were therefore mainstreamed and included in the Priority Programmes of RADA's 2018–2022 Strategic Business Plan. The development of a pest and disease database was central for RADA, as evidenced by the use of clinic data for decision making on extension matters. All key partners in different functions saw value and importance in all components
  - in **Trinidad and Tobago**, the Director of ETIS said they will continue using Plantwise Knowledge Bank resources (such as the Factsheet Library App) and running plant clinics under their own budget. ETIS is eager to continue building a pest database to support decision making and to continue promoting collaboration with other partners in the country. Although no new linkages have been developed as a result of Plantwise, there was agreement among key informants that the programme has had a positive effect on collaboration for the benefit of farmers and that this attitude will remain post-2020
  - **Grenada** has adopted the plant clinic methodology through the Pest Management Division (PMD) of the Ministry of Agriculture (MAFFG) and is offering the service at the subdistrict level. The method has been welcomed by farmers and MAFFG recognizes it has enabled them to deliver a better service to the agricultural communities. Monitoring and evaluation is considered important for encouraging an ethic of continuous improvement. The linkages strengthened by the programme were more at the intraorganizational level. The participation of students in plant clinic activities was a significant development that is very likely to continue. Clinic data is considered to be of value and is occasionally used to guide decision making and monitoring; however, the amount of data generated by the limited number of plant clinics is quite low, which limits its utility
  - in **Barbados**, the Ministry of Agriculture and Food Security has adopted the plant clinic methodology and it is expected the activities will continue at a national level under the existing approach, stakeholder linkages and funding. The plant health rally concept has also been highly appreciated as a means of reaching more farmers cost-effectively

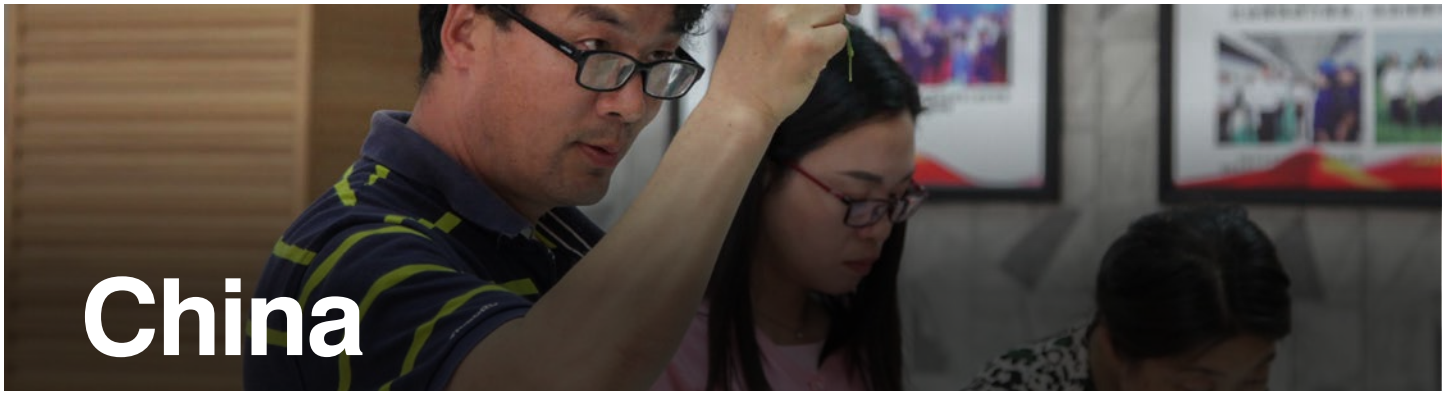
2020 highlights

- The Caribbean governments put safety protocols into action once the COVID-19 pandemic was declared. This included totally ceasing face-to-face activities, which has forced Plantwise partners to look for options to keep provide technical advice to farmers. Virtual plant clinics (Trinidad), technical messages turned into short videos (Trinidad, Barbados and Jamaica), and photographs and queries shared through WhatsApp groups have allowed constant contact with farmers during lockdown. Online platforms like Zoom and MS Teams for coordination meetings, webinars and online training of plant doctors and data managers has also played a key part in enabling country partners to accomplish their workplans
- Plant clinic activities have been included in parish-level extension officer goals within RADA's corporate plan in Jamaica for 2021/22 to ensure sustainability of the clinics after the end of the Plantwise programme
- CABI has signed a Memorandum of Understanding with the Ministry of Agriculture (MoA) in Trinidad and Tobago, creating an opportunity for expanding implementation of plant clinics to other regions of the country
- Twenty plant doctors (seven female, 13 male) from ETIS at the MoA in Trinidad received training in how to produce videos for social media, aiming to start producing videos with technical messages for farmers based on factsheets and pest management decision guides (PMDGs)
- ETIS in Trinidad and Tobago used the modality of virtual plant clinic sessions to reach farmers during the pandemic lockdown. The session included 19 short talks about key pest and crop problem management, and these videos reached 81,447 views through ETIS's Facebook page
- RADA from the Ministry of Agriculture in Jamaica used text messages to reach 2553 farmers with information in a mass extension campaign to control the lettuce pest complex
- Training of Trainers (ToT) was conducted virtually for national plant doctor trainers (five female, eight male), representing all 13 parishes in Jamaica
- Refresher training of Modules 1 and 2 was conducted for the ToT team from Grenada
- The ToT group in Trinidad and Tobago trained 19 new plant doctors for NAMDEVCO (12 female, seven male) covering Modules 1 and 2
- In Jamaica, RADA initiated an award plan for plant doctors with outstanding performance in plant clinics. Thirteen plant doctors were acknowledged and received a certificate recognizing their effort
- Constraints regarding data collection in Barbados were identified and fixed, with data now being collected by plant doctors as they give support to farmers through new communication methods. A Plantwise Online Management System (POMS) data analysis was used for supporting the 2021 budget request to continue covering plant clinic activities
- Revision and update of recommendations by pest was carried out by Plantwise coordinators in Barbados. They used PMDGs to revise the quality of recommendations given by plant doctors and to call for improvements where possible
- A curriculum for introducing Plantwise concepts into the teaching scheme at the Barbados Community College was fully drafted and is under final revision, with incorporation of these materials expected by the next teaching cycle in 2021
- A consultation meeting with stakeholders was conducted virtually by RADA Jamaica to identify possible areas of collaboration under the plant clinic programme between agro-input suppliers, the Pesticides Control Authority, farmer organizations (JAS), educational institutions (UWI CASE and 4H Clubs), MICAF Research and Development, CABI and RADA. There was interest in integrating efforts and in getting access to data and information. A matrix for identifying the types of collaboration proposed for 2121 was circulated to the participants for follow-up in early 2021

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	0	184 (101)
Plant doctors trained	39	361 (90)
PMDGs drafted	0	51
Factsheets drafted	0	90

Figures in brackets indicates number of plant clinics and plant doctors known to be active by end of 2020



China

Partner Name	Role
Ministry of Agriculture and Rural Affairs (MARA)	Helps 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
Zhejiang Agricultural and Forestry University (ZAFU)	University partner for piloting sustainable plant doctor training
China Wisdom City Working Committee (CCIT)	Business middleman to pilot Plantwise commercialization strategy

Sustainability outlook

- CABI led a sustainability assessment in 2020 involving 16 key informant interviews (10 males, six females) and two focus group discussions with programme partners to evaluate how Plantwise interventions would continue in future. In certain regions, the Plantwise approach has been highly successful, with strong signs of sustainability. Partners indicated the programme implementation and management mechanism has contributed to its sustainability (eg integrating plant clinic networks into regional plant health systems; encouraging partners to be innovative with clinic operations and management approaches; and using the sustainability roadmap to guide annual planning)
- Chinese partners felt a private sector-engaged plant clinic network promising mutual benefits for involved private sector actors was more likely to be sustainable than a purely public good clinic network. In Sichuan province, for example, plant clinic data validation results have been used by the SCPPS for an agro-input shop rating system to supervise the performance of agro-input dealers, with the best performers receiving business advantages
- In the Beijing area, where some of the greatest success has been achieved, integration of Plantwise components into the government's priorities and policy implementation is considered to be the key factor leading to sustainability. The Beijing Green Control Product Subsidy Policy "Work Program for Extensive Application of Green Control Products in Beijing (Trial)" is one good example. Each year, 100m Chinese Yuan (CNY) of government funding has been secured for subsidies under this policy, which relies on data collected through the prescription forms of plant doctors
- Of the interviewees, 85% thought the Plantwise plant doctor training was the element of the programme most likely to be sustained post-2020. This is because the training is perceived to be easier to integrate with other relevant programmes, and therefore has a higher possibility of obtaining government financial support post-2020. The ongoing development and updating of Plantwise factsheets for farmers and pest management decision guides (PMDGs) might be sustained to a certain extent, mainly by linking this to other relevant projects
- The sustainability of Plantwise methods for monitoring plant clinic performance is low: it is more difficult to obtain special financial support from government for the quality control of an existing system than to apply for money to build something new. Related to this, clinic data validation is unlikely to continue due to the heavy workload and expertise required. Exploring machine validation could be a solution to improve sustainability of clinic data validation

2020 highlights

- Many Plantwise activities were delayed due to government measures to deal with the COVID-19 epidemic, especially during the first half of 2020. However, with the adoption of an online training and meeting approach, plant doctor refresher trainings, cluster meetings and monitoring and evaluation discussion are still possible. As a result, almost all planned activities were completed by end of year. Only one activity from the original 2020 planning was cancelled. According to feedback from LIOs, they will continue to use the online meeting platforms to organize plant doctor refresher training sessions and cluster meetings. The quality of interaction online was considered to be adequate and it reduced costs, saved travel time and also gave participants the opportunity to replay discussions if needed
- A Partnership Statement was signed with ZAFU
- Funds (£112,662) were allocated to Plantwise activities by in-country partners, mainly for plant doctor training sessions, refresher training, monitoring and supervision of plant clinics, and clinic data management system maintenance
- Four national trainers conducted plant doctor training (plant clinic operation, field diagnosis and giving good advice) for 76 agro-input dealers (26 female, 50 male). Of these trainees, 43 (13 female, 30 male) passed the final exam to obtain the plant doctor certificate
- An online plant doctor exam was established on a Chinese platform (wjx.cn). This platform allows trainers to create unique exams, drawing questions from a bank of more than 150 questions. This online approach fits with virtual training approaches and also automates the scoring process, which increases efficiency when dealing with large numbers of users. This system was used for the 76 agro-input dealers trained in 2020; an additional 250 previously trained plant doctors took the quiz via wjx.cn as a form of refresher training
- The establishment of 78 new plant clinics by BPPS and SCPPS was facilitated, for a total of 186 active plant clinics in the country. These clinics handled 99,126 queries in 2020, with all data recorded in the data management systems of two LIOs
- A write-shop was organized with national experts, leading to the development of 12 new pest management decision guides (PMDGs) and facilitation of an expert review of 47 PMDGs and 114 factsheets for farmers (previously published): 28 of the PMDGs and 83 factsheets for farmers were updated
- Four needs-based training sessions were facilitated on Green Control technology of vegetables, rice and citrus for 855 participants (405 female, 455 male) in Beijing and Sichuan province
- A series of mass extension campaigns on pest control, pesticide use, cultivation, fertilizer and soil management of vegetable and fruit trees was facilitated, reaching about 15,200 farmers (unknown gender) with targeted messages through social media
- A submission of "Integrated Pest Management – promoting extension services linked to Plantwise plant clinics in Beijing" was awarded First Prize at the Beijing Municipal Agri-Tech Extension Awards in March 2020

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	78	211 (186)
Plant doctors trained	76	760 (226)
PMDGs drafted	12	67
Factsheets drafted	0	174

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Costa Rica

Partner name	Role
Extension Department, Ministry of Agriculture (MAG–DNEA)	NRO and LIO
Plant Health Department, Ministry of Agriculture (MAG–SFE)	LIO
University of Costa Rica	Provides support for training and diagnostics
Adventist Church	Helps coordinate plant clinic sessions for indigenous communities
Rural Development Institute (INDER)	Supports plant clinic activities with complementary services

Sustainability outlook

- CABI conducted a sustainability assessment involving interviews with farmers, plant doctors and decision makers from the Ministry of Agriculture (MAG) to evaluate how Plantwise would likely be sustained after 2020. Findings showed that MAG is interested in keeping all the components of the programme running as part of their working strategy
- The plant clinics and complementary activities were regarded by interviewees as the most important aspect of Plantwise and as having the greatest impact. All extension agencies in the pilot regions have incorporated the methodology into their operations under the instructions of the Regional Directors of MAG–DNEA, supported by the National Director of Extension. According to the directors, this methodology fits well with MAG–DNEA's mandate and will continue being used even after Plantwise ends, including the fixed and mobile clinic scheme and plant health rallies. All operating costs of the clinics will be covered by MAG
- MAG–DNEA's decision makers and plant doctors agree that pest and disease data is important; however, the number of queries captured in the Plantwise Online Management System (POMS) has been limited. This is because MAG has another mandatory reporting system already established and the duplication of data collection is not practical. In a more recent development triggered by the Plantwise intervention, MAG–DNEA is considering merging POMS with, or otherwise modifying, its own data system to facilitate data analysis (as is possible in POMS)
- Access to information through the Knowledge Bank and other Plantwise tools was ranked by most key informants as one of the most important aspects of the programme. All those interviewed asserted that they will continue to use the Plantwise Factsheet Library app and the online Knowledge Bank, and that they will continue to produce factsheets as needed. Furthermore, the establishment of the dedicated WhatsApp group to support diagnostics was rated as an excellent contribution. That group will continue to function and continues to attract new members, including invited experts
- Partners agree strongly on the importance of monitoring the execution of activities to ensure the quality of services provided. However, as MAG already had its own monitoring system through its planning chiefs, partners have not been heavily reliant on the tools and processes introduced through Plantwise. Plant clinic work will continue to be monitored under the existing system during quarterly follow-up visits

2020 highlights

- The pandemic and associated restrictions induced changes in the strategies for implementing Plantwise activities. Communication with coordinators, plant doctors and farmers were maintained through virtual media once mandatory social distancing was initiated in March. Many plant doctors created new chat groups to keep providing technical assistance to farmers. The diagnostic support to plant doctors was reinforced through the dedicated WhatsApp group, which has increased its number of members. Face-to-face activities were undertaken again in the second semester following safety protocols, but only in areas of the country with low incidence of COVID-19 cases. The Plantwise plant doctor training (Modules 1 and 2) was adapted by CABI and the training of trainers team for online delivery. This was combined with practical sessions as homework for the participants and the use of the Zoom polling tool to ensure a high level of engagement. All plant doctors from MAG contributed to the prevention of COVID-19 spread during the coffee berry harvest season by offering talks to coffee farm owners on safety procedures involving migrant coffee pickers from remote communities and neighbouring countries
- The initiative for reaching indigenous farmers in remote communities of Chirripó with plant clinic services was strengthened with the participation of INDER and the continued collaboration of the Adventist Church. Plant clinic sessions continued despite COVID-19 but with reduced attendance, and they were only held in places considered low risk by the health authorities. In addition, 8232 vegetable crop seedlings were given to indigenous farmers and other smallholder farmers in the Turrialba Region, with technical follow-up provided by local plant doctors
- Three training of trainer members received refresher training on Plantwise Modules 1 and 2 in preparation for a training new plant doctors as requested by MAG. Two of these national trainers then provided plant doctor training for 36 participants (33 male, three female) in the Brunca Region of Costa Rica. Three pilot plant clinics were established for this region, with the aim of reaching 10 new active clinics in 2021
- Thirty-five plant doctors received training on recognizing, sampling and managing Fusarium TR4 in Musa sp. as part of a preventive campaign aiming to improve surveillance against the introduction of this destructive disease to Costa Rica
- CABI organized an international webinar on the importance of advisory services and technology transfer through remote means during the pandemic. In total, 62 plant doctors from Bolivia, Perú, Costa Rica and Nicaragua learned how to organize technical information from the Plantwise Knowledge Bank in PDF booklets and discussed ideas for maintaining engagement with farmers despite the COVID-19 restrictions
- Eleven face-to-face plant health rallies were conducted following safety protocols, reaching 217 farmers (141 male, 76 female) with various types of information for pest and crop management
- Five new factsheets were produced with management recommendations for climate change adaptation in plantain production, management of black weevil in plantain and family agriculture
- Plant doctors and other extension agents delivered 1900 factsheets about management of the banana black weevil in a campaign in the Caribbean Region of Costa Rica
- An agreement was made with the Director of DIECA (the Research and Extension Division of the Sugar Cane League (LAICA)) to have them share their technical materials for sugar cane, accessible at https://servicios.laica.co.cr/laica-cv-biblioteca/index.php/Library/catalog
- Twenty plant doctors (15 male, five female) received training on data management using the offline data management tool, with a lesson on generating new graphs and tables using pivot tables

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	3	31 (28)
Plant doctors trained	36	123 (80)
PMDGs drafted	–	46
Factsheets drafted	5	5

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Ethiopia

Partner name	Role
Ministry of Agriculture (MoA), Plant Health Regulatory Directorate	NRO
Oromia Region Bureau of Agriculture	LIO
Amhara Region Bureau of Agriculture	LIO
Tigray Region Bureau of Agriculture	LIO
SNNP Region Bureau of Agriculture	LIO
Dire Dawa Administration Council Bureau of Agriculture	LIO
Benshangul Gumuz Region Bureau of Agriculture	LIO
Sidama Region Bureau of Agriculture	LIO
Self Help Africa (SHA)	Financial support for clinic operations in some districts in SNNP Region
Regional Plant Health Clinics	Technical and diagnostic support
Federal and Regional Research Institutes	Technical and diagnostic support

Sustainability outlook

- CABI led a sustainability assessment involving 17 key informant interviews with programme partners and a document review to evaluate how Plantwise would likely be sustained by partners after 2020. Findings showed local partners unpacked, adapted and adopted some components of Plantwise based on its relevance and compatibility to existing structures and systems
- The most adopted activities included Plantwise plant doctor training (Modules 1 and 2), the plant clinic model and the use of Plantwise resources such as PMDGs and factsheets for farmers. The least adopted activities were data management, implementation of structured plant clinic monitoring templates for quality assurance, plant health rallies and mass extension campaigns
- Although it is not evident that the current level of adoption will automatically translate into future willingness to provide financial support or the same level of sustainability, the government has previously contributed to cover various implementation costs, including Modules 1 and 2 training, cluster meetings, procurement of clinic materials and equipment, production and printing of pest management information, and field monitoring activities. This suggests that the necessary financial capacity exists
- In a very positive development, MoA has included plant clinics in its five-year agriculture plan, with the intention of setting up 200 plant clinics over the coming five years. Moreover, plant clinics are included in the revised draft agriculture and rural development policy of Ethiopia
- Sustainability is not without its challenges. For example, solutions will still be needed for financing local transport of personnel, the high level of plant doctor turnover and the lack of sufficient data management personnel. There is also still some reluctance at district level to take full ownership and fully embed the approach into regular programmes

2020 highlights

- Emerging issues, especially COVID-19 and the massive desert locust outbreak, led to a sudden shift in the government's priorities and competition for government resources (attention, operational budget and personnel). This has caused delays in or even cancellations of some Plantwise activities. Travel and gathering restrictions related to COVID-19 have affected monitoring, backstopping, training and meetings. However, most plant doctors have continued supporting farmers on a one-to-one basis. A number of planned Plantwise activities were prioritized, rescheduled and carried out in the last quarter of the year once restrictions eased. In order to adapt to the situation, country partners have put more emphasis on quality assurance activities, conducted several refresher training courses and facilitated exchanges on experiences and lessons learned. Efforts have also been made to carry out monitoring and assessment activities remotely. Due to constraints on training new plant doctors, partners have instead encouraged previously trained plant doctors to launch new plant clinics. As a result, 39 new plant clinics were started during the year (against the original plan for 20). Finally, law enforcement operations in Tigray have also interrupted plant clinic operations in the region, where over one-third of the total plant clinics of the country operate. Plant doctors from the region have not been able to participate in training and exchange activities
- SHA contributed £1,060 for plant clinic operations during the year and regions/districts spent about £980 to support monitoring and backstopping activities
- One expert from MoA attended the Plantwise-supported Masters of Advanced Studies in Integrated Crop Management course in Switzerland in 2020
- A report was finalized on a study investigating the level of adoption of plant clinic advice and its impact on male and female farmers
- Five rounds of needs-based refresher courses were conducted on selected topics from Modules 1 and 2 and on e-plant clinics for 201 plant doctors and experts (27 female), with £770 in funding support from MoA
- Five rounds of cluster exchange meetings were conducted for 208 plant doctors (80 male, 28 female)
- The establishment of 39 new plant clinics was facilitated – twice as many as originally planned – for a total of 211 (167 active) plant clinics in the country
- Revision and updating of seven previously published pest management decision guides (PMDGs) was facilitated in collaboration with national experts, as well as the drafting of five new ones
- One article was published on the Plantwise blog entitled "Strong partnerships between agro-dealers and plant doctors promote responsible pesticide use in Ethiopia"

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	39	211 (167)
Plant doctors trained	–	517 (215)
PMDGs drafted	5	72
Factsheets drafted	–	10

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Ghana

Partner name	Role
Ministry of Food and Agriculture	NRO
GIZ/MOAP	Development partner
MAG	Development partner

Sustainability outlook

- A sustainability assessment was conducted involving 13 key informant interviews and 16 focus group discussions with programme partners and beneficiaries to evaluate how Plantwise would likely be sustained by partners after 2020. Findings showed that, in addition to facilitating new linkages and greater levels of exchange between some partners (such as the Plant Protection and Regulatory Services Directorate (PPRSD) and the Cocoa Research Institute of Ghana), activities such as write-shops, cluster meetings and daily interaction via social media have helped initiate and solidify linkages between stakeholders that are likely to continue
- New partnerships (such as with ADRA, GIZ/MOAP, iDE and Solidaridad) have been successful in setting up plant clinics, along with private sector organizations like Kuapa Kokoo and Agxtension Africa. However, long-term funding for Plantwise activities via these partnerships has not always materialized. Despite the benefits provided by plant clinics and outreach activities provided by government partners, the sustainability of these activities is also not assured due to lack of integration into the national extension system and irregular government funding
- To help ensure sustainability of plant doctor training and capacity building, there is an ongoing drive to integrate Plantwise plant doctor training into the curriculum of agricultural colleges across the country. Commercialization of the courses for provision to the private sector also offers some potential for sustainability. Personnel from within PPRSD, the universities and national research institutions have also been trained as trainers as part of the sustainability plan for the programme. They have carried out all plant doctor training programmes for the past four years and are in a position to continue this; however, these events have been project-supported and future funding is not defined. Interest in the use of data management tools is high, but addressing challenges such as the cost of data and ageing tools without confirmed funding sources will not be possible
- The Plantwise Knowledge Bank and Plantwise Factsheet Library apps are, and will continue to be, regularly used by plant doctors in Ghana. Keeping the content on these platforms updated is seen by partners as a future risk. The established social media groups and peer-to-peer support they provide between plant doctors and between plant doctors and experts is likely to continue. Many aspects of monitoring and evaluation, including plant clinic visits and cluster meetings to review and enhance performance, are unlikely to be sustained without external funding support

2020 highlights

- Activities at all levels slowed down due to COVID-19, as traditional ways of working were no longer possible for the period during which lockdowns were enforced. Adverse effects were not experienced across the whole country as lockdowns were for specific locations only; however, the ban on public gatherings made it difficult to reach out to large groups of people. The implementation team employed innovative ways to continue supporting partners, such as the use of social media (WhatsApp, Telegram) and digital meeting platforms like Zoom and MS Teams. Mobile plant clinics, already one of the major means of reaching farmers, became very popular with plant doctors. So, too, did offering virtual consultations through mobile phone services to farmers. Over the period, virtual workshops were also conducted with local experts to draft pest management decision guides (PMDGs). Towards the end of 2020, once restrictions were lifted, a return was made to the traditional ways of conducting plant doctor training; however, this required modifications to accommodate and ensure strict adherence to all COVID-19 protocols
- Plant clinic data has continuously been used by the National Plant Protection Organization (NPPO) and PPRSD at the Ministry of Food and Agriculture to support pest surveillance activities in 2020
- Funds (£2597) were allocated by the Modernizing Agriculture in Ghana Program (MAG) for monitoring plant clinic activities in the Greater Accra and Eastern Region
- Funds (£7400) were allocated by GIZ's Market Oriented Agricultural Program (MOAP) for operational costs, cluster meetings and monitoring of plant clinic activities in Brong Ahafo, Eastern, Volta and Central Regions
- Two of the 15 national trainers conducted plant doctor training (Modules 1 and 2) for 140 plant doctor trainees
- Two trainers from the Cocoa Research Institute of Ghana conducted training on the identification and management of cocoa pests and diseases for 81 plant doctors (74 male, seven female)
- One write-shop with national experts was facilitated, leading to the development of 21 new PMDGs
- Six national experts validated 10,731 plant clinic records on the Plantwise Online Management System, assessing the quality of diagnoses and recommendations made by plant doctors as part of the clinic monitoring system

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	248 (193)
Plant doctors trained	140	586 (273)
PMDGs drafted	21	122
Factsheets drafted	–	6

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

India

Partner name	Role
Department of Agriculture, Jammu (DAJ)	RO/LIO
M.S. Swaminathan Research Foundation (MSSRF)	RO/LIO
National Agro Foundation (NAF)	LIO
Syngenta Foundation India (SFI)	Financial support for training
International Competence Centre for Organic Agriculture (ICCOA)	Financial support for training

Sustainability outlook

- CABI led an assessment in 2020 involving 40 key informant interviewees and five focus group discussions with programme partners (62 members) to evaluate how Plantwise will be sustained by partners post-2020. Findings showed that partners are interested in continuing to apply the Plantwise principles and approaches
- Specifically, Plantwise aligns with and supports the farmer-centric, local-specific goals of MSSRF and the Village Resource Centre (VRC) and Village Knowledge Centre (VKC) programmes. The stakeholder linkages and partnerships that have already established by the VRCs and VKCs to deliver and receive necessary information to farmers will help ensure sustainability
- State officials have also indicated their interest in adopting the Plantwise model, but resources for capacity building are needed to create the required plant doctors, which is seen as a challenge
- Findings highlighted that partners would continue to use and adapt some ICT components relating to plant clinic activities, such as helplines and public address systems, and to share information via social media. However, it was not clearly elaborated by what means the data management and sharing systems (including the Plantwise Online Management System (POMS)) and the production of pest management decision guides (PMDGs) would be sustained
- In summary, the survey showed that five major elements (training, plant clinic operations, data management, content development and monitoring) will be sustained through allocations at organizational level by existing and new VKCs and by seeking new projects (eg RESILIENCE funded by The Royal Norwegian Embassy in India; the Kisan Hub project of the Department of Biotechnology, Government of India; and the CSR project of HDFC bank). Two remaining aspects of data use (data validation and research/publications) will be difficult to sustain as a regular practice, as partners have concerns relating to resources and other priorities

2020 highlights

- The COVID-19 pandemic has significantly affected smallholders' agriculture food systems, especially the input and output supply chains and access to extension services. The lockdown period and restrictions in the transport network have brought mobility to halt. Fortunately, field teams are familiar with using ICT and have easily evolved mechanisms for online plant clinic sessions. The pilots conducted during the initial days of the pandemic received more than the expected level of attention. The success of this transition was due to several factors, including:
  - support and cooperation of technical partners in conducting virtual plant clinic sessions, PMDGs, write-shops, etc, sometimes at a higher frequency than under conventional operations
  - support from the MSSRF teams for farmers in using online tools, and the willingness of farmers to adapt quickly
  - leveraging the advantage of other diverse ICT tools, including voicemail, audio and video advisories, helpline services, social media, etc, along with online communication systems
- Funds (£68,000) were allocated to Plantwise activities by in-country partners for conducting Plantwise training, establishing plant clinics, backstopping, monitoring and evaluation activities, etc
- A Partnership Agreement and Data Sharing Agreement were signed with the Government of Andhra Pradesh (Department of Agriculture) to launch Plantwise in that state; however, activities were delayed by COVID-19
- Private-sector actors such as HDFC bank (CSR wing) and SFI are coming forward to support training and plant clinic activities with farmer producer organizations, VKCs, agri-entrepreneurs, farm schools and informal farmer groups. These organizations have been using the plant clinic services to extend support outside project areas
- An extensive study was conducted covering more than 400 households to assess the integration of gender in Plantwise. Findings showed that, following the introduction of plant clinic activities to the region, women farmers have increased their involvement in decision making relating to the usage of pest management options. The major interventions done in programme areas included choosing clinic timing and locations, considering convenience for women farmers and running women-only plant clinics
- The establishment of nine new plant clinics by MSSRF and DAJ was facilitated, for a total of 51 active plant clinics in the country
- National trainers conducted Modules 1 and 2 training (plant clinic operation, field diagnosis, giving good recommendations) for 61 plant doctor trainees (16 female, 45 male)
- E-plant clinic training was conducted for the 61 new plant doctors to introduce the use of digital devices at plant clinics
- Two write-shops with national experts were facilitated, leading to the development of 35 new PMDGs and the updating of 45 previously published PMDGs
- A plant clinic monitoring system was developed using Google tools to improve monitoring with fewer resources
- Data validation and analysis training was conducted for five participants using national trainers, validating 650 entries
- Online mass extension campaigns were facilitated using mobile phones/social media/VKCs, reaching 2875 farmers with targeted messages on paddy and legume pests
- Four plant health rallies were facilitated with targeted messages on Fall Armyworm (FAW), plus special plant clinic farmer meetings were organized
- New interactions between plant health stakeholders and for jointly analysing clinic data were observed and documented, developing strategies to tackle emerging crop problems (such as FAW), gathering and sharing information periodically with state-level authorities and conducting joint plant health campaigns. Stronger interaction is coming between agro-input dealers and plant doctors regarding updated information on plant health issues, inputs and regulations to stay abreast of the latest changes
- New research projects have been initiated by national partners to find solutions to crop problems identified through clinic data

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	9	88 (51)
Plant doctors trained	61	377 (75)
PMDGs drafted	35	142
Factsheets drafted	0	95

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Kenya

Partner name	Role
Ministry of Agriculture, Livestock and Fisheries (MoAL&F)	NRO, LIO
Kenya Agriculture and Livestock Research Organization (KALRO)	Member of National Steering Committee (NSC) and various technical subject matter specialist teams; also provides diagnostic services, supporting clinic expansions
Kenya Plant Health Inspectorate Service (KEPHIS)	LIO; member of NSC and various technical subject teams
Pest Control Products Board; Agrochemical Association of Kenya (AAK/Croplife Kenya); University of Nairobi (UoN)	Member of NSC and various technical subject teams
Katoloni Mission Community-Based Organization	LIO
Self Help Africa (SHA)	Supports plant clinic expansion
27 county governments	Supports plant clinic expansion; running clinics

Sustainability outlook

- Discussions were held with partners to assess how they will continue implementing Plantwise-related activities post-2020. This built on lessons captured in a CABI Working Paper entitled "Integrating Plant Clinics into County Agricultural Advisory Systems", produced at the start of 2020. These assessments found that Plantwise contributed to shaping agricultural advisory systems following devolution and provided an innovative approach that county governments could adapt
- A number of county governments will support their staff to continue running plant clinics; 13 counties have articulated plant clinic operations (albeit differently) in their County Integrated Development Plans. Funding for clinics will be sourced from the county government through building synergy with existing projects and approaching possible funders (such as non-governmental organizations). At the national level, the Plant Protection Services Division aims to continue taking the lead on coordination and will seek to embed clinic activities into the Kenyan agriculture support system. KEPHIS will continue running clinics from its regional offices
- Partners see value in Plantwise Online Management System (POMS) data; nine counties reported sharing plant health data in internal reports and with other stakeholders. To support sustainability post-2020, KEPHIS aims to develop a complementary pest management information system (PIMS), with the intention of integrating this with POMS data (pending agreement on its use)
- KALRO indicated it will continue developing pest management decision guides (PMDGs), but there was no indication that partners will continue with plant health rallies. MoAL&F will focus on supporting areas relating to capacity building, but a funding source for this remains to be secured

2020 highlights

- Due to COVID-19 restrictions, a number of planned Plantwise activities for 2020 had to be adapted or even cancelled. The number of plant clinic visits were significantly reduced and one plant doctor training workshop scheduled for October with funding from SHA was cancelled. Most counties reported giving farmers information through digital devices as a way of mitigating the hindrance to face-to-face interaction caused by COVID-19. The reduction of certain activities did, however, create an opportunity for some unforeseen activities to be conducted. For example, a new batch of national plant doctor trainers within MoAL&F was trained, and information materials about desert locust management were mass printed to address this critical issue in East Africa in 2020. In a separate development, the Ministry of Agriculture and CABI initiated collaboration with Astral Aerial, a private company involved with GIS and mapping, and agreed to pilot the use of aerial imagery for diagnosis; however, this was put on hold as a result of COVID-19
- Two counties (Elgeyo Marakwet and Homabay) reported funding the launching of clinics and day-to-day operations amounting to KES 235,400 (£1622), while Nakuru County spent KES 830,000 (£5723) on plant doctor training
- Most counties reported using the data in POMs to report internally on top pests and diseases seen at the clinics; nine counties (Migori, Kiambu, Nakuru, Uasin Gishu, Tharaka Nithi, Nyeri, Siaya, Trans Nzoia and Bungoma) gave details on how they shared information with various stakeholders, including agro-dealers, KALRO, KEPHIS and county government officials
- Training of trainers was conducted on plant doctor training Modules 1 and 2 for nine staff (six female, three male) at the Kenya School of Agriculture
- CABI and national trainers conducted Modules 1 and 2 of plant doctor training (plant clinic operation, field diagnosis, giving good recommendations) for 20 plant doctor trainees (11 female, nine male). These new plant doctors also took part in e-plant clinic training to introduce them to the use of digital devices at plant clinics
- SHA facilitated the establishment of 21 new plant clinics by Busia, Homabay and Migori Counties for a total of 295 active plant clinics in the country
- Two write-shops with national experts were facilitated, leading to the development of 60 new PMDGs and the review of a further 50 PMDGs developed in 2019 for publishing
- Five Standard Operating Procedures were finalized to guide the scale-up of Plantwise-related activities in Kenya, covering stakeholder engagement, capacity building, clinic establishment and operations, data management and use and monitoring and evaluation

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	21	305 (295)
Plant doctors trained	20	709 (295)
PMDGs drafted	60	326
Factsheets drafted	0	7

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Malawi

Partner name	Role
Department of Agricultural Extension Services (DAES), Ministry of Agriculture, Irrigation and Water Development (MoAI&WD)	NRO and LIO
Department of Agricultural Research Services (DARS), MoAI&WD	Provides support for diagnostics and training
Department of Crop Development (DCD), MoAI&WD	Chair of national steering committee (NSC); coordinates activities at district level and backstops plant doctors
Self Help Africa (SHA)	LIO
United Purpose (UP)	LIO
CropLife Malawi	Member of NSC; contributes to development of pest management decision guides (PMDGs)
Pesticide Control Board	Member of NSC; contributes to development of PMDGs
Lilongwe University of Agriculture and Natural Resources (LUANAR)	Member of NSC; contributes to development of PMDGs and training of plant doctors
Green Belt Authority	Provides the National Data Manager and facilitates data validation by cluster coordinators
Agriculture Research and Extension Trust (ARET)	Contributes to development of PMDGs

Sustainability outlook

- CABI facilitated a sustainability assessment involving the review of previously written documents plus 14 key informant interviews with programme partners. The intention was to evaluate how the different elements of the Plantwise intervention might be sustained by partners after 2020. Overall, it is expected that much of the Plantwise approach will be sustained; however, some specific elements may not be continued without donor support. The key risk/challenge will be resource mobilization, especially when no government projects are available
- Among all the Plantwise countries, Malawi has seen some of the most extensive integration of Plantwise – in particular the plant clinic concept – into national strategies and budgets. Plant clinics were included in the Malawi National Agriculture Policy (September 2016), where they were named as one of the innovative approaches to agricultural extension. Plant clinics have also been included in the Malawi Growth and Development Strategy III and in the National Agriculture Extension and Advisory Services Strategy for Malawi, which includes a plan for establishing 500 plant clinics between 2020/21 and 2024/25. Finally, plant clinics have been included in the National Agricultural Investment Plan (2017/18–2022/23)
- Stakeholders interviewed were confident that Malawi would continue to train more plant doctors and scale up the plant clinics in spite of CABI's supporting role being heavily reduced. They have competent trainers from DARS, DAES, DCD and LUANAR, including some based in the districts. Similarly, both plant health rallies and mass extension campaigns will be continued, as these built on systems and services already in place
- Data collection at plant clinics will continue, particularly as an increasing number of plant doctors are obtaining digital devices, which makes the process of collection and uploading to the Plantwise Online Management System (POMS) far simpler. At a local level, plant doctors use their own clinic data to inform the planning of future activities with farmers and in developing key messages for rallies/campaigns. They also use the data in writing their fortnightly reports for their supervisors. At a national level, the clinic data is used by DAES and DCD, for

instance to identify priority areas for the distribution of pesticides to manage Fall Armyworm (FAW). Clinic data is also used by students in their academic research at BSc, MSc and PhD levels. Most of these students have been from LUANAR or have attended the Masters of Advanced Studies in Integrated Crop Management (MAS–ICM) programme in Switzerland

- Elements of Plantwise that were considered to be more difficult to sustain going forward due to partner budget constraints were the ongoing development of new resource materials, capacity building and the implementation of routine plant clinic performance monitoring. However, as partners in Malawi have become very accustomed to using tools like the Plantwise Knowledge Bank, the Plantwise Factsheet Library app and social media for obtaining and exchanging information, they are certain to continue using them in the future

2020 highlights

- COVID-19 impacted on the operations of Plantwise Malawi in 2020, especially during periods of lockdown. Plant clinic operations were particularly affected, as gatherings were discouraged; however, in some cases individuals or groups of up to three farmers could still visit plant doctors for advice. Meetings and workshops, particularly those requiring international travel by CABI staff, were disrupted. One key example of this disruption was the data sharing workshop that had been planned. Instead of the workshop, key informant interviews were held with individual organizations through Zoom and over telephone and WhatsApp calls to learn about data and data sharing in Malawi. The sustainability assessment also had to be conducted remotely, using the same communications tools for most of the key informant interviews. Towards the end of the year, once restrictions eased, partners were able to hold some workshops, such as for data management and e-plant clinic training. CABI participated virtually through Zoom to provide support. In general, however, training was well executed by Malawi's talented national trainers
- Funds amounting to £80,000 were provided by the Ministry of Agriculture through the Malawi Agriculture Sector Wide Approach Support Project II (ASWAP SP II) to support plant doctor training, plant clinic operations and clinic cluster meetings. UP also committed £5200 to support clinic cluster meetings and to procure personal protective equipment for all plant doctors, as well as to fund two tablet computers and an automated weather station in Dedza District
- The NSC held a meeting in which solutions were discussed for sustaining plant clinic operations in Malawi post-2020 through commitments from its members
- To address the issue of women's participation at the plant clinics, plant doctors tried conducting mobile plant clinics at the Village Savings and Loans groups where women meet to discuss agri-entrepreneurial matters. The pilot was successful in increasing the number of women attending the clinic sessions
- Five national trainers conducted Module 2 training (giving good recommendations) to complete plant doctor training for 113 participants across four districts: Chitipa (13 male, six female), Lilongwe (19 male, nine female), Mchinii (30 male, 11 female) and Mzimba (13 male, 12 female)
- Data management training was conducted for eight participants (six male, two female)
- E-plant clinic training was conducted for 30 plant doctors (18 male, 12 female) to introduce the use of digital devices at plant clinics for data collection and to improve access to information resources. A total of 16 new tablet computers were issued to transition some of the existing clinics into e-plant clinics
- The use of Plantwise digital tools (the data collection app, the Factsheet Library app and educational games) was promoted, targeting plant doctors. A total of 115 plant doctors were able to install the apps and use them
- Seventeen plant health rallies were facilitated, reaching 2642 people with targeted messages on multiple crop management topics
- One mass extension campaign was facilitated using a mobile van and reaching 12,670 farmers (7715 male, 5955 female) with targeted messages on the identification and management of African armyworm

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	28	155 (126)
Plant doctors trained	113	583 (250)
PMDGs drafted	–	61
Factsheets drafted	–	7

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Mozambique

Partner name	Role
Ministry of Agriculture and Rural Development (MADER), Departamento de Sanidade Vegetal (DSV)	NRO; LIO; chair of the national steering committee (NSC)
National Directorate of Agricultural Health and Biosafety	LIO; NSC member; involved in training
National Directorate of Family Farming Development	LIO; NSC member; finance administrator; data management; development of extension materials
National Directorate of Family Farming Assistance	LIO; NSC member; data management; development of extension materials
Project Horti-Sempre	Participation in training
Agrifocus	Participation in training; NSC member
IIAM – Mozambique Institute of Agricultural Research	LIO; participation in training; NSC member; data management; development of extension materials
FAO Mozambique	Participation in training; co-financing
A Faculdade de Agronomia e Engenharia Florestal (FAEF) é uma unidade orgânica da Universidade Eduardo Mondlane (UEM) (UEM/FAEF)	LIO; NSC member; development of extension materials; participation in training
Project to Support Programme for National Agricultural Extension (PRONEA) (PSP)	Co-financing
International Fund for Agricultural Development (IFAD) Mozambique	Co-financing

Sustainability outlook

- A sustainability assessment was conducted involving key informant interviews with programme partners to evaluate how Plantwise would likely be sustained by partners after 2020. A total of 13 partners were interviewed. Findings showed that sustainability will depend on other donor-funded projects taking up elements of Plantwise
- Plant clinics and complementary activities have been minimal over the past two years, a situation aggravated by COVID-19 and cyclones. These activities are therefore unlikely to be sustainable
- Data management and use are equally non-sustainable due to limited plant clinic activities and inadequate resourcing by in-country partners
- The popularity of the Knowledge Bank among partners makes it one of the resources that is likely to remain useful long-term, particularly because CABI will continue supporting its maintenance and make it freely available to partners
- Monitoring performance of Plantwise activities will not be sustainable, as these are entirely reliant on CABI support

2020 highlights

- The outbreak of the COVID-19 pandemic, coupled with back-to-back climatic shocks, had a significant negative effect on the implementation of Plantwise activities in the country. To curb the spread of the virus, the government imposed several restrictions, including on travel and social gatherings. As a result, implementors had to adapt their way of working to avoid group meetings. Plant doctors resorted to mobile plant clinics and field visitations to provide advice to farmers. Mass media platforms were used to disseminate targeted messages to large audiences in an effort to ensure farmer reach. Partners were also able to generate and share leaflets with farmers on the management of specific pests via social media networks
- Two cluster meetings were conducted: one in Moamba with the participation of 12 (three female and nine male) plant doctors, and one in Inhambane with the participation of 10 male plant doctors
- A virtual meeting was held to discuss the status of Plantwise in Mozambique following changes under the Ministry of Agriculture, which had stalled the implementation of activities
- A study on the role of Plantwise in providing advisory services to farmers during the COVID-19 pandemic was conducted by CAATINGA (an IFAD-funded project)
- A small meeting was held in Maputo with stakeholders (two female, three male) to discuss progress and challenges with implementation

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	75 (74)
Plant doctors trained	–	88 (74)
PMDGs drafted	–	37
Factsheets drafted	–	19

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Myanmar

Partner name	Role
Plant Protection Division (PPD), Department of Agriculture (DoA), Ministry of Agriculture, Livestock and Irrigation (MoALI)	NRO and LIO
Yezin Agricultural University (YAU)	Provides technical support
Department of Agricultural Research (DAR)	Provides technical support

Sustainability outlook

- CABI conducted a sustainability assessment involving 23 key informant interviews with programme partners (four officials, six support staff, five researchers and eight plant doctors) to evaluate how Plantwise would likely be sustained by partners after 2020. Overall, there was a very positive view of Plantwise support to Myanmar agriculture through increased knowledge on pests and diseases and capacity building of extension staff. Plantwise has been well-aligned with the National Plant Health System Strategy (NPHSS 2016), but implementation requires increased and sustained connectivity and coordination between different plant health stakeholders
- Sustainability of the Plantwise approach was given a boost in 2019 when plant doctor training was integrated with the knowledge centres under the IFAD-funded Fostering Agricultural Revitalization in Myanmar (FARM) project in Myanmar's central dry zone
- Limited staff and budget to operate plant clinics, lack of IT infrastructure, high extension staff turnover and limited staff capacity are viewed as significant challenges to Plantwise sustainability in Myanmar. Deep-rooted adoption of Plantwise elements such as plant clinics would require the incorporation of Plantwise activities into staff routine. For example, there are good opportunities for the original plant clinic concept to evolve towards mobile teams of plant doctors equipped with tablets and visiting farmers in the field
- The use of Knowledge Bank resources to disseminate IPM-based strategies for managing key pests and diseases is likely to be sustained. There is, however, an expectation that CABI will continue to play a backstopping role, for example in the development of new technical material on pests and diseases (Plantwise factsheets for farmers and pest management decision guides(PMDGs)).

2020 highlights

- In 2020, COVID-19 travel restrictions and further lockdown in Myanmar significantly limited the possibility of organizing face-to-face meetings and implementing activities as originally planned. Plant clinic operations were able to continue to some extent, but there were approximately 40% fewer queries reported than in the previous two years. This was mostly due to the lockdown effective in the second half of 2020, which prevented most plant doctors from operating plant clinics or visiting farmers as usual. The pandemic caused delays in implementing a mass extension campaign to raise awareness about the Fall Armyworm and its management, using PPD apps and a SciDev.Net video. In general, online meetings were therefore set to ensure that key activities (such as discussions with and the capacity building of plant doctors, the sustainability assessment and the national forum) could be conducted. This was successful in ensuring the continuity of Plantwise operations throughout 2020. In the second half of the year, follow-up with active plant doctors was done exclusively online, with plant doctors from Shan State and Ayeyarwady Region answering calls at each plant clinic or extension office. The sustainability assessment methodology had to be revised so that interviews could be conducted through online surveys sent to key informants rather than through face-to-face meetings and group discussions. The online nature of the national forum event provided a great opportunity to gather a number of key representatives from DoA, DAR and YAU
- Researchers from DAR and YAU have been using plant clinic data for their research on pests and diseases
- CABI conducted e-plant clinic refresher training with new tablets for 60 knowledge centre managers (22 male, 38 female) through the FARM project in the Nay Pyi Taw area
- The official inauguration of FARM plant clinics was launched, with 55 participants (30 male and 25 female) at Kyone Kone Village, Pyinmana Township and Nay Pyi Taw
- Online refresher ToT was conducted for 10 staff on plant doctor training Modules 1 and 2 through FARM. These local trainers then went on to conduct the plant doctor training for 38 new plant doctors (nine male, 29 female). This training done entirely by national trainers was a first for Myanmar.
- The establishment of 15 new plant clinics by PPD was facilitated for a total of 57 active plant clinics in the country
- The integration of Plantwise training materials was initiated into State Agriculture Institute programmes through online meetings with representatives
- PPD was supported in developing 10 new factsheets, as well as in reviewing 10 previously published factsheets
- A virtual national forum event was organized in December 2020 with Dr Ye Tint Tun, Director General of DoA; PPD Director Mr Aung Kyaw Oo; and 15 other participants (six male, nine female) to discuss the role and sustainability of plant clinics beyond the Plantwise programme and the integration of Plantwise plant doctor training into agriculture training programmes

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	15	107 (57)
Plant doctors trained	38	189 (89)
PMDGs drafted	0	10
Factsheets drafted	10	29

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Nepal

Partner name	Role
Plant Quarantine and Pesticide Management Centre (PQPMC, formerly Plant Protection Department (PPD))	NRO
Provincial Agricultural Development Directorates (ADD)	LIO (linked through the national government)
Plant Protection Laboratory (PPL)	LIO (linked through the national government)
International Development Enterprise (iDE)	LIO
Farmer IPM Associations (FFS–IPM)	LIO

Sustainability outlook

- CABI led a sustainability assessment in 2020 involving 16 key informant interviews and focus group discussions with 14 personnel from partner organizations to obtain a sense of how Plantwise is expected to continue after 2020. The Plantwise programme is highly regarded by partners in Nepal, but only certain programme elements had achieved sustainability by the time of this assessment. The new administrative structure established in Nepal has created a major challenge for the integration of Plantwise into formal work processes
- The Plantwise plant doctor training and the plant clinic concept are already integrated and supported by both national and provincial governments through inclusion in annual budgets. PQPMC has made plant clinics part of its community-based surveillance programme, through which plant clinic data can be used for appropriate actions at the National Plant Protection Organisation (NPPO) level. In addition to establishing plant clinics under public sector service providers, CABI has also linked this approach with "Community Based Facilitators" (CBFs), who run the clinics through their own initiative and resources, helping link farmers to quality inputs that are often unavailable in remote communities. The plant doctor training and function has been shown to increase farmers' trust in the CBFs, thereby strengthening the CBF business model (a 30%–50% increase in income was reported by the CBFs interviewed) and the overall sustainability of the service
  - Other programme interventions are not yet funded by the government or other partners and have therefore lagged behind in terms of progress. The clinic data aspect – including data management, validation and use – has been particularly difficult to fit into existing systems. Similarly, the Plantwise monitoring and evaluation (M&E) tools and processes were acknowledged as a new concept of evaluation in the country. However, uptake has been poor as no structured plan is currently in place to take such tools forward
- Key informants claimed the Plantwise Knowledge Bank is a unique and useful resource, acting as a back-end support for programme implementation with easy-to-access information. There was a desire to have more localized content available on the platform to further increase relevance for both plant doctors and farming communities. However, despite having strong expertise and trained manpower, the government does not have a structured system currently in place to carry this forward

2020 highlights

- The COVID-19 pandemic impacted Plantwise programme implementation due to lockdowns and restrictions on movement, the unavailability of farm inputs to farmers at critical periods, the lack of access to advisory services, and special considerations for households to meet their daily needs, among other factors. Considering these difficult situations, Plantwise partners firmed up quick plans and reorganized activities that could be conducted remotely (eg online meetings/training sessions to reach plant doctors as a first step). The number of farmers reached directly through plant clinics was heavily diminished in 2020 due to COVID-19 restrictions. Plant doctors were therefore shown different options available – such as SMS, video calls or social media – to reach resource-poor farmers in their communities. An SMS service with validated content was made available to plant doctors and approximately 4500 SMS messages were drafted in Nepali and shared with 32 CBFs and 27 Marketing Planning Communities (MPCs) for dissemination to farmers. Plant clinic cluster meetings and online training sessions on IPM systems were held to remotely assist plant doctors in overcoming the challenges at field level. Online training sessions and workshops were also held for various activities that needed no or minimal travel (eg data validation, development and review of factsheets, gender inclusion discussions, etc). The online approach was initially challenging but gradually became easier with experience, enabling partners to implement certain activities entirely online
- A new Partnership Statement was signed with iDE to continue plant clinic operations, content development and M&E
- Funds were allocated by PQPMC (£75,000) and iDE (£2500) to Plantwise activities regarding training in Modules 1 and 2, plant clinic operations and M&E
- Linkages of MPCs – private produce aggregators – with the programme were facilitated to provide support to CBFs in running plant clinics as part of an important value chain intervention
- PQPMC and iDE evaluated plant clinic data to make informed decisions on the development of location-specific pest management decision guides (PMDGs) and factsheets
- National trainers conducted Plantwise Module 1 training (field diagnosis and plant clinic operation) for plant doctor trainees in four provinces and Module 2 training (giving good recommendations) for participants in two provinces
- Two write-shops with national experts were facilitated, leading to the development of 20 new PMDGs and the updating of 20 previously published factsheets
- "Data Validation and Analysis" training was conducted for 10 participants (two female, eight male)
- Specific, needs-based training was facilitated online on rice IPM training for 21 participants (12 female, nine male) to improve understanding and promotion of the principles described in PMDGs and to promote ecotechnologies with the smallholder farming communities
- Online workshops were organized for clinic cluster meetings and other M&E exercises using Google Tools for data capture
- Sixty-three farmer meetings and one plant health rally were facilitated, reaching more than 1000 farmers with targeted messages on the management of pests such as Fall Armyworm (FAW), tomato leafminer, locusts and Parthenium
- A FAW video was customized for the Nepalese context on the role of Plantwise in developing awareness and managing this invasive with IPM approaches
- Focus group discussions and key informant interviews were conducted to assess the integration and role of gender in Plantwise Nepal and to identify strengths, limitations and other lessons learned. This case study will be completed in 2021

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	68 (35)
Plant doctors trained	Unknown	363 (50)
PMDGs drafted	20	33
Factsheets drafted	–	41

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Nicaragua

Partner name	Role
Universidad Nacional Autónoma de Nicaragua (UNAN)–León	NRO; LIO; diagnostics
Universidad Católica del Trópico Seco (UCATSE)	LIO; diagnostics
Universidad Martin Lutero (UML)	LIO
Humboldt Centre	LIO
Instituto de Promoción Humana Nicaragua (INPRHU)	LIO
Norwalk Nagarote	LIO
Juan Francisco Paz Silba (JFPS) (cooperative)	LIO
Cooperativa de Servicios Múltiples Campesinos Activos de Jalapa (CCAJ) (cooperative)	LIO
Central de Cooperativas de Pueblo Nuevo (CECOOP)	LIO
Asociación de Comunidades de la Península de Cosigüina (ACODEPEC) (farmer association)	LIO
Abonatura	LIO
Paisaje Urbano	LIO
American–Nicaraguan Foundation (ANF)	LIO

Sustainability outlook

- A sustainability assessment of Plantwise components after 2020 was conducted using a series of questionnaires designed for collecting key information from national coordinators, plant doctors and farmers. The results showed strong interest from farmers in continuing to receive plant clinic support and strong interest from key partners – such as universities, NGOs and cooperatives – in continuing to use the approach
- Plant clinics have been institutionalized by some farmer cooperatives, and it is expected that they will continue to operate. However, their level of activity will depend on the financial status of the cooperative. Three of the five institutions interviewed have included plant clinics in their operational plans, but without an institutional budget. A majority of the plant doctors indicated that plant clinics align with the structure and existing needs of their organizations and that they would therefore continue including them in their annual plans. However, they expressed fear that political instability, insufficient organizational resource capacity and high workloads are likely to affect the running of plant clinics
- Most partners indicated that they would continue to use the Plantwise Knowledge Bank resources, especially factsheets, pest management decision guides (PMDGs) and photo-sheets. Social media networks were also recognized as a tool that will continue to support diagnosis and information sharing. Most respondents felt that data management systems are unlikely to be sustained, mainly due to the lack of good IT infrastructure and a poor data collection culture
- Coordination of plant clinic networks and monitoring clinic performance are perceived to be difficult to maintain due to limited funding and are therefore unsustainable

- A diploma course based on the Plantwise training modules was launched by UCATSE as part of the academic offer of the institution. This will ensure the long-term sustainability of plant doctor training
- Although monitoring and evaluation was rated as very important, most felt it is an expensive activity that cannot be sustained. The cost of transportation in Nicaragua seems to be one of the key factors considered risky for the implementation of monitoring visits to plant clinics

2020 highlights

- The Government of Nicaragua did not encourage any safety protocols to prevent the spread of COVID-19 until late 2020. However, a good proportion of the population took their own precautions, avoiding crowds and following recommendations circulated globally by international news. The local Plantwise team coordinator and Plantwise partners continued with activities as planned, but reduced the number of contacts with farmers and applied safety measures when face-to-face activities were involved. Activities were postponed in zones where cases of COVID-19 were reported and virtual communication was strengthened for coordination meetings via Zoom, radio and Facebook for extension messages. Although the number of queries dropped because of low farmer mobility, the WhatsApp diagnosis support group continued to be of great support to plant doctors, who kept up virtual and face-to-face contact with farmers
- A Memorandum of Understanding was signed for the implementation of the 2020 activity plan with UCATSE and UNAN–León
- Eleven plant health rallies were conducted on the monitoring and identification of pests in vegetable crops, control of the Sorghum Yellow Aphid, management of "crespillo" virus in sesame, management of papaya and maize pests, and management of white grubs in maize, reaching 374 farmers (304 male, 69 female)
- Ten radio programmes on management of key pest and diseases were conducted in collaboration with the LIO Humboldt Centre
- A mass extension campaign on the monitoring and management of Fall Armyworm (FAW) was conducted, reaching an estimated 3000 people
- A three-month diploma course based on Modules 1 and 2 launched by UCATSE, with 20 students (19 male, one female)
- A booklet on the management of sesame pests and diseases was produced and shared with the plant clinic in Achuapa
- One PMDG was prepared on sesame virus "crespillo", as well as three factsheets on sesame pests and diseases (the sesame virus, aphids and angular spot) and one photo-sheet on the natural enemies of the Sorghum Yellow Aphid
- Two blog posts were produced, one on the success story of a student from UCATSE trained on the Plantwise modules, and one on the impact of the FAW mass extension campaign in Somotillo
- Plant clinics were promoted at the International Congress of Technologies held in Managua on 19 March 2020, organized by INTA; 150 farmers (90 male, 70 female) received information about plant clinic services
- A workshop on the safe use and maintenance of pesticide sprayers was conducted by a plant doctor from León, in collaboration with Protecno-Technological products company, for advanced agronomy students from UNAN–León Nicaragua (41 male, 32 female)
- Modules 1 and 2 training was conducted for 19 staff from Oxfam (12 male, four female) and from Prodeza (three male)
- Thirty-nine agronomy students (12 female, 27 male) from UNAN–León received an induction on the use of the Plantwise Knowledge Bank for accessing technical materials. These tools have been adopted as part of the toxicology course for agronomists at UNAN–León

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	35 (11)
Plant doctors trained	19	175 (28)
PMDGs drafted	1	138
Factsheets drafted	3	46

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Pakistan

Partner name	Role
Ministry of National Food Security and 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 Azad Jammu and Kashmir	LIO
Department of Plant Protection Karachi	LIO

Sustainability outlook

- An assessment of Plantwise sustainability was conducted using key informant interviews and focus group discussions with several programme partners. Plant clinics have been operating sustainably at scale in Pakistan from an early stage of the programme. Plantwise has been introduced to Pakistan province by province, and it is now strongly owned at the provincial level
- This success is considered to be largely due to provinces such as Punjab and Sindh making the plant clinics part of their key performance indicators and building the concept into the regular duties of extension officers without any need for an honorarium to be paid. Government investments have supported the acquisition of tablets and other basic plant clinic materials, eg umbrellas, tables and basic tools to aid in diagnostics. Provinces joining the programme more recently (Gilgit-Baltistan, Khyber Pakhtunkhwa, Balochistan and Azad Jammu and Kashmir) are expected to develop similar self-sustaining mechanisms
- No official coordinating body or steering committee was established to lead the programme at a national level prior to 2020; however, a key output of 2020 was to identify a national coordinator, a national data manager and a national monitoring and evaluation manager for Plantwise activities going forward
- Plantwise training sessions are already part of the government system, with resources in terms of both staff time (national trainers) and funds for direct costs. Plant clinics are regularly monitored and lessons learned are shared through regular cluster meetings
- Clinic data management and most clinic data use occurs at provincial or sub-provincial levels, for instance for assessing plant doctor performance and monitoring specific pest outbreaks during critical periods

2020 highlights

- Plantwise activities in Pakistan have generally been less affected by the pandemic in 2020 than in most other countries. Most notably, as the plant clinics are generally located in remote areas where COVID-19 cases are less common, Agriculture Extension Department staff (plant doctors) have been able to continue working regularly. Clinics only ceased for a short time in areas where there were extreme lockdowns. The Director General of the Agriculture Extension Department Punjab, for example, was enthusiastic about running all plant clinics daily during a period of severe pest problems affecting cotton in spite of the pandemic. COVID-19 has been a partial factor in the decision not to hold an annual national forum event, although this was also influenced by transfers of senior government officers
- Collectively, the LIOs allocated £193,000 from their own budgets for plant clinic operations and the purchase of IT equipment and plant clinic materials
- A Partnership Agreement and a Data Sharing Agreement were signed with the Directorate of the Agriculture Extension Department Azad Jammu and Kashmir
- A Memorandum of Understanding was signed with the Directorate of the Department of Plant Protection Karachi to establish a Data Centre. The site for this Data Centre has been allocated and all necessary equipment has been purchased. The Agriculture Extension Department Punjab is also taking the lead in managing data from plant clinics of Punjab through its provincial setup for data management
- In-country partners at national and provincial level have been using plant clinic data for various purposes:
  - the Ministry of National Food Security and Research uses clinic data in designing insect pest zoning
  - the Pakistan Agriculture Research Council has used clinic data to identify topics, initially on wheat crop, for the development of extension literature (Plantwise factsheets for farmers and pest management decision guides (PMDGs))
  - the Agriculture Extension Departments of Punjab, Sindh and Balochistan provinces are using Plantwise data for forecasting and campaigning against different crop health problems. In Balochistan, it has also proved useful for assisting farmers of organic cotton
- Training of trainers (ToT) was conducted on plant doctor training Modules 1 and 2 for 10 male local staff
- CABI and national trainers conducted plant doctor training Modules 1 and 2 (plant clinic operation, field diagnostics and giving good recommendations) for 120 trainees (112 male, eight female)
- The establishment of 60 new plant clinics was facilitated in Khyber Pakhtunkhwa, Azad Jammu and Kashmir and Balochistan, for a total of 1001 active plant clinics in the country
- "Extension Messages" training was conducted for four participants and one write-shop was facilitated with national experts, leading to the development of 15 new PMDGs and 15 factsheets
- ToT was conducted for 24 local staff (22 male, two female) on "Monitoring Plant Clinic Performance"
- "Monitoring Plant Clinic Performance" training was conducted, leading to the development of a plant clinic monitoring concept that involves activities using both paper forms and Google Forms for data collection
- E-plant clinic training was conducted for 125 participants (121 male, four female) to introduce the use of digital devices at plant clinics
- Data management training was conducted for 15 male participants and data validation and analysis training was conducted for 25 participants (22 male, three female)
- 106,076 queries were handled at plant clinics, of which 96,076 were recorded in the Plantwise Online Management System (POMS)
- Three plant health rallies were facilitated, reaching 116 farmers (113 male, three female) with targeted messages
- A mass extension campaign about Fall Armyworm (FAW) management was facilitated jointly with the Action on Invasives programme, reaching an estimated 144,586 farmers through social media and field days/training

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	60	1024 (1001)
Plant doctors trained	120	2085 (2030)
PMDGs drafted	15	85
Factsheets drafted	15	101

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Peru

Partner name	Role
National Institute for Agricultural Innovation (INIA)	NRO and LIO
National Service for Agricultural Health (SENASA)	LIO; provides diagnostic support to plant clinics
Local Government (municipalities)	LIO
Regional Direction for Agriculture San Martín	LIO
"La Molina" Agricultural University	Provides technical support to plant clinics
International Potato Centre (CIP)	Provides technical support to plant clinics
Entomological Society of Peru	Provides technical support to plant clinics
National Program for Social Inclusion, Tambos	Provides technical support to plant clinics

Sustainability outlook

- CABI led a sustainability assessment involving interviews with farmers, plant doctors and decision makers from the key partner institutions to discuss the future of Plantwise activities in Peru after 2020. There is evidence of a high level of adoption and ownership of the Plantwise programme at the national level, with interest in expanding the plant clinic concept to all of INIA's Experimental Stations across the country. At present, some important institutional factors have positively influenced the stability and acceptance of the programme in Peru
- INIA, the NRO for Plantwise implementation, has internalized Plantwise in its rural advisory service modules. It has adopted the programme approach and framework as a procedure model under its rural extension strategic action plan at the eight Agrarian Experimental Stations where plant clinics are currently operated. More specifically, plant clinics have been recognized as a key extension method in the National Guide of Technology Transfer Methods
- National partners are very confident that plant clinics will still be running after the major Plantwise programme winds down, although monitoring activities specific to plant clinics are unlikely to be maintained due to the lack of required resources. The plant health rally concept was also well received in Peru; therefore, partners are likely to continue using it for disseminating specific messages
- Partners value the contribution from Plantwise in reinforcing internal collaboration among INIA's units and also with other key institutions, such as SENASA and the local governments (Agrarian Agencies)
- The training of trainers group formed by INIA's specialists (from different Agrarian Experimental Stations) is expected to maintain its activity after the major Plantwise support finishes. Similarly, the WhatsApp group established to help strengthen communication and support the remote diagnostics system was considered to bring benefits and will likely be sustained
- There is interest in using the Plantwise Knowledge Bank, but continued use depends on functionality and relevance. The low amount of Spanish material in the Knowledge Bank and the lack of linkage to INIA's technical content database is a risk to sustainability
- Plant clinic data management and use is less likely to be maintained due to the lack of familiarity with data analysis, as well as to the strong centralization of the clinic data management

2020 highlights

- Plantwise activities in Peru were adjusted in the face of restrictions caused by the COVID-19 pandemic. Communication was maintained between coordinators, plant doctors and farmers through virtual media, where possible. Weekly meetings were held with the national and local coordinators of Plantwise at the Agricultural Experimental Stations in Peru in order to closely monitor the implementation of programme activities. INIA (in conjunction with local governments and SENASA) developed different channels to provide remote technical assistance to farmers. INIA maintained a weekly virtual plant clinic service via their Facebook page. Diagnostic support to plant doctors was reinforced through a dedicated WhatsApp group and via phone. Face-to-face activities were undertaken again in the second semester following the establishment of safety protocols, but were restricted to areas of the country with low incidence of COVID-19. CABI organized a series of webinars to deliver technical information to plant doctors and other collaborators in Peru and other Spanish-speaking countries in the region at the same time
- An update on Plantwise activities was presented at a virtual technical meeting with 30 participants to review plant clinic progress at the INIA Agrarian Experimental Stations as part of the institutional workplan for 2020
- Plantwise Plant Doctor Training (Modules 1 and 2) were adapted by the training of trainers team in Peru and CABI for online delivery and used to provide refresher training for field staff (four female, 15 male), using practical sessions as homework and the Zoom polling tool
- Twenty-three new factsheets were developed on different technical topics of interest
- Fifteen plant health rallies were facilitated, reaching 428 people (194 female, 234 male) with targeted messages
- A webinar was organized with 42 plant doctors (20 female, 22 male) on the development and use of Plantwise and INIA technical documents, using media such as radio programmes, web pages, Facebook and YouTube to disseminate technical information to support producers while restrictions on travel and gatherings were in force
- CABI and partners conducted numerous training and information sessions through social media for groups of service providers and farmers. These included topics such as biocontrol and sustainable production, the use of quality seed and the identification and control of pests and diseases in potato production, improved potato varieties with Phytophthora tolerance, integrated management of the potato moth, and biological control in hard yellow corn
- A refresher training session on data analysis was implemented using the Spanish version of the Plantwise offline data management tool, including the production of maps with GPS coordinates (eight female, 15 male)

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	84 (41)
Plant doctors trained	12	382 (25)
PMDGs drafted	–	34
Factsheets drafted	14	123

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Rwanda

Partner name	Role
Rwanda Agriculture and Animal Resources Development Board (RAB)	NRO
Ministry of Local Government (through district local governments)	LIO; financial support for plant doctor training
Cultivating New Frontiers in Agriculture (USAID's Feed the Future Rwanda Hinga Weze Activity)	Financial support for plant health rallies (PHRs)
Agro Input Suppliers Federation	Member of national steering committee (NSC)
University of Rwanda	Member of NSC
University of Technology and Arts of Byumba	Member of NSC
Rwanda Inspectorate, Competition and Consumer Protection Authority	Member of NSC
Imbaraga Farmers Organization	Member of NSC
One Acre Fund	Financial support for PHRs

Sustainability outlook

- CABI conducted a sustainability assessment for Plantwise in Rwanda involving a document review, key informant interviews, focus group discussions and a workshop with programme partners to evaluate how Plantwise would likely be sustained by partners after 2020
- The findings of the sustainability assessment showed that the ability to sustain plant clinics will be dependent on the availability of funds. Current initiatives include the integration of plant clinics into existing extension approaches, such as Twigire Muhinzi and farmer cooperatives. In order to sustain the process of data collection and use, there is a need for the Ministry of Agriculture and Animal Resources (MINAGRI) to incorporate plant clinic data into larger systems of data collection and to show the benefits of doing so. However, MINAGRI has so far been unable to include the programme's interventions into the country's strategic planning framework. Plantwise is also yet to be fully integrated into the main extension activities of the local governments
- One key Plantwise intervention that is not likely to be sustained beyond the current donor support is plant doctor training. As much as the stakeholders appreciate the usefulness of this training, which is perceived to add to the knowledge of extension officers, the majority of district local governments are unable to provide sufficient funding support, making its sustainability a challenge. However, the presence of national trainers and the willingness of at least some districts to commit funds to such training is positive
- Plant health rallies are likely to be sustained owing to broad support and investment from various interested parties, including RAB, the One Acre Fund and USAID/ Feed the Future. There is also sufficient capacity in-country to support ongoing and future campaigns
- The development of extension material and the use of the Plantwise Knowledge Bank are also likely to continue due to broad acceptance and appreciation of the usefulness of Plantwise extension materials – pest management decision guides (PMDGs), factsheets for farmers and photo-sheets. These Knowledge Bank resources will remain freely accessible to all Plantwise countries. However, sustaining the data management system will not be possible due to lack of adequate capacity and investment by the partners
- Monitoring plant clinic performance, cluster meetings, and assessment of Plantwise outcomes and impact are less likely to be sustained as these are heavily reliant on funding support from CABI

2020 highlights

- It was initially feared that COVID-19 would significantly impact Plantwise activities in Rwanda. However, only plant clinic operations were significantly affected owing to the government directive limiting public gatherings. Even with this restriction, plant doctors were able to undertake farm visits and electronically capture plant clinic data. Luckily, all the plant clinics in Rwanda had been transformed into e-plant clinics through the provision of additional tablets via the programme. Other activities, such as the sustainability assessment, were conducted virtually. It was also possible to hold face-to-face meetings and training workshops under strict adherence to government restrictions
- Three training sessions on Modules 1 and 2 were conducted by local trainers for 54 extension workers (10 female, 44 male), with financial support from respective district local governments – Nyamasheke (£7318) and Kayonza (£5855)
- An SMS campaign on Fall Armyworm (FAW) identification and management was conducted, targeting 15,000 farmers registered on the "Smart Nkunganire System" (a digital input subsidy platform developed by BK TecHouse, in partnership with RAB) through 154,890 SMS messages
- Training of trainers was conducted for 17 local staff (10 female, seven male) on FAW diagnosis and management, leading to validation of the newly developed FAW training material
- One write-shop with national partners was facilitated, leading to the revision of 31 PMDGs and of one factsheet for farmers
- The enrolment of 158 users onto the newly developed CABI Academy Crop Pest Diagnosis e-learning course was facilitated by CABI and country partners. This online course is designed to enable users to obtain the hands-on skills required for field-based diagnosis of plant health problems
- The effectiveness of social media platforms in relaying plant health information was assessed, with results showing that nearly 90% of plant health practitioners use these platforms for both social networking and work-related discussions
- Mass extension campaigns on FAW identification and management were carried out over the radio, broadcasting pre-recorded and live messages through the Rwanda Broadcasting Agency
- Ten plant health rallies were conducted (in 10 different districts) on FAW identification and management through funding (£2927) by USAID Hinga Weze, reaching 2174 people
- An NSC meeting was held with 27 participants (nine female, 18 male) to review the progress and discuss the sustainability of the programme beyond the current donor support

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	66 (52)
Plant doctors trained	54	404 (110)
PMDGs drafted	–	46
Factsheets drafted	–	43

Figures in brackets indicate the number of plant clinics and plant doctors active 2020

Sri Lanka

Partner name	Role
Ministry of Agriculture (MoA)	Top-level programme steering
Seed Certification Service (SCS) of the Department of Agriculture (DoA)	NRO
Provincial and Inter-Provincial Department of Agriculture (Extn.)	LIOs
Department of Export Agriculture (State Ministry of Development of Minor Crops including Sugarcane, Maize, Cashew, Pepper, Cinnamon, Clove, Betel-Related Industries and Export Promotion)	Supports plant clinic implementation

Sustainability outlook

- A sustainability assessment was conducted involving three key informant interviews with programme partners to understand how they were likely to sustain Plantwise after 2020. Respondents placed a high value on the existing structure (the NRO is under the central DoA and one of the LIOs are under the provincial DoA), as it supports internalization of components of the Permanent Crop Clinic Programme (PCCP) and it helps in communicating the programme concept and implementation to almost all the organizations involved in the plant health system. However, no clear evidence was provided that this structure will be maintained, or of how it would be resourced post-2020
- The Plantwise interventions considered to be the most valuable are Plantwise Modules 1 and 2 training and the running of plant clinics. Respondents mentioned that plant clinics are an effective extension tool that could be continued with little support from CABI, as has already been the case for some years. These components have been highly adopted in Sri Lanka, with e-plant clinics incorporated into the extension system. Maintaining the capacity of plant doctors and addressing the existing staff shortage within DoA will be a challenge
- The Plantwise Knowledge Bank platform and plant clinic data were considered to have great value, and outputs such as pest management decision guides (PMDGs) and factsheets for farmers could be developed at national level. However, there is currently no clear indication of how these will be sustained post-2020. Key informants felt activities such as data management, validation and analysis require technical and financial support and are unlikely to be sustained
- Monitoring and evaluation was considered to be essential for maintaining the quality of programmes and the sustainability of Interventions. Digitization of plant clinic monitoring tools (Google Forms) has been completed and shared with stakeholders, but awareness raising among plant doctors and district coordinators is still required, along with coordination and resources to support this activity

2020 highlights

- Because of COVID-19, major field activities such as cluster meetings for district coordinators and annual planning meetings were cancelled. The Government of Sri Lanka also imposed a complete lockdown in March 2020 and public gatherings were still limited at the end of the year. In addition, the Government of Sri Lanka revised the budget allocation for DoA, diverting funds towards dealing with the COVID-19 pandemic. More than £54,000 in funding had been allocated to Plantwise/PCCP activities in 2020 by in-country partners such as DoA and the Provincial and Inter-Provincial DoA (Extn.). This budget was intended to support plant clinic operations, training sessions, procurement of materials, etc, but as a result of the crisis these funds were unavailable. Therefore, Plantwise/PCCP changed the approach to the planned activities so that they could be achieved largely through online modes, eg a higher focus on PMDG development and review, data management and use, etc. Mass media, especially newspapers, were used to raise awareness about accessibility of plant clinics and Fall Armyworm (FAW) identification and management. For the first time, special plant clinics for specific groups (young farmers clubs; women-headed households) were also organized to extend the support of plant clinics to these vulnerable groups
- DoA (Government of Sri Lanka) used plant clinic data to develop short reports called "Diagnostic outcomes of plant clinics in Sri Lanka". These reports are based on plant clinic data collected over five years (2016–2020) and have so far been developed for three districts (including inter-provincial areas)
- Two special plant clinics were implemented for women-headed households to support the government-led SAUBAGYA programme and raise awareness of the PCCP. This targeted women who are active members of the programme and whose main livelihood is farming. Among other things, these special plant clinics have encouraged the use of homemade (affordable) preparations to manage pests and diseases
- A special plant clinic was provided through DoA's "1920 Skype service" to young farmer clubs to motivate them to benefit from the PCCP and to adopt integrated pest management tactics in their cultivation
- Two refresher training sessions were conducted on Plantwise Modules 1 and 2 for 47 plant doctors (22 female, 25 male); five refresher training sessions were conducted on e-plant clinic operations for 105 plant doctors (36 female, 69 male)
- Training was provided for 55 Good Agriculture Practice (GAP) facilitators (12 female, 43 male) on Plantwise Module 1 through DoA's Plant Protection Service
- Two write-shops with national experts were facilitated, leading to the finalization of 51 PMDGs developed in 2018 and 2019 but never completed, plus the development of two new PMDGs. Volume 2 of a Sri Lankan PMDG book was produced
- One data management training session was conducted for nine participants (two female, seven male), as well as data harmonization training for four participants (one female, three male)
- Three clinic cluster meetings were conducted with a total of 70 participants (12 female, 58 male) to discuss lessons learned, challenges and opportunities in the Plantwise/PCCP operations
- Mass extension campaigns were facilitated using mass media, with targeted messages on FAW identification and management. At the core of this campaign was a "FAW vehicle", which drove around the region for three days to disseminate information to communities, holding events at market places and temples. This activity was then covered by local media – including Swarnavahini TV, which has wide media coverage – and by various national newspapers

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	0	820 (392)
Plant doctors trained	0	1321 (572)
PMDGs drafted	2	155
Factsheets drafted	0	19

Figures in brackets show number of active plant clinics and plant doctors in 2020

Thailand

Partner name	Role
Rice Department (RD), Ministry of Agriculture and Cooperatives (MOAC)	NRO and LIO
Department of Agriculture Extension (DoAE), MOAC	LIO
Kasetsart University, Bangkok	Member, national steering committee (NSC)
Thai Phytopathology Society	Member, NSC

Sustainability outlook

- CABI conducted an assessment of in-country Plantwise sustainability, involving a document review and 23 key informant interviews with key officials and experts from MOAC and the Plantwise coordination unit, zonal and district crop protection experts, researchers, plant doctors and farmers. Findings showed that partners in Thailand find Plantwise relevant to the national mission and policy. However, although they see the engagement of DoAE and other related organizations in plant clinic operations and complementary activities as a positive step that could help engage local governments and other actors to adopt the Plantwise concept, they do not see the plant clinic model expanding without donor support. This is compounded by the fact that an initial focus on the RD led to low engagement with other public and private sector partners. As of 2020, the programme has never been implemented across Thailand at a scale required for its wider acceptability
- The RD believes that plant clinics and data management will continue without support from CABI because these activities have been ongoing with the rice farmers for some time now. However, the frequency of clinics is expected to decrease
- DoAE will continue plant doctor training for all their district level extension staff through their own state funds. However, the operation of plant clinics is considered as additional to the core work of staff who function as plant doctors. It has therefore not been integrated into their official duties. This, combined with low farmer attendance due to poor coordination and advertising of clinic sessions, leads to a situation where the incentives to run plant clinics are inadequate
- National partners reported that monitoring and evaluation (M&E) is rarely done due to lack of time and resources, although there was a shared understanding that better use of M&E and data should have been undertaken to make the programme more effective. In addition, DoAE may not use the Plantwise Online Management System (POMS), as staff already use an existing reporting system. Although the existing system does not capture the same kind of detail on pests and diseases as the plant clinic records, it is not foreseen that the authorities will make adaptations at this time. Challenges associated with IT infrastructure are also a major concern for data collection

2020 highlights

- Despite the lockdown due to COVID-19, some activities were still possible. For instance, plant doctors were able to provide advice to farmers over the phone and via social media (Line and Facebook). Furthermore, partners switched to virtual means to conduct plant doctor training sessions and clinic cluster meetings for progress review
- Plant clinic data was used mainly in the department reports issued by the RD and DoAE and shared within the departments
- Funds (£54,000) were allocated to Plantwise activities by DoAE for five plant doctor training sessions by national trainers
- One NSC meeting was conducted with the participation of six members (two male, four female) to discuss Plantwise sustainability and support from CABI beyond donor funding
- A study was conducted to investigate the impact of Plantwise on the level of pest management knowledge and skills of DoAE extension staff trained and serving as plant doctors
- CABI trainers conducted Modules 1 and 2 training using an adapted version of the courses for 16 trainees (five male, 11 female) through Zoom and using Google Classroom/Forms for class exercises and exams
- Fifteen national trainers conducted five Modules 1 and 2 training sessions for 379 (147 male, 232 female) plant doctor trainees in three states: Suratthani, Khonkaen and Pitsanulok
- National partners became fully responsible for clinic data management; two National Data Managers were assigned from DoAE and RD
- Production was facilitated of a Thai version voiceover awareness video on the biological management of Fall Armyworm (FAW), using a video initially produced under the Plantwise and Action on Invasives programmes in Bangladesh
- Two mass extension campaigns were facilitated with targeted messages on FAW and rice blast management, using social media and posters to reach farmers with actionable advice
- Preparation and preservation was facilitated of samples of rice insect pests and diseases for display and use at plant clinics and during RD field days

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	–	29 (24)
Plant doctors trained	395	801 (62)
PMDGs drafted	–	34
Factsheets drafted	–	37

Figures in brackets indicate the number of plant clinics and plant doctors active in 2020

Uganda

Partner name	Role
Department of Crop Protection, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	NRO; chairs National Steering Committee; supervises and supports plant clinic operations and clinic data management, including provision of clinic kits to districts
Directorate of Agricultural Extension Education, MAAIF	Member of National Steering Committee; coordinates extension service delivery and provides financial support to district local governments (DLGs), along with training and other activities
DLGs (96)	LIOs
Project for Restoration of Livelihoods in Northern Uganda (PRELNOR)	Facilitates operation of plant clinics in the nine project districts of Adjumani, Agago, Amuru, Gulu, Kitgum, Lamwo, Nwoya, Omoro and Pader in the northern region
Makerere University, Kampala (MUK)	Member of National Steering Committee; provides plant doctor training to students
Uganda Christian University (UCU)	Provides plant doctor training to students
National Agriculture Research and Development Organisation	Member of National Steering Committee; provides support in plant doctor training, diagnostics, data validation and extension material development

Sustainability outlook

- A sustainability assessment was carried out involving four consultative physical meetings with 75 programme partners (23 female, 52 male) from 26 districts to evaluate how Plantwise would likely be continued by partners after 2020. Participants were from MAAIF, DLGs (including the chief accounting officers, plant doctors and their supervisors), non-governmental organizations, universities, the National Agriculture Research and Development Organisation and the private sector
- The assessment found that training of plant doctors and the operation of plant clinics, although not regular, will certainly continue post-2020. These activities have not only been incorporated into government policy documents, but MAAIF and DLGs have also been contributing their own resources. In some cases, plant doctor modules have been integrated into the training curricula of higher education institutes and in-service training, beyond the standard programme operation
- In addition to using plant clinic data at district level for pest and disease surveillance, university students have been using it for dissertation research. One example involves a student from UCU who used clinic data to assess the performance of plant clinics, characterizing the clinic beneficiaries as well as reviewing the kinds of problems and approaches to crop management that were recorded in the data
- Some continuation of plant health rallies is also envisaged, utilizing technical support from MAAIF. Although less tangible, partners stated that Plantwise has increased communication and collaboration between various stakeholders and has built capacity in planning and executing mass extension campaigns. This provides a foundation on which future activities can be built
- The assessment also identified significant existing challenges. For instance, plant clinic operations are constrained by limited staffing, irregular clinic sessions and low awareness among farmers, all of which need addressing if sustainability at scale is to be achieved. Other areas facing sustainability challenges include the development, translation and dissemination of extension materials, clinic data validation and data use, and monitoring and evaluation

2020 highlights

- In light of the COVID-19 outbreak, the Government of Uganda issued guidelines and precautionary measures in mid-March to contain its continued spread. These measures restricted movements, banned meetings and the use of public transport, and closed all government offices except essential offices such as public health. The presence of government staff at the offices belonging to essential services was scaled down to 30% capacity to enable observance of COVID-19 standard operating procedures. In April, with the onset of rains, plant doctors and other agriculture officers were allowed to give advice to farmers once permission was received from the Resident District Commissioner for any travel within the district or country. Given the poor internet connectivity in the country, virtual meetings were rarely possible. Therefore, as face-to-face meetings were not permitted for a period of three months, Plantwise implementation slowed significantly. For instance, MUK was unable to carry out plant doctor training for students during recess term, and only a handful of districts were able to conduct a limited number of plant clinic sessions after some restrictions were eased. Face-to-face meetings resumed in mid-July 2020
- Discussions were carried out with MAAIF and the World Bank Uganda office regarding integrating clinic data into the National Food and Agriculture Statistics System (NFASS), which is still at the planning stage
- Funds (£49,534) were allocated to Plantwise activities by in-country partners for plant doctor training and the operation of plant clinic sessions
- A total of 30 new plant clinics were established, two in each of Mubende and Kagadi districts and a further 26 in districts in northern Uganda in partnership with PRELNOR. This brings the cumulative total of 290 active plant clinics in the country
- Six national trainers conducted plant doctor training sessions (plant clinic operation, field diagnostics and giving good recommendations) for 22 plant doctor trainees in Buvuma and Kyotera districts
- A workshop was facilitated with 10 national experts (seven male, three female), leading to the review and updating of 86 previously published pest management decision guides (PMDGs)
- An assessment was conducted to document lessons learned from integrating Plantwise plant doctor training modules into institutions of higher learning. This involved 23 participants (15 male, eight female) from seven academic institutions, comprising lecturers, heads of departments and four students who completed the plant doctor training course from MUK and UCU. The institutions have chosen either to conduct a solid block (one week) of plant doctor training or to integrate the training content into existing course units and community field attachments. In addition to enriching the study experience of faculty and students with a very practical and interactive training experience, the use of the plant clinic as a community outreach tool increases the visibility and impact of these institutions in the surrounding communities. These successes have helped ensure institutional funding commitments to continue the plant doctor training as part of curriculum activities. The Plantwise training also makes graduates more marketable now that the plant doctor function is included in the official job description for government extension workers
- Surveys were conducted to assess the usefulness of online plant doctor quizzes and to understand the effectiveness of social media chat groups as a means of advancing plant health information. This found that there are various chat groups where plant health information is shared and discussed. These groups function at district and national level, as well as for commodity-specific groups (eg cocoa farmers) and project-specific groups. Practitioners tend to belong to more than one social media group associated with their work: 35% belonged to three to six chat groups and 20% belonged to six to 10 different chat groups. Among those surveyed, 92% felt these social media groups made a moderate to significant contribution to the delivery of extension services

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	30	290 (282)
Plant doctors trained	50	987 (900)
PMDGs drafted	0	350
Factsheets drafted	0	71

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Vietnam

Partner name	Role
Vietnam Academy of Agricultural Sciences (VAAS), Ministry of Agriculture and Rural Development (MARD)	NRO, data management
Plant Quarantine Diagnostic Centre (PQDC) Plant Protection Department (PPD), MARD	LIO, lab diagnostic facility
Southern Horticultural Research Institute (SOFRI)	LIO
Western Highlands Agriculture and Forestry Science Institute (WASI)	LIO
Plant Protection Research Institute (PPRI)	LIO, lab diagnostic facility, review of Plantwise technical material
Sustainable Management Services Vietnam Co. Ltd (ECOM-SMS), Vietnam	LIO (coffee plant clinics)
BOMS Software Ltd., Vietnam	Technology partner to develop AI Plant Doctor App

Sustainability outlook

- CABI and partners conducted a sustainability assessment, involving six key informant interviews and discussions with a further 13 plant doctors and 11 farmers, to evaluate how Plantwise would likely be sustained by partners after 2020. Although key informants feel plant clinics enhance the capacity of plant doctors and benefit both the government and private sector, budget to support all the plant clinics has not been secured. A significant challenge is the lack of official policy for plant clinic operations
- Since 2017, there has been a gradual decline in the number of active clinics. In response to the lack of support from institutional budgets, some of the plant clinics have been successful in securing funding from alternatives sources, including the USAID-funded project Integrated Pest Management (IPM) for exportable fruit crops in Vietnam. However, the longer-term continuity of most plant clinics will depend on the availability of provincial funding. Although Vinh Phuc provincial PPD, SOFRI and WASI might continue supporting a few plant clinics through their own funds, establishing linkages between non-governmental organizations and the private sector could also be beneficial
- Plantwise resources such as the Knowledge Bank have been well-received by plant doctors and will continue to be used going forward. Similarly, plant doctors and government officials agree that plant clinic data has been valuable because understanding the risks farmers face regarding pests and diseases is essential. VAAS has used plant clinic data for generating reports that are shared with other national stakeholders; the data has also been used to develop a proposal for scaling up plant clinics in the country. However, given that plant clinics only operate in some provinces and reach a limited number of farmers, the clinic data has not been considered useful at a national level. While SOFRI and WASI have expressed commitment for recording and uploading data to the Plantwise Online Management System (POMS), there was no confirmation that this process will be funded by partners
- Finally, most respondents reported that monitoring and evaluation is not implemented very systematically in Plantwise activities. Doing so, including data validation to monitor plant doctor performance, would require more time and resources

2020 highlights

- The COVID-19 pandemic had a significant impact on Plantwise activities in Vietnam in 2020. Plant doctors were obliged to reduce standard plant clinic activities and instead advised farmers over social media (eg Zalo and Facebook) during the lockdown period. Nonetheless, plant doctors were still capturing data through their prescription forms and uploading it to POMS. Plant doctors reported an increase in the use of materials in the Knowledge Bank during 2020. Similarly, stakeholder meetings were held online. The piloting of coffee-focused plant clinics was delayed, as was data management training with staff of ECOM-SMS. Plantwise activities planned with Olam Plantation Vietnam for 2020 also had to be postponed
- One national steering committee meeting was conducted to discuss the evaluation of the Technology Report submitted to MARD as a proposal for plant clinic scale-up in the country and the impact of COVID-19 on activities. Members acknowledged Plantwise's services to the country and requested the Director of CABI SEA to write a request letter to PPD for a formal evaluation of the proposal. This letter was submitted to PPD, but the response was still pending by the end of 2020
- The "AI Plant Doctor" app was developed and launched for the identification and management of dragon fruit problems through collaboration between BOMS Software Ltd, SOFRI and CABI. This new tool was then promoted at two technology exhibitions and presented at the TECHFEST forum by representatives of BOMS Software
- Two advocacy meetings and one plant doctor cluster meeting were conducted with ECOM-SMS to identify a sustainable approach and strategy for piloting coffee plant clinics in 2021 by lead coffee growers who are trained as plant doctors
- The Vietnamese translation of the "Awareness Video for Biological Management of Fall Armyworm (FAW)" was facilitated. This video was originally produced and disseminated in Bangladesh. The plan is to conduct a mass extension campaign in Vietnam in 2021 using this FAW video on social media, websites and YouTube

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	0	25 (12)
Plant doctors trained	0	130 (26)
PMDGs drafted	0	35
Factsheets drafted	0	63

Figures in brackets indicate number of plant clinics and plant doctors active in 2020

Zambia

Partner name	Role
Ministry of Agriculture (Department of Agriculture) (MoA)	NRO; co-financing; LIO
Zambia Agriculture Research Institute (ZARI)	LIO; chair of the national steering committee (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 and custodian of the pesticides list
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)	Supports training of plant doctors; LIO
Netherlands Development Organisation (SNV)	Supports training of plant doctors; LIO
Mulungushi University	Development of extension materials
Monze School of Agriculture	Development of extension materials
National Agriculture Information Services	Member of NSC
Conservation Farming Unit (CFU)	Sponsors training of their staff as plant doctors
World Vision Zambia (WVZ)	Member of NSC; LIO; sponsors training of government agricultural extension staff as plant doctors
Zambia National Farmers Union	Member of NSC
University of Zambia (UNZA)	Member of NSC; supports development of extension materials and trainers
Simalaha Community Conservancy (SCC) (Peace Parks)	LIO; sponsors training of their staff as plant doctors, as well as government staff

Sustainability outlook

- A sustainability assessment was conducted involving key informant interviews with programme partners to evaluate how Plantwise would likely be sustained by partners after 2020. A total of 22 key informant interviews were conducted, involving stakeholders with and without knowledge of Plantwise operations. Discussions were held on Plantwise interventions that will be sustained beyond donor funding, interventions that will not be sustained, challenges and risks to sustainability. Findings showed varying degrees of sustainability for the different elements of the programme
- Stakeholder linkages developed under Plantwise are likely to continue within the functions of some organizations, eg National Plant Protection Organisation and Extension, sharing plant clinic data for general surveillance. Others, such as NSC meetings, will not continue unless provided with budgetary support by partners or through other projects
- Plant clinics near the SCC are likely to continue for some time through funding from the Peace Parks Foundation. Clinics situated near plant doctor residences are also likely to run longer and are more likely to continue

generating data. The MoA had included plant clinic operations in their 2020 budget, although this was not funded due to inadequate allocations from the state. There is, however, an indication that future funding support will be provided for plant clinic activities through state funding to the MoA. Mass extension campaigns will easily continue if mainstreamed into similar approaches by organizations such as the Disaster Management and Mitigation Unit, the Zambia Metrological Department and MoA, which have been sending SMS through their Integrated Agriculture Management Information System (ZIAMIS) or radio messages

- The use of Knowledge Bank resources such PMDGs and factsheets will continue, as partners are now aware that these will remain freely available and accessible. The use of social media platforms to support diagnosis and information sharing will also continue. Most data management processes, including validation and harmonization, are unlikely to continue because these are costly and entirely CABI-driven
- Other elements, such as monitoring of plant clinic performance and cluster meetings, will not continue due to their reliance on funding from CABI

2020 highlights

- COVID-19 has affected a lot of planned activities in Zambia due to restrictions aimed at preventing the spread of the virus. People were not allowed to meet in groups for long periods, which affected plant clinic operations and planned workshops. However, with financial support from CFU and the COmON Foundation through the Peace Parks Foundation, the team was able to hold two plant doctor training workshops and run plant clinics at the SCC in Western Zambia. Activities such as the data sharing workshop and the sustainability assessment were held virtually
- Funds (£60,588) were allocated by CFU and the SCC for plant clinic operations and training their lead farmers and plant doctors
- Two NSC meetings were held, and one stakeholder forum
- CABI staff and national trainers conducted Modules 1 and 2 training for 70 CFU lead farmers and agriculture extension officers (49 male, 21 female)
- Three national trainers conducted Modules 1 and 2 training for 20 plant doctor trainees (13 male, seven female) with funding from Good Nature Agro (GNA)
- The establishment of 51 new plant clinics was facilitated by SNV, WVZ and SCC
- One write-shop with national experts was facilitated, leading to the revision of 10 pest management decision guides (PMDGs) and the development of two new factsheets
- E-plant clinic training was conducted for 14 participants (13 male, one female) to introduce the use of digital devices at plant clinics
- Plant clinic data was used by national partners to identify new research projects and to set up trials on Fall Armyworm (FAW)

Quick stats

Quick stats	New in 2020	Cumulative total
Plant clinics established	51	172 (91)
Plant doctors trained	90	442 (120)
PMDGs drafted	–	42
Factsheets drafted	–	51

Figures in brackets show the number of active plant clinics and plant doctors in 2020

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

Plantwise is supported by:

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