

PlantwisePlus Annual Report

KNOWLEDGE FOR LIFE

PlantwisePlus enables countries to confidently face the challenges of plant health threats in a changing climate by empowering smallholder farmers to increase income, food security and food safety by producing more and higher quality food.

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Abbreviations

BBTV	Banana bunchy top virus
CBSD	Cassava brown streak disease
DGIS	Directorate General for International Cooperation of the Netherlands
EAC	East African Community
ECOWAS	Economic Community of West African States
EU	European Union
FNS&SA	Food and nutrition security and sustainable agriculture
INTPA	European Commission Directorate General for International Partnerships
IPM	Integrated pest management
КРК	Khyber Pakhtunkhwa (province of Pakistan)
MARA	Ministry of Agriculture and Rural Affairs
MoU	Memorandum of understanding
NPPO	National plant protection organisation
PRA	Pest risk analysis
PRISE	Pest Risk Information Service
SADC	Southern African Development Community
SMS	Short Messaging Service

Executive summary

PlantwisePlus is a global programme, led by CABI, that contributes to improving the incomes and livelihoods of smallholder farmers through supporting sustainable approaches to crop production, leading to safer and higher-quality food in domestic markets. It builds on and enhances work done under the preceding Plantwise and Action on Invasives programmes, but also introduces new elements to address gaps and opportunities identified through the lessons learned. Interventions under PlantwisePlus contribute to three "impact pathways": (i) **pest preparedness**, (ii) **farmer advisory**, and (iii) **pesticide risk reduction**.

The programme is currently in a proof of concept phase (2021–2023), which aims to demonstrate that the core principles and assumptions of the programme are correct and to verify that the proposed interventions have the potential for practical implementation at scale. This includes an assessment of the effectiveness of individual outputs as well as the overall programme approach in regard to meeting the needs of target groups and beneficiaries through implementing appropriate solutions. In this initial phase, the focus is on gathering information and baseline data against which the assumptions can be tested, as well as piloting specific elements of the new programme in a limited number of focus countries to assess demand, uptake and, where possible, outcomes and impact.

In 2022 PlantwisePlus implementation was mainly concentrated in six focus countries: Kenya, Ghana, Pakistan, Zambia, Uganda and Bangladesh. An additional 21 countries across Africa, Asia and the Americas are benefitting from backstopping of plant clinic and related activities that were introduced under the Plantwise programme, as well as newly developed digital learning and decision support tools.

Programme implementation is generally on track with regard to meeting expected targets (see Annex I). Some delays have been experienced: for instance, in guiding policy developments for more streamlined regulation of lower-risk plant protection products. However, there have also been areas with more rapid progress than expected: for example, gender advocacy work in Ghana and skilling of women and youth agricultural service providers to create new income-generating opportunities. Some key highlights from 2022 include the following:

- Prioritization of potential invasive plant pests was completed in Zambia, Burkina Faso and Pakistan, and was initiated in Bangladesh, using CABI's Horizon Scanning Tool
- More than 40 full pest risk analyses (PRAs) were conducted in Kenya and Ghana, with the process now fully integrated in national plant protection activities
- An estimated 4.3 million farmers were reached by PlantwisePlus through a combination of plant clinics (149,276), plant health rallies and the like (32,847), Pest Risk Information Service (PRISE) SMS alerts (43,543), mass extension campaigns (445,100), digital tools (197,727) and subsequent farmer-to-farmer sharing of information acquired (3,473,972)
- The Crop App Index (www.cropappindex.org) was launched in February, providing a guide to approximately 500 agricultural apps and web-based tools for users around the world

- A framework was developed for the PlantwisePlus Toolkit, a platform that will serve as a one-stop-shop for recommended digital decision support tools produced by CABI and third parties
- The CABI BioProtection Portal (www.bioprotectionportal.com), an open-access online knowledge resource for advisors and farmers, is now available in 32 countries globally and is attracting increasing support from private sector stakeholders
- Automated translations embedded in CABI's open-access digital learning products were tested with users in multiple countries in a major step towards facilitating wider uptake of tailor-made distance learning courses globally
- A social learning group of gender stakeholders from the government, academic and non-governmental sectors in Ghana was formed and 427 agricultural officers and extension staff were trained on the use of tools to enhance the gender sensitivity of their work
- Engagement was initiated with the Green Label crop production standard in Ghana and the KS1758 code of practice in Kenya, and training was provided to 326 extension agents and facilitators who will support farmers to comply with these standards
- Releases of a biological control agent against the papaya mealybug in coastal Kenya are resulting in successful establishment of the agent at all sites, impacting pest populations
- A first new local production facility for a selected biological control agent was established and facility
 personnel were trained in Khyber Pakhtunkhwa (KPK) Province of Pakistan for the management of a key
 pest in tomato

These and other achievements in 2022 highlight the uptick in implementation that was observed during the past year. Several studies that test programme assumptions were conducted under various parts of the programme, such as (i) evaluating the sustainability of plant clinics in the absence of continuous programme support, (ii) reviewing the success of co-ordinated actions against invasive species, and (iii) assessing the level of interest among agro-input dealers in a voluntary certification scheme linked with performance criteria. These have contributed immensely to the learning by CABI and its partners on what works and what does not work.

In December 2022, the Royal Tropical Institute was awarded a contract to conduct an external review of the proof of concept phase of the PlantwisePlus programme. The purpose of the review is to test the performance of PlantwisePlus against the logframe and impact pathways, and to provide practical advice for the scaling of the programme in both the current focus countries and new countries (including fragile nations) from 2024. The external review report will be available in time for the Donor Forum meeting on 9–10 May 2023.

Introduction

Food security, food safety and the sustainability of agricultural production are critical challenges for the growing global population. Major crops that are important for food and nutrition security, as well as income generation, in developing countries suffer from frequent and severe production constraints due to poor crop management. These limitations are further exacerbated by factors such as invasive species and climate change. The plant health system of the future needs to be more proactive and agile in identifying and responding to plant health problems.

At both national and regional levels, there are often no consistent or co-ordinated mechanisms for surveillance, rapid detection and response, or for providing the technical support needed to identify plant health problems and deliver effective solutions.

A major driver of crop loss is limited access to reliable information about best practices that could enable smallholder farmers to become more prepared for emerging plant health threats, such as new pest outbreaks. Due to the limited reach provided by public advisory services, agro-input dealers continue to be a major source of advice to farmers; however, they generally lack the capacity to provide accurate diagnoses and sound crop health advice.

Due to increasing plant health threats, indiscriminate use of highly toxic plant protection products is affecting product efficacy, as well as human, livestock and environmental health. Awareness of pesticide risks and mitigation measures is still low among smallholder farmers, as well as agro-advisory service providers.

PlantwisePlus is a global programme, led by CABI, that contributes to improving the incomes and livelihoods of smallholder farmers by helping them apply sustainable approaches to crop production, leading to safer and higher-quality food in domestic markets. The programme builds on and enhances work done under the programmes Plantwise and Action on Invasives, but also introduces new elements to address gaps and opportunities identified through the lessons learned from implementing those programmes.

To respond to the needs of farmers and the systems that support them, PlantwisePlus is helping countries predict, prevent and prepare for plant health threats, thereby reducing crop losses. This is achieved by addressing the key remaining challenges identified through the Plantwise and Action on Invasives programmes, and thus supporting countries and farmers to produce the required quantity and quality of food in a changing climate.

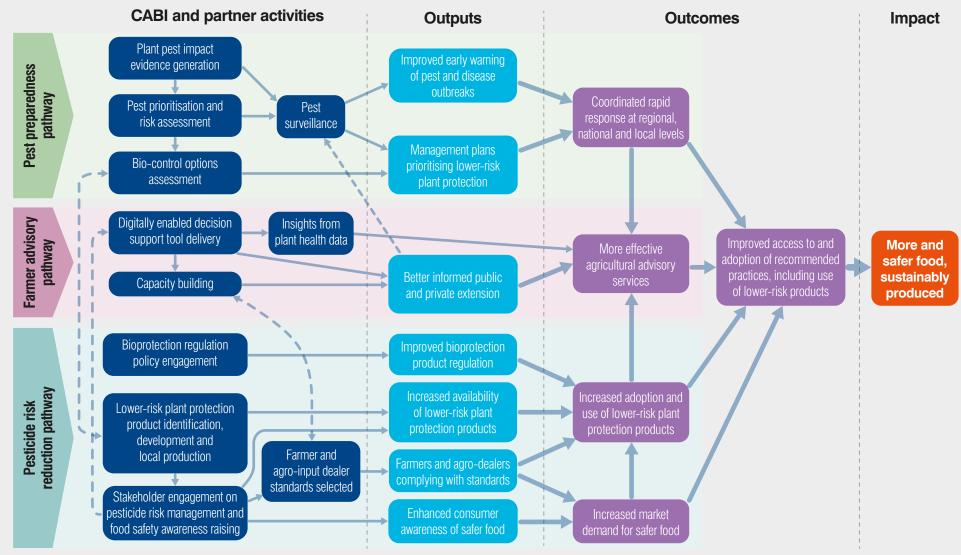
PlantwisePlus delivers processes and tools that contribute to the following impact pathways:

Pest preparedness: By strengthening the detection of and response to pest outbreaks, the programme supports countries to implement more consistent and co-ordinated mechanisms to predict, detect, identify and respond to plant health problems.

Farmer advisory: By delivering digital advisory tools, the programme boosts sustainable agriculture and improves the capacity of public and private actors who provide support to smallholder farmers to diagnose crop health problems and recommend sustainable solutions.

Pesticide risk reduction: By enhancing the use of lower-risk plant protection solutions, the programme helps reduce reliance on high-risk farm inputs that have adverse effects on human health and biodiversity, while helping to meet the demand for safer and locally produced food.

PlantwisePlus impact pathways



Delivered through gender-sensitive approaches and climate-resilient practices

Underpinning the three impact pathways are four major internal work streams (programme-specific objectives), plus the ongoing backstopping of the Plantwise approach as follows:

- Strengthening systems for the detection of, and response to, pest outbreaks (contributes mainly to the pest preparedness pathway)
- Enhancing knowledge of and the uptake of sustainable plant health practices through responsive digital advisory and learning tools (contributes mainly to the farmer advisory pathway)
- Increasing the supply of safer food through enterprises that are driven by women and youth to meet growing demand by consumers in rural, urban and peri-urban markets (contributes mainly to the pesticide risk reduction pathway)
- Developing the capacity and systems for the local production and distribution of low-risk plant protection products (contributes mainly to the pesticide risk reduction pathway)
- Maintaining partnerships established under the Plantwise programme as a basis for the delivery of several of the new PlantwisePlus activities (contributes mainly to the farmer advisory pathway)

However, external communication and reporting have been streamlined to focus on the three impact pathways.

PlantwisePlus is currently in a proof of concept phase (2021–2023), which aims to demonstrate that the core assumptions of the programme are correct and to verify that the proposed interventions offer the potential for practical implementation at scale. This includes assessing the effectiveness of individual outputs, as well as the overall programme approach, in regard to meeting the needs of target groups and beneficiaries through appropriate solutions. In this initial phase, the focus is on gathering information and baseline data against which the assumptions can be tested, as well as piloting specific elements of the new programme in a limited number of countries to assess demand, uptake and, where possible, outcomes and impact.

PlantwisePlus implementation includes activities with a global focus, as well as activities with a country focus. In 2022, country-specific activities were concentrated mainly in six focus countries: Kenya, Ghana, Pakistan, Zambia, Uganda and Bangladesh. In addition to that, the programme continued to provide strategic backstopping to 21 other PlantwisePlus countries across Africa, Asia and the Americas where elements of the Plantwise approach continue: Afghanistan, Barbados, Bolivia, Burundi, China, Costa Rica, Ethiopia, Grenada, India, Jamaica, Malawi, Mozambique, Myanmar, Nepal, Nicaragua, Peru, Rwanda, Sri Lanka, Thailand, Trinidad and Tobago, and Vietnam.

The donors contributing to PlantwisePlus in 2022 are the Directorate General for International Cooperation of the Netherlands (DGIS), the Swiss Agency for Development and Cooperation, the European Commission Directorate General for International Partnerships (INTPA), the UK Foreign, Commonwealth and Development Office, and the Australian Centre for International Agricultural Research. In addition, the Ministry of Agriculture and Rural Affairs (MARA) of the People's Republic of China provides financial contributions for programme implementation in China through its contributions to the CABI Development Fund for the operations of the MARA–CABI Joint Laboratory in Beijing.

This report presents an update on PlantwisePlus implementation between January and December 2022, which builds on the progress made since inception. The global programme consists of more than 50 activities under 13 outputs. To simplify communication, this report provides a narrative of the progress made through presenting key highlights from programme activities covering a range of outputs, plus challenges encountered and measures taken during the reporting period. Annex I provides a more comprehensive, but concise, update on the results achieved against programme indicators and specific targets for the proof of concept.

In addition to this annual report, CABI has compiled supporting technical reports containing further details on implementation under each output and activity. These are available upon request.

PlantwisePlus highlights

Pest preparedness

Pest preparedness

Changing weather patterns are helping to drive the spread of invasive pests to new areas, and existing pest outbreaks also flare up unpredictably. However, there is often no consistent or co-ordinated mechanism at a national or regional level to ensure effective pest surveillance, rapid detection and response. To address these capacity gaps, PlantwisePlus has implemented several initiatives in 2022 to reduce the spread of invasive pests and to better prepare communities for future outbreaks.

Horizon scanning, PRA and response planning for identified threats

The methodologies and tools developed in PlantwisePlus are being increasingly utilized by countries to carry out PRAs, create lists of priority invasive species, and devise management strategies for them. Building on the progress made in 2021, in 2022 PlantwisePlus trained a further cohort of representatives from national plant protection organisations (NPPOs) and experts from universities in Bangladesh, Burkina Faso, Ghana, Kenya, Pakistan and Zambia on the use of CABI's Horizon Scanning and PRA tools. These web-based tools allow for pest species to be prioritized and for risk analyses to be carried out for high-priority pests. To assist NPPOs to conduct more structured horizon scanning and risk analysis, PlantwisePlus generated a total of 20 pest insight reports (five per pilot country: Ghana, Kenya, Zambia and Burkina Faso). These insight reports use information gathered by regularly web-scraping/-searching to identify multiple sources of pest and disease outbreak information. Subject matter experts then synthesize the data into a report that guides countries in evaluating the level of risk posed by each organism. Feedback from NPPOs indicates that the reports are useful and have triggered changes to risk management.

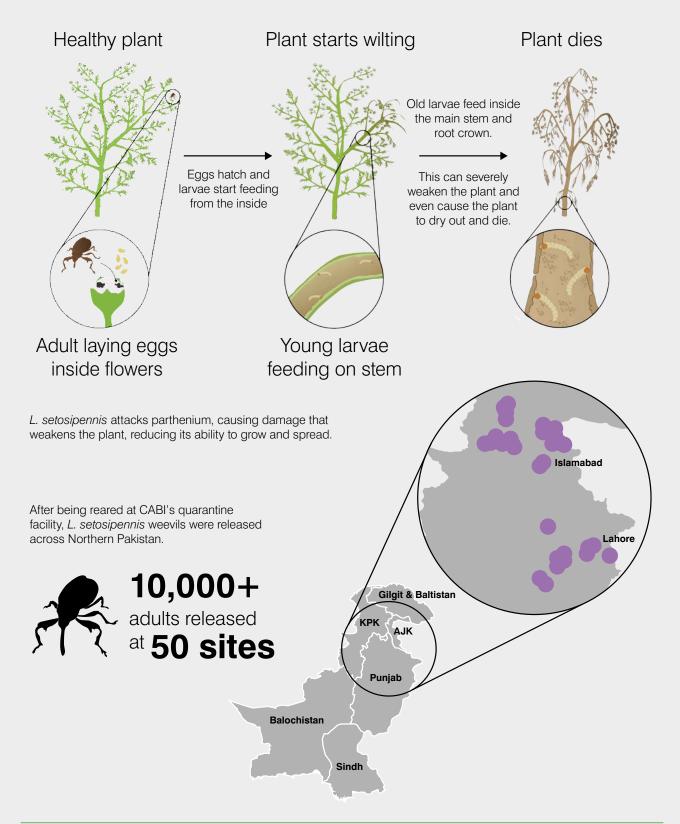
To reduce the time and costs associated with seeking assistance from subject matter experts, a proof of concept has been initiated in regard to using machine learning to filter raw information. Also being tested is a human-centred design approach, which seeks to better understand NPPO priorities and how pest insight reporting and other pest risk-related activities fit within their mandate. This approach has already confirmed that capacity development in regard to understanding risk is needed to make full use of the various tools.

Surveillance activities in Ghana and Kenya were undertaken in response to the species prioritized by the horizon scanning exercise. As a result, several previously unreported species were discovered, showing the value of this targeted surveillance.

In 2023, the use of the Horizon Scanning and PRA tools will be extended to look at threats regionally. This will take place for the East African Community (EAC), Southern African Development Community (SADC) and Economic Community of West African States (ECOWAS) economic blocs. In addition, PRA will be conducted for prioritized invasive species using CABI's Horizon Scanning Tool in Bangladesh.

Rearing and releasing biocontrol agents to combat invasive parthenium weed

PlantwisePlus is rearing and releasing the stem-boring weevil, *Listronotus setosipennis*, to control the invasive weed, *Parthenium hysterophorus* in Pakistan. Also known as "famine weed", parthenium can **reduce pasture carrying capacities by as much as 80% to 90%**. It is also poisonous and has severe impacts on human and livestock health.



Improvements to the tools planned for 2023 include the development of a French version for francophone countries and an exploration of the potential to include climate change information in the tools. A "risk register" will be developed for Ghana and Zambia based on the recommendations from the human-centred design workshops held in these countries. This risk register will record all of the pests that are identified as being of phytosanitary concern, along with any risk assessments that have been undertaken, regulatory decisions taken, etc. This register will provide government, industry and other stakeholders with a tool they can use to identify and prioritize action against significant pests and diseases in their regions. It will also help to ensure that the necessary resources are allocated to address the identified risks.

Biological control of invasive species

The papaya mealybug (*Paracoccus marginatus*) is an invasive species in Kenya and several other African countries. This sucking pest causes economic damage to papaya fruits, vegetables and ornamental plants. A classical biocontrol programme in Kenya began with the introduction of the parasitic wasp (*Acerophagus papayae*) into quarantine facilities in Kenya. In 2022 releases of the biocontrol agent were made in eight coastal districts of Kenya, with the wasp being established at all sites and high rates of parasitism (up to 72%) recorded in the field. Farmers in the release areas were also trained on how to maximize the benefits of the biocontrol agents. To further strengthen this nature-based pest management intervention, the Kenya-based biocontrol production team underwent training on an improved mass production technology that has proven successful in Pakistan. By the end of the year, monthly production of the biocontrol agent had increased 200-fold. For 2023, further releases are planned for Kenya and in South Sudan, where permission for release has been granted. Uganda is another potential country where releases could be made; however, PlantwisePlus is still awaiting release permission.

Another interesting technology that could aid the establishment of this biocontrol agent is the use of natural enemy field reservoirs. This low-tech approach could be used to increase the numbers of wasps on farms. A study of this approach is planned for 2023 in Kenya to evaluate its potential for use in Africa. Also in 2023, post-release monitoring and impact assessment of the biological control programme will be undertaken to evaluate the suppression of papaya mealybug populations in Kenya.

Parthenium weed is an invasive weed species that has spread throughout much of rural and urban parts of Pakistan. It poses a major threat to biodiversity and has negative impacts on crops and pastures, and on human and animal health. A biological control programme to assess and release a Parthenium stem boring weevil (*Listronotus setosipennis*) has been initiated by PlantwisePlus, with the approval of the Pakistan Agricultural Research Council and Department of Plant Protection. In 2022 the mass production of the weevil was expanded to new production sites and thousands of the weevils were released in several provinces. In 2023 further releases are planned, as well as post-release monitoring to assess the establishment and overwintering survival. The PlantwisePlus team is working to improve the rearing facilities and expertise at the provincial level through collaborations with universities. To increase stakeholders' understanding of the management of Parthenium with the stem boring weevil, the team has conducted seminars, workshops, training of trainers, and farmer field days.

Creating an evidence base for interventions against invasive species

In Zambia, cassava is the second most important crop after maize and is increasingly gaining importance as a promising drought insurance crop that can aid in climate change mitigation. However, cassava production is under threat in northern parts of the country due to cassava brown streak disease (CBSD), a viral disease that can devastate cassava yields. CABI experts produced an evidence note to help inform policy makers on the damage caused, and the management options that are available. The effects of CBSD and management strategies were assessed through a combination of household surveys and secondary data. Farmer survey results across the three surveyed districts indicated annual average yield losses of 1.4 tonnes per hectare. An early indication of the economic damage due to CBSD in Zambia estimates it to be over USD 500,000 annually, making this disease the leading constraint on cassava production in sub-Saharan Africa. Despite 67% of the surveyed farmers indicating regular field monitoring for abnormal changes or pest presence, limited knowledge of CBSD impedes effective control and management of the disease in Zambia.

A communication campaign was designed to address the specific issues relating to CBSD and the need to support farmers in affected areas. In addition to raising awareness of the issue, the campaign encouraged national engagement, with a view to establishing large-scale propagation of clean planting material as an option for farmers while plant breeding efforts are explored. In 2023 support will continue through making

clean planting materials available, and the development of a training curriculum for personnel propagating clean planting material, to ensure they meet the necessary quality requirements. As clean planting materials become available there will be a shift in the messaging to farmers, to support them in finding and accessing these materials. Based on further data about the spread of CBSD in the country, it may be possible to develop regionally-tailored communication campaigns with messages that are appropriate to the local CBSD status. For example, where CBSD has yet to spread, the messaging would focus on restricting the introduction of planting materials from outside of the area and implementing phytosanitary processes.

Farmer advisory

Many smallholder farmers still lack access to reliable information about best practices in agriculture. Public extension plays an important role in supporting smallholder agriculture, but there are not enough trained advisors to meet the needs of smallholders. Therefore, farmers often seek advice on plant health from agroinput dealers and others in their communities. PlantwisePlus recognizes that there are limits to the number of agricultural service providers that can receive formal training on best practice. As a result, PlantwisePlus is seeking to improve access to intuitive decision support tools, distance learning and information, to allow advisors and farmers to make better crop management decisions.

PlantwisePlus Toolkit

The PlantwisePlus Toolkit brings together tried and trusted digital tools to help farmer advisors to identify websites and apps that can support decision-making. Lessons learned from past digital projects were used in the design and development of the Toolkit site, to ensure it is as functional as possible, with pages optimized to load promptly on weaker connections and using minimal mobile data. The development also incorporated specific design considerations for users on desktop, tablets and mobile devices, as well as a focus on accessibility and a seamless user journey. The compilation of decision support tools in one place will make a big difference to the discoverability of the PlantwisePlus digital tools.

To continue building up the PlantwisePlus Toolkit, CABI developed a new digital decision support tool (the Crop Sprayer dosage calculator app) and upgraded two existing tools: the PlantwisePlus Knowledge Bank and the Plantwise Factsheets Library app. The PlantwisePlus Knowledge Bank is a core component of the PlantwisePlus Toolkit and in 2022 improvements were made to its functionality and content, with new external content added focusing on climate-smart agriculture. Another area identified by users as requiring improvement was the need to update the materials available in the Factsheet library app. The Pest Management Decision Guides and Factsheets for Farmers of several countries were reviewed this year, including Rwanda, Kenya, Uganda, Nicaragua, India and Pakistan. The reviews paid particular attention to the chemical control methods, confirming that the chemicals used are registered and effective against the pests concerned.

Awareness-raising activities aimed at promoting the PlantwisePlus digital decision support tools and learning products continued throughout 2022. This included producing news articles, blogs, flyers, and short demonstration videos, and holding workshops. In Bangladesh, the digital tools were introduced to more than 6,400 Sub-Assistant Agricultural Officers as part of a plant doctor training effort. A key lesson learned from this activity is that, despite the popularity of Google, paid ads are not sufficient to reach the key user groups of extension workers, agri-input suppliers and farmers. Reaching these groups requires more diverse means, including promotion at face-to-face events and making use of country-based networks, such as social media platforms, short messaging service (SMS) messages, and agriculture platforms. The network of Plantwise partners are considered by CABI to be an important channel for the dissemination of new digital tools.

Sustainable agricultural practices on the PlantwisePlus Knowledge Bank

In 2022, a review was undertaken to identify existing climate-smart integrated pest management practices on the PlantwisePlus Knowledge Bank. The aim was to identify gaps related to climate-smart agriculture (CSA) advice to support future content improvements, especially regarding **actionable practices associated with adaptation**. Below are some of the CSA practices that were identified across a range of resources such as Pest Management Decision Guides and Factsheets for Farmers.





CONSERVING AND ENCOURAGING NATURAL PEST ENEMIES by planting flowering plants around crop fields.

INTERCROPPING

increases the stability of crop yields, improves soil quality, and increases the efficiency of water and soil use.

APPLYING MANURE COMPOST improves soil nutrients, crop yield, and water retention.

()) CAB

MANAGING WATER EFFECTIVELY through

careful preparation of the land to avoid waterlogging, or to channel water for irrigation, and use of mulches to conserve soil moisture.

PLANTING RESISTANT

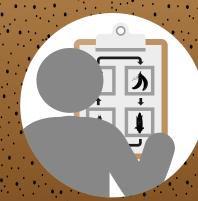
CROP VARIETIES such as those resistant to drought, pests, salinity, and other climate-related stress. Direct seeding outside also reduces soil degradation and erosion.



7,962

FACTSHEETS WITH CSA RECOMMENDATIONS IDENTIFIED IN THE PLANTWISEPLUS KNOWLEDGE BANK

CSA practices like these help farmers to adapt and build resilience to climate change.



CROP ROTATION helps to improve overall soil health and increases resilience of the cropping system to climate change. Plant clinics continue to operate in many of the PlantwisePlus countries and the ongoing dialogue with, and backstopping of the partners operating those advisory services, enables PlantwisePlus to monitor outreach and provide strategic assistance when needed.

Alongside the PlantwisePlus Toolkit, CABI has developed the Crop App Index, an interactive website that helps agricultural service providers and farmers find agricultural apps and decision support tools that meet their needs. This online inventory was launched in February 2022 with 350 digital tools listed, and by the end of 2022 covered over 500 tools, with more being added regularly. The site has already proven popular with users trying to find a digital tool that meets their needs. Between launch and the end of the year, more than 18,000 users, largely from PlantwisePlus countries and other low-income and lower-middle income countries, have navigated and used the Crop App Index. The average use time is 1 minute 30 seconds, which fits with CABI's assumptions of a complete work flow on the site (the time required to find a digital tool that meets users' needs).

A new system has been built to collect, manage and visualize data from PlantwisePlus digital products. This will provide insights into the way the PlantwisePlus digital tools are being used, the people using them and the type of information that they are consuming. Automated processes will allow this data to be drawn together from different sources, harmonized into standard formats, and presented in dashboards that will provide a programme-wide overview of PlantwisePlus tools and users.

CABI BioProtection Portal

By the end of 2022, the CABI BioProtection Portal had received more than 1 million visits since its launch in February 2020. Five new countries were made available on the site in 2022 (Sri Lanka, Nepal, Ivory Coast, Costa Rica and Australia), bringing the total number of countries to 32. There are now approximately 4,000 bioprotection products available on the Portal, providing farmers with nature-based solutions for 927 pests.

An offline version of the Portal was launched in 2022 so users can now use the tool where internet connectivity is poor or unavailable. A review of the CABI BioProtection Portal was undertaken in 2022 to investigate user experiences, the lessons from which led to improvements that aimed to increase the site speed and reduce the number of clicks required to perform a product search.

Two new sponsors of the Portal have signed a three-year agreement, meaning the Portal now has 14 partners, six sponsors and five donors. This private sector income is crucial for the future sustainability of the Portal. The three partners who were the first to sign an agreement in 2019 have renewed their partnership for another three years. All partners have been given access to user analytics dashboards, as well as training on how to use them. Collaborative work was conducted with Rainforest Alliance, a sponsor of the Portal, with the result that their logo is now displayed against products on the Portal that are compatible with the Rainforest Alliance certification standards. This gives growers working under the scheme more guidance in regard to product selection.

Data for three new countries (USA, Indonesia and Malaysia) was prepared and is now awaiting translation and/or testing prior to being loaded onto the Portal. It is anticipated that a further 13 countries will be added to the Portal in 2023, which will result in a total of 45 countries being available on the Portal by the end of the PlantwisePlus proof of concept phase. In addition, the resources section of the Portal will be further developed to improve awareness and understanding of biocontrol among users. Efforts are also ongoing to identify the most appropriate and effective channels to promote use of this decision support tool by in-country public and private sector agriculture advisory services.

Improved provision of gender-sensitive agricultural extension

Alongside the delivery of tools to assist advisors with technical decision-making, the PlantwisePlus programme has been engaging partners in Ghana and Pakistan on the issue of gender awareness and sensitivity in advisory services. The agricultural advisory services field has historically been male-dominated, potentially creating a barrier to women farmers' access to such services. Gender dynamics and social norms can prevent women accessing and utilizing technology, while male extension workers may not be aware of the types of advisory services that women would most benefit from. Furthermore, there are still pervasive, inaccurate perceptions of women's abilities in agriculture that must be addressed in order to ensure equitable access to agricultural advisory services. During 2022, a gender and rural advisory services assessment was conducted in Pakistan, and the results were shared with stakeholders in a validation workshop held in Lahore, Pakistan. A similar assessment that was conducted in 2021 in Ghana was also finalized and published during 2022. The assessment found the existence of a strong policy framework and institutional structure for mainstreaming

gender in agriculture extension in Ghana, while the Pakistan assessment identified that there is a weak policy environment and weak accountability mechanisms. The two assessments identified similar challenges, such as restrictive social norms and difficulties faced by women extension staff working in the field. After validating the assessments, action plans were developed in collaboration with stakeholders in each country to address the key findings.

In Ghana, actions contained in the gender and rural advisory services action plan that were carried out included forming a social learning group of gender stakeholders from the government, academic and non-governmental sectors, and training 400 district-level extension staff on gender issues and tools to enhance the gender sensitivity of their work. Additionally, an investigative article was commissioned to explore the factors that impede women's employment in the extension sector. PlantwisePlus also supported an award ceremony for the best female farmer in the Bono region, as part of the 2022 Farmers' Day celebrations. This intervention helps to bridge gender inequalities and raise the profile of female farmers, improving their participation in, and the benefits they obtain from, agriculture.

In Pakistan, the development of the gender and rural advisory services action plan is at an earlier stage, with the national validation workshop taking place in November 2022, prior to the finalization of a strategy to respond to the recommendations. Given the very different gender contexts within the two countries, a different strategy and activities are required to support the issue of gender within extension in Pakistan, with policy gaps noted as a key issue in that country. However, a "Gender in Agriculture" working group will also be established in Pakistan in 2023 to promote the implementation of the social learning approach in the country.

During 2023 activities will continue in both Ghana and Pakistan; however, there is a recognition that influencing the gender sensitivity of national extension services requires a number of changes at both social, policy and organizational levels, which will require sustained efforts over the medium to longer term.

Continuation of the Plantwise approach

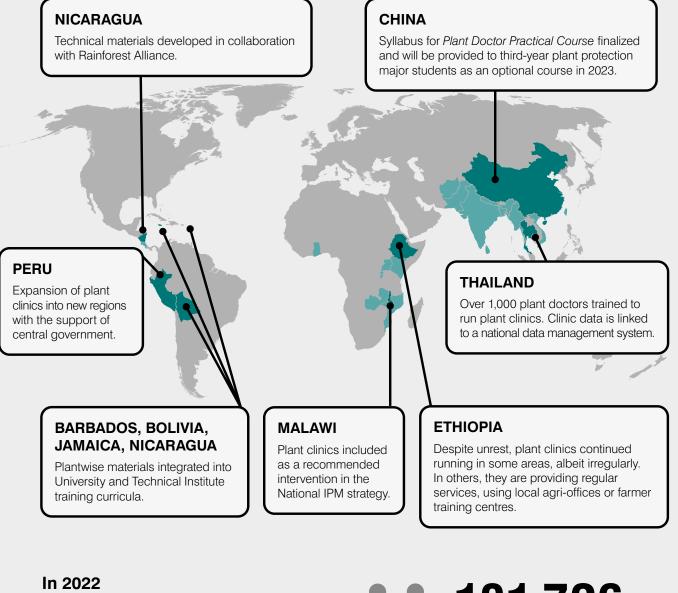
CABI continues to provide strategic backstopping for the implementation of the Plantwise approach (primarily focused on plant clinic operations) across all of the 27 PlantwisePlus countries. Priority areas include, for instance, stakeholder meetings for review and planning, training of trainers, refresher trainings, trouble-shooting of clinic data issues, diagnostic support, and monitoring visits. In addition, digital resources developed under Plantwise and PlantwisePlus remain a permanent resource that any country can access.

In 2022, two years after the transition of Plantwise into PlantwisePlus, a follow-up sustainability assessment was carried out to address questions about the former programme, including what survived and why or why not? Six countries were chosen where clear signs of country commitment to the Plantwise approach had been observed during programme implementation: Nepal and Pakistan (Asia); Ghana, Kenya, and Malawi (Africa); and Jamaica (Caribbean). The aim of this latest assessment was to gain an understanding of the legacy of Plantwise, or elements thereof, and how the context in each country influenced what happened, positively or negatively, since the programme ended, as well as what the drivers of, and constraints on, sustainability were. The assessment found that four of the six countries (Jamaica, Malawi, Nepal, and Pakistan) were likely to continue running plant clinics, while Ghana and Kenya faced challenges due to a lack of staff and funding. Policy support was found to be crucial in Jamaica and Malawi, while Ghana and Kenya were found to lack the necessary commitment and investment to implement the policy. The assessment highlighted the importance of country context in determining sustainability. Each of the country cases shows that knowledge on national policy, institutional mandates, mode of operation, and available resources are paramount to ensure that interventions fit with existing structures and capacities. Sudden changes can undermine partnerships and achievements made, which makes it difficult to engineer or promote sustainability. The assessment also highlights the need for continued support to ensure positive gains are maintained and built upon.

There is still considerable interest from countries in regard to investing in the Plantwise model of plant clinics and, in 2022, initial discussions were held to this end with stakeholders in Papua New Guinea and South Sudan. In 2023, implementation of the programme in these countries is commencing with desk reviews and discussions with key stakeholders. This ground work is vital, as a good understanding of the landscape of the plant health system within a country is needed to ensure that the right partners are engaged from the beginning.

Continuation of the Plantwise approach implementation

Plantwise activities are ongoing in 27 countries around the world. This demonstrates the sustainability and continued importance of the concept to countries and smallholder farmers.







Active plant clinics

181,726

Farmers reached directly through plant clinics and plant health rallies



Farmer reach

Various combinations of farmer outreach activities were conducted in the PlantwisePlus countries in 2022, including different forms of face-to-face interactions leading to direct reach (e.g. plant clinics, plant health rallies) and complementary interactions that led to indirect reach (mass extension campaigns, SMS pest alerts, digital decision support tools). Overall, an estimated 4,342,465 farmers were reached directly and indirectly through programme-supported activities.

A total of 149,276 farmers were reported to have been served through the plant clinics that continued to run in 2022 across the 27 PlantwisePlus countries. This is more than a 50% reduction in plant clinic reach compared to 2021. This change was driven mainly by a reduction in virtual plant clinics in the Caribbean, which had reached more than 100,000 farmers in 2021. Other notable changes in clinic reach at country level included decreases in reported clinic visits of more than 50% in China and Nepal, and increases of 50% or more in Pakistan, Sri Lanka and India. A further 32,847 received actionable information about important plant health problems through physical plant health rallies and similar information events, such as group discussions and social media chat groups. The majority of these activities in 2022 took place in India, with the focal subjects being identified based on plant clinic data and with the MS Swaminathan Research Foundation delivering the farmer outreach. In Kenya, the Pest Risk Information Service (PRISE) disseminated more than 40 SMS messages to more than 20,000 subscribing farmers in the short rain season and over 23,000 farmers in the long rain season. These communications informed farmers of the best time to take action for specific crop pests and provided other good agricultural practice advice.

Nearly 200,000 farmers are estimated to have been reached through digital decision support tools in 2022. This analysis is based on data only from the current 27 PlantwisePlus countries plus any other low-income or lower-middle income countries. It includes cases of (i) farmers using the tools themselves and (ii) agricultural service providers using the tools to improve their support to farmers. The vast majority of cases of digital tool use relate to the CABI BioProtection Portal (54%) and the PlantwisePlus Knowledge Bank (42%). The remaining 4% were cases of farmers or advisors using the Plantwise Factsheets Library app, the Fertilizer Optimization Tool and the Crop Sprayer app. When looking at all types of users from all countries, there were a total of 658,795 uses of these tools in 2022. This means that about 35% of the usage is by the key target groups (advisors and farmers) in the target countries.

Two major mass extension activities took place in 2022. One related to the management of CBSD in Zambia. This communication campaign was two-pronged, being designed to support farmers who lack awareness of the disease to identify and manage it, as well as to raise awareness nationally of the need to mobilize resources so that farmers have access to disease-free planting materials. The main medium for communication was radio, with several radio stations across Zambia airing the messaging that was developed through PlantwisePlus. To complement this work and enhance the capability of public and private sector journalists and bloggers to report on the topic of CBSD, a training session was held for 39 journalists in July, with the aim of enhancing the accuracy of reporting on the issue in the press. PlantwisePlus estimates that approximately 210,000 cassava-growing households with radios would have received the messaging.

The other significant mass extension activity under the PlantwisePlus umbrella in 2022 took place in Burundi, where the programme facilitated the development of videos on the management of banana Xanthomonas wilt and safe pesticide use. These videos were shared with nearly 235,000 farmers in the country through AUXFIN's G50 approach, whereby local influencers (e.g. lead farmers) share information within their communities using digital devices.

PlantwisePlus farmer reach in 2022

Extension method	Total farmers reached*	Male (<35)	Male (35+)	Male (unknown age)	Female (<35)	Female (35+)	Female (unknown age)	Unknown gender/ age
Direct reach: Plant clinics, trainings	149,276	-	-	28,962	-	-	10,915	109,399
Plant health rallies, farmer field days	32,847	-	-	22,388	-	1	6,867	3,591
PRISE SMS pest alerts	43,543	-	-	15,689	-	-	8,774	19,080
Digital decision support tools	197,727	28,856	25,495	-	21,762	19,043	-	102,571
Indirect reach: Mass extension campaigns (e.g. radio, SMS)	445,100	-	-	103,038	-	-	107,243	234,819
Subtotal (direct and indirect reach)	868,493	28,856	25,495	170,077	21,763	19,043	133,799	469,460
Farmer-to-farmer sharing	3,473,972							3,473,972
Total farmers reached	4,342,465	28,856	25,495	170,077	21,763	19,043	133,799	3,943,432

*This includes data from Plantwise Burundi, which is funded separately from PlantwisePlus through the Royal Netherlands Embassy in Burundi and NUFFIC

Research commissioned by PlantwisePlus in 2022 provides detailed evidence of the extent of the sharing of agricultural information/solutions by one farmer with another. The survey asked individual farmers how many other farmers they tend to pass extension information on to after receiving it from the original source. The research showed variability in the amount of information shared in different countries and how many people the information was shared with, depending on the information source (e.g. face-to-face, SMS, radio). Detailed analysis is still ongoing but, based on this data, we continue to estimate farmer-to-farmer sharing at four additional farmers receiving extension information for each one who has received the original message. It should be noted that this is a conservative figure, with strong indications from the study data that farmer-to-farmer sharing is more significant. It is expected that a more precise, evidence-based estimate for farmer sharing will be used in future reporting.

Pesticide risk reduction

There is a gradually increasing awareness of pesticide risks on a global level; however, this is not necessarily translating into the adoption of risk-mitigating production practices by farmers at the pace required to prevent further damage to human, livestock and environmental health. Unsustainable food production persists due to a dependence on chemical plant protection products, many of which pose serious health hazards, and this dependence is driven by various, often complex, market forces. There are several strands of activities under the pesticide risk reduction pathway that aim to address these different market pressures in order to reduce the use of hazardous products and promote lower toxicity alternatives, including biological solutions. Below are some examples of how PlantwisePlus is working with plant health system stakeholders to help raise awareness of, identify and/or develop lower-risk solutions to, and increase the accessibility of, those safer alternatives.

Assessment of agro-input dealer interest in a voluntary certification scheme

A large PlantwisePlus-led survey in 2021 examining the regulatory frameworks that govern operating environments for agro-input dealers found significant differences between countries in the mandatory requirements for the licensing or certification (hereafter referred to simply as certification) of agro-input dealers. It also revealed that voluntary certification schemes for agro-input dealers are extremely rare. In general, the level of training and post-certification support to agro-input dealers is minimal, which raises a lot of questions about the quality of service they are providing to farmers who, in many cases, see the agro-input dealers as one of the only sources of advice.

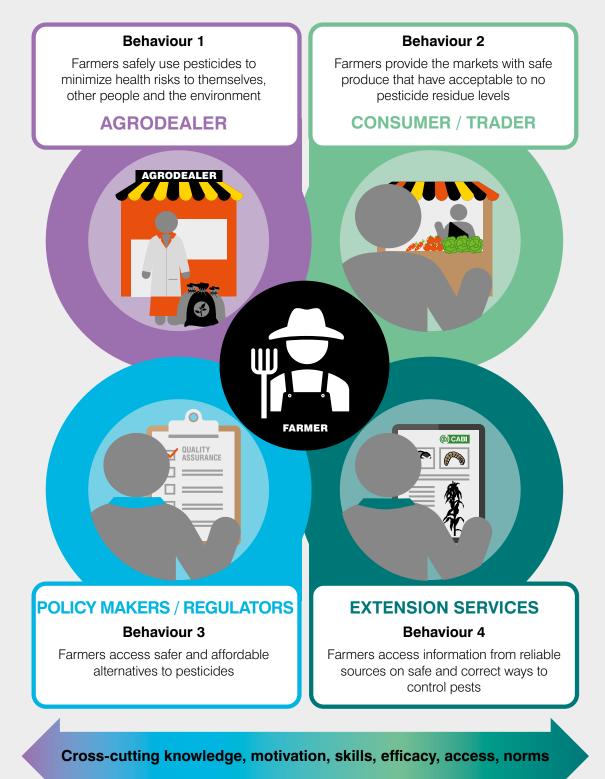
Based on this initial finding, PlantwisePlus conducted a rigorous study of agro-input dealers in Uganda. A total of 557 agro-input dealers (52% female; 67% youth¹) from several regions of the country were interviewed, with questions asking about their accreditation, the products they sell, their knowledge gaps, etc. The study found that nearly half of the sampled agro-dealers were not accredited to run their business, even though this is mandatory in Uganda. It was noted that those outside of the capital city, Kampala, were less likely to be accredited. Nearly all agro-input shops visited were selling at least one highly hazardous pesticide product. In contrast, only 16% were selling biopesticides, which was due to unawareness of such products, lack of demand from farmers for them, and lack of access to them. Regression results showed that agro-dealers with mandatory certification are significantly more likely than their non-certified counterparts to have knowledge of biopesticides, to sell biopesticide products, and to recommend multiple pesticide alternatives to their customers.

The study also included a discrete choice experiment to assess the agro-input dealers' level of interest in the concept of a voluntary certification scheme, in which they would be required to comply with agreed performance

^{1.} Youth are taken to be people under 35 years old, as defined by the African Union.

Pesticide risk reduction: social and behaviour change

PlantwisePlus surveyed stakeholder behaviours around pesticide use in Kenya to develop a behaviour change communication strategy. The campaign targets farmers and other key groups, **encouraging them to change their behaviours** by offering decision support tools from the PlantwisePlus Toolkit to promote low-risk plant protection solutions to reduce reliance on high-risk pesticides.



standards and, in return, would receive some form of support (e.g. training) to enhance their business. The results showed that the concept is greatly valued by agro-input dealers, particularly in regard to its potential to provide training opportunities and ensure greater safety in respect of human health and the environment. Agro-input dealers also have a positive attitude towards a voluntary certification scheme that restricts the sale of high-risk products, especially if it stimulates additional income-generating opportunities, such as the provision of pest diagnostics and integrated pest management- (IPM-) based advisory services. It was evident that agro-input dealers are conscious of pesticide risks to human and environmental health and would be keen to participate in a certification scheme promoting safer plant protection products.

Given the positive outcomes of the existing mandatory certification scheme in terms of pesticide risk reduction, as well as the willingness of agro-input dealers to supply lower-risk products and promote safer practice, there is clearly an opportunity to enhance the quality of service that this important stakeholder group provides to smallholder farmers. This could be tackled either through introducing a new, complementary, voluntary scheme or through strengthening the existing mandatory certification process. When these insights were presented to officials in the Ugandan Ministry of Agriculture, Animal Industries and Fisheries, the feedback was that a voluntary certification scheme is not a realistic proposition and that any additional training for agro-input dealers would need to be linked to the mandatory training programme. It was agreed that an easier first win would be to improve the existing system, specifically by developing a format and content for the delivery of training on low-risk plant protection products and, in particular, biopesticides. The CABI BioProtection Portal will serve as an excellent basis for this awareness raising. A planning/development workshop will be held early in 2023 to finalize details on the next steps to be taken.

Local production and uptake of biological pest control

A key aim of the PlantwisePlus programme is to increase the availability and uptake of lower-risk solutions to crop health problems, in particular for the management of pests and diseases. One of the interventions to achieve this is the establishment of local facilities for the mass production of biological control agents for use by farmers in the area. By early 2022 the greatest progress made on this activity had taken place in Pakistan, where agreements were in place with partners to pilot low-tech mass production facilities in the provinces of Punjab and KPK. The biocontrol agent to be produced (*Trichogramma*) is commonly sold commercially around the world, but is not widely available in Pakistan. This parasitic wasp will be produced principally for the management of a key pest (*Helicoverpa*) on tomato, which is a crop-pest combination that is notoriously heavily sprayed with pesticides. The first facility to be prepared was in KPK, where a PlantwisePlus expert provided training to 10 local personnel in 2022. Similar capacity building will be provided to partners in Punjab in 2023 and both facilities should be producing the biocontrol agents for local farmers during 2023.

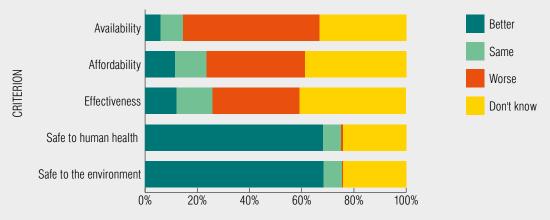
In parallel with the planning and establishment of the mass production facilities, a gender-focused assessment of the potential challenges and barriers to the adoption of the *Trichogramma* technology was carried out in Punjab, Sindh and KPK provinces. An analysis of the study data was completed in 2022, drawing on insights from key informant interviews with researchers and agriculture extension staff, and in-depth interviews and focus group discussions with women and men farmers, some of whom were using *Trichogramma* in their crops. The main reasons farmers gave for not using *Trichogramma* included lack of information and training, and an unreliable supply of the agent. Targeting women directly in communication about the biocontrol method helped to imporve uptake by farming households. The reduced health risk of the biocontrol method was reported to be important for women farmers, while men farmers were more concerned about the effectiveness of the biocontrol method no pest management and to improve yield and income. However, it was found to increase the demand on women's time and labour, while their decision-making role in regard to the income from tomato production was reported to remain low. The study findings are expected to inform the further piloting and scale-out of the technology, to ensure it is more gender-responsive and benefits both men and women farmers overall.

Enabling farmers to meet voluntary production standards

One effective way to regulate the use of pesticides is through the application of crop production standards, which often require stricter monitoring and adherence to pesticide policies. Following a review of existing standards across multiple countries at the start of PlantwisePlus's proof of concept phase, CABI identified certain standards for which farmer compliance was difficult and which the PlantwisePlus programme could support through appropriate capacity building. Two standards were identified as a first step: (i) Ghana Green

Situational analysis for a voluntary certification scheme for agro-input dealers

A PlantwisePlus study surveyed **more than 500 agro-input dealers in Uganda** to gather their views on a voluntary certification program designed to promote safer plant protection products and reduce pesticide risks.



Agro-dealers' perception of biopesticides compared with synthetic pesticides

Reasons for not stocking biopesticides

While all 557 of the agro-input shops surveyed sold synthetic pesticides, only 16% sold biopesticides. The leading reason was a lack of awareness.

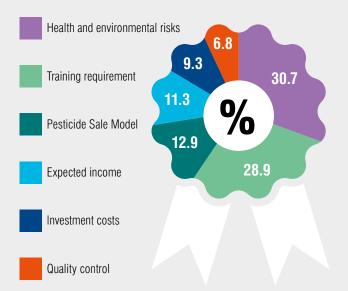


Perception of the most important topics to be included under voluntary certification

This suggests that agro-dealers are not only driven by profit, but are also keen to protect human and environmental health from pesticide risks. This is pertinent as nearly a third of agro-input dealers reported having experienced pesticide-related illness.

90%

of agro-dealers expressed willingness to participate in a voluntary certification scheme to promote safer plant protection products and reduce pesticides risks.



Label standard GSA (GS 1054 & GS 1074) – a food safety certification scheme; and (ii) Kenya KS1758 – a code of practice for the horticulture industry. The highlight presented here focuses just on the Ghana Green Label standard.

Insights from data collected in Ghana in 2022 on the effectiveness of farmer groups showed that farmers' engagement and negotiations with local fresh food off-takers are their key weakness area, and that this relationship is characterized by mistrust. Additional training will be given to the farmer groups, alongside technical training, to improve their understanding of their business and what their "ask and offer" is when they engage with traders. CABI has also worked with various off-takers to build buyer–seller relationships to create market demand and therefore drive the adoption of standards.

CABI has started working with Green Label to improve their overall training approach, starting with a 360-degree audit to identify areas for improvement. The audit approach used was developed by CABI and enables a company to get back to basics and understand and develop their training programmes from a variety of points of view. This paves the way to creating a strong foundation for introducing new innovative approaches to training, such as the use of information and communication technologies, e-learning, and continuous development programmes. CABI and Green Label jointly identified key areas of intervention and developed a work plan, particularly focusing on training trainers, developing training materials and certifying producer groups. Recognizing that the adoption of standards is driven by market demand, Green Label and CABI are collaborating with Eden Tree, a local fresh food off-taker. As a starting point, Eden Tree facilitated the formation of a group of 20 farmers who are currently supplying the company with a range of products. The farmers were brought together in a workshop to understand their relationship with Eden Tree, and to discuss issues relating to the market and the business, and the benefits of being in a group as regards overcoming challenges. The participants were then invited to form a group that would be trained by Green Label and CABI in order to achieve the Green Label standard. The intention is that they will later be certified, once a contractual relationship has been established.

More than 100 agricultural extension workers from the Greater Accra, Ashanti, Volta and North regions were trained in all of the 10 modules of the Green Label standard, as well as in the use Pest Management Decision Guides and in the use of plant protection products. The intention was not to train them to be certified/accredited trainers, but to provide them with knowledge of the standard and the use of decision support tools to provide backstopping to farmers who are interested in participating in the standard. In 2023, the plan is to train and certify five groups of farmers linked with Eden Tree on the Green Label standard, and to further improve the relationship and trust between buyers and sellers.

Difficulties encountered and measures taken

Pest preparedness

In order to effectively prepare for and manage pest issues, it is essential for all stakeholders to collaborate in a co-ordinated approach. Although many agencies have the authority or responsibility for plant health, they often act independently. By working together, stakeholders can pool their resources and knowledge so as to implement a more effective response to pest threats. Fulfilling the needs of legal and institutional frameworks and mandates can be challenging due to highly specific institutional targets that are not necessarily easy to harmonize. PlantwisePlus is working on a co-ordination mechanism that can enable all agencies to be a part of country plant health initiatives. This approach has been successful in Zambia and Kenya for interventions against CSBD and Apple snails, resulting in high levels of engagement with policy makers.

A growing number of countries use the tools and methodologies developed under PlantwisePlus to conduct pest-initiated and pathway-initiated PRAs, and to identify priority species for surveillance and management. A pathway-initiated PRA is one that is focused on a single pathway which may have multiple pests associated with it. This type of PRA commonly arises from a request to import a new plant commodity or a commodity from a new country of origin. A pest-initiated PRA is one that is focused on a particular pest that may have multiple pathways of entry. The basic PRA training that was provided to several country NPPOs in online workshops over the past couple of years was very well received and considered a success. However, it was not adequate to fully address the capacity gaps of trainees, due to limited time in the online sessions, internet connectivity issues for some participants, or distractions from regular jobs while training virtually in their home countries. Consequently, a growing number of NPPOs are now looking to implement full PRAs to create priority lists of invasive species through face-to-face workshops. This is creating a high demand for CABI's expertise and time, and there is a limit to the number of such training workshops that can be organized per year in each country. The solution arrived at is to conduct regional PRA workshops that are aligned to the African Continental Free Trade Area protocol, and these are being planned for 2023 for the EAC, ECOWAS and SADC regional economic blocs.

Biological control of pests through the enhancement of natural enemies that already exist in the environment (i.e., augmentative biological control) can be an efficient management strategy, but is not necessarily cost-effective. This was found to be the case for use of the parasitic wasp *Telenomus remus* against fall armyworm in Ghana. Although the biocontrol agent was effective, it remains a challenge to find a cheap, smallholder-friendly mass production method. Further research is needed on reducing production costs before the agent can be applied practically and eventually scaled out. Similarly, for the fall armyworm parasitic wasp *Eiphosoma laphygmae*, which is a candidate agent that would be introduced from the pest's area of origin (i.e., classical biological control), the rearing system has not worked consistently across CABI's quarantine laboratories in Switzerland, Kenya and Pakistan. In Kenya in particular, the insect colony is very difficult to maintain in the laboratory. Therefore, it will be more prudent to optimize the system currently in use in Switzerland and Pakistan before attempting to apply it elsewhere.

In Zambia, CABI had not yet achieved the desired tangible impact through communication campaigns on the effective management of CBSD. It was recognized that knowledge transfer alone was not sufficient to achieve this goal in Zambia. The communication efforts were successful in raising awareness of how the disease is spread, but the farmers required a solution that was not available to them: disease-free planting material. This informed the decision to invest in the provision of clean planting materials. This activity is being implemented in 2023, with plans to study the uptake of the recommendations and the results in terms of cassava yield.

Farmer advisory

The key user groups of agricultural tools are considered to be extension workers, agro-input dealers and farmers. Reaching these user groups through 'traditional' mass advertising sites is challenging as these groups are more likely to use SMS messages and locally based social media digital platforms (WhatsApp and Facebook) to gain relevant agricultural content. To better target users in 2022, tailored activities were implemented in each target country to engage target audiences in ways that are appropriate and effective for their context. CABI has acquired new in-house expertise in this subject area to ensure that there is sufficient awareness of the digital tools developed and/or promoted by the programme. Furthermore, by having CABI-endorsed decision support tools in one place (the PlantwisePlus Toolkit), it should be easier for PlantwisePlus and its partners to promote the decision support tools and for users to locate and learn about these resources.

Several significant upgrades were made to the CABI Academy platform in 2022. These included upgrades to the server to handle the increase in usage, along with continual improvements to the user interface and backend systems. In order to meet the demand for new languages, the Google Translate plugin was added to enable rapid roll-out of content. These translations can be overwritten, if necessary, by nominated people acting as translators. This addition is already proving useful, with students using it to support their learning. However, automatic translations have been challenging to implement with the existing Moodle software and many adjustments have had to be made. For example, translations are now cached to avoid high Google Translate fees. Additionally, there is no easy way to share translations between tools for commonly used phrases. PlantwisePlus is looking at better ways to handle this across decision support tools and courses in 2023.

Pesticide risk reduction

To encourage farmers to reduce conventional chemical pesticide use (and especially misuse), governments employ a variety of public policies to regulate the use of plant protection products. The PlantwisePlus programme aims to engage with policy makers in areas including food safety and reducing the use of conventional pesticides, as well as the promotion of lower-risk IPM solutions such as biopesticides. Engagement with policy makers in Pakistan on the introduction of new biopesticide regulations started more than two years ago and, despite initial good progress, has stalled, with the new regulations still in the process of being ratified by the government. This delay led to the postponement of a planned "biopesticide roadshow", as well as the test registration of the AflaPak bioprotection product. In lieu of these activities, a CABI working paper was prepared describing the steps taken in developing a lower-risk plant protection product registration system. The paper (to be published in 2023) will be used to guide work planned for Sri Lanka, where activities are expected to be launched in 2023, by which time it is hoped that the political situation in that country will be more stable.

Kenya is a hotbed of activity around the subject of pesticide risk reduction and CABI is playing a role in raising awareness of this subject through the sharing of science-based information and strategy development. However, policy engagement has been challenging as various policy reviews and restructurings are currently taking place, making it difficult to find the right stakeholders with whom to engage. Due to these difficulties the decision has been made to suspend direct policy engagement and prioritize building partnerships with other institutions doing similar work, e.g. the Syngenta Foundation and the Fresh Produce Exporters Association of Kenya, to deliver a joint briefing paper that can be used to engage policy makers and the public.

In Pakistan, there were delays in setting up a *Trichogramma* (biological control agent) mass production facility due to the long bureaucratic process to obtain a signed memorandum of understanding (MoU) from Punjab Province. Instead of suspending the activity completely in Pakistan, it was decided to establish a production facility in KPK Province. Training was provided to staff from this facility in KPK as well as for staff who will eventually run a facility in Punjab. Once the MoU agreement is signed with Punjab Province, the facility infrastructure will first be improved and then the *Trichogramma* production can be quickly set up because the local team is already prepared.

Communication and visibility

Planning

Much of the planning in 2022 centred on using the audience segmentation work carried out in 2021 as a framework for tailoring materials and using the variety of communication channels as efficiently as possible to reach the right people, ensuring that the external messaging aligned with the programme's impact pathways. Outputs from this included updated visibility materials available in a number of languages, better communications resources for programme staff, and sharing more stories from the field.

Press, public relations and events

With most of the world in post-pandemic recovery, travel to attend in-person events resumed in 2022. Many events were hybrid, which allowed the programme to have both an online and a physical presence at conferences through the year. At the start of 2022, the Plantwise programme received the International IPM Award of Excellence (IPM Team category) at the 10th International IPM Symposium, after the event had been postponed due to the Covid-19 pandemic. Programme staff also had speaking slots at the event.

PlantwisePlus tools were showcased at a CABI stand at European Development Days in June. The event offered one of the first opportunities to connect with peers in person, demonstrate the tools live, and receive feedback. The programme also had a presence at the World Food Prize in October, and CABI representatives also took PlantwisePlus materials to the 27th Conference of Parties (COP27) and African Green Revolution Forum. A number of individual PlantwisePlus staff also had speaking slots at global events throughout 2022, including the International Plant Health Conference, the International Congress of Entomology, and CABI's Review Conference.

Since in-person meetings were once again possible, in 2022 the programme also hosted regional launch events in Ghana, Zambia and Pakistan. Local partners and press were invited to learn more about the programme and to strengthen relationships. A video was developed for the Africa events and updated visibility materials, such as banners and flyers, were produced for all events. Each event received press attention, with Ghana, Zambia and Pakistan gaining 12, 5, and 21 pieces of coverage, respectively, resulting in a combined total of over 50,000 views.

The online courses on Crop Pest Management and Crop Pest Diagnosis, available under the CABI Academy, were launched in Bangladesh, Bolivia, Burkina Faso and Rwanda, to showcase and trial the newly integrated translation tool. Each launch was supported with a press release, blog, social media campaigns, and email.

Other launches included the Crop App Index in February, which received eight pieces of press coverage, and in October the PlantwisePlus Knowledge Bank migration to the CABI Digital Library website.

The Crop App Index and CABI BioProtection Portal were highlighted at the G20 Chief Scientists of the Ministries of Agriculture meeting in Indonesia in July.

Digital communications and materials

Our analysis of audiences and channels identified that, to reach our target audience, the core integrated communications channels of email campaigns, blogs and other web content, events, and social media should be supplemented by using the networks in which CABI staff and our partners are involved. To better equip PlantwisePlus staff, all communications materials, including flyers, videos, slide decks, and more, were compiled into one easy-to-access area in CABI's file-sharing system. This allows programme staff to quickly and easily find the most up-to-date materials. For example, resources for the CABI Academy are available in a number of languages, including, for example, Kinyarwanda to aid dissemination in Rwanda where the courses are open access.

In total, 67 news articles were published, with 40,819 users accessing the blog. Furthermore, articles on the blog were better optimized for search engines, to encourage more readers and repeat visits. One aspect of this work is publishing "list articles". This has proven to be a successful tactic as the top three articles published in 2022 all employed this structure: 4 pests and diseases of maize links through to Pest Management Decision Guides on the PlantwisePlus Knowledge Bank; Agricultural mobile apps strengthening extension lists CABI's range of mobile apps; and 5 ways that youth agricultural training benefits young people in Uganda outlines the advantages of empowering youth in agriculture. All of these articles cover core aspects of PlantwisePlus.

2022 saw an increase in followers on social media by 10% on Twitter and 45% on LinkedIn. Due to a lack of traffic and engagement, the PlantwisePlus Facebook page was closed down in July. A main CABI account remains on the platform. Notably, the PlantwisePlus Knowledge Bank saw a 32% increase in social media traffic. Social media was also the primary platform for sharing PlantwisePlus video and audio content in 2022. Videos were shared through PlantwisePlus channels around core concepts such as biological control and IPM, as well as those relating to key international days that align with the programme, such as World Food Day, International Day of Plant Health, International Day for Rural Women, International Youth Day, International Day of Biological Diversity, and others. For International Women's Day, a special podcast episode was recorded with an expert panel made up of programme staff and partners on the role that biases and misconceptions play in preventing women farmers' access to agricultural advisory services in different regions and cultural contexts around the world.

In terms of significant usage milestones achieved in 2022, the CABI BioProtection Portal reached over 1 million visits since its launch in 2020, which was marked with a CABI News story. The PlantwisePlus Knowledge Bank celebrated 10 years since its launch. In that time, it has had over 3 million visits, and this was highlighted in a social media video.

Overall, communications activities were more audience-focused in 2022, with outputs better targeted at the programme's wide-ranging audiences, from the end-users of tools to potential implementation partners. In 2022, the PlantwisePlus website had 348,000 visits.

Annex 1: PlantwisePlus progress against Results Framework CAB

Note that the proof of concept Results Framework does not include targets at objective or impact levels, as the focus of the work during this phase is to test our approach and programme assumptions. There is no expectation that, within these first three years of the programme, we will deliver against high-level objectives that are relevant for the 10-year programme.

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress ma	Proof of concept target		
				Target	Achieved	Progress narrative	
Overall Objective	(Impact)						L
Climate-resilient	Proportion of farmers adopting		M:	M:	M:	n/a during proof of concept stage	M:
agricultural	sustainable/safer agricultural practices		F:	F:	F:		F:
production supplying safer food	(disaggregated by age/gender)		<35	<35	<35		<35
	Income levels of farmers and		M:	M:	M:	n/a during proof of concept stage	M:
different genders and from diffe	agricultural service providers of		F: F: F:		F:		
	age groups		<35	<35	<35		<35
	Improved gender parity in agriculture					n/a during proof of concept stage	
	Number of agribusinesses producing safer produce and inputs					n/a during proof of concept stage	
Specific Objective	e 1						u
Knowledgeable	Number of agricultural service		M:	M:	M:	n/a during proof of concept stage	M:
and professional	providers delivering actionable		F:	F:	F:		F:
agricultural service providers (including			<35	<35	<35		<35
agro-input dealers) increasing uptake and promotion of climate-smart plant health practices and inputs	Proportion of recommendations provided that are in line with best agricultural practices					n/a during proof of concept stage	

PlantwisePlus description	P
Outputs	
1.1 Digitally	"-
supported	a
"PlantwisePlus	C
Toolkit" developed	
to facilitate	
implementation	
of sustainable and	
safer plant health	
practices	\vdash
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PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (2022)			
				Target	Achieved	Progress narrative	
Outputs							
1.1 Digitally supported "PlantwisePlus Toolkit" developed to facilitate implementation of sustainable and safer plant health practices	"Toolkit" of tools developed and accessible for key users in each country	Global	0	6	6 tools (PlantwisePlus Knowledge Bank, CABI BioProtection Portal, Factsheet Library app (iOS, Android), Crop Sprayer, Fertilizer Optimizer Tool, Crop App Index) (6 cumulative)	PlantwisePlus Toolkit website and Crop Sprayer app fully developed. Existing digital advisory tools maintained and populated with new content.	7 tools
μασιιστο	Upgraded Plantwise Knowledge Bank as digital platform to support offline and online access	Global	0	1	2 significant upgrades (moving the site to a new platform and improved user experience features) (2 cumulative)	User feedback gathered via surveys and face-to-face interactions with agricultural service providers and incorporated into the Knowledge Bank.	3 significant upgrades
	Financing models assessed for the PlantwisePlus Toolkit	Global	0	0	0 (0 cumulative)	Lessons learned from previous models used by CABI assessed in order to start refining Toolkit finance models.	3 models assessed
1.2 Effective data collection systems developed and tested for quality	Proposed mechanisms for quality assurance of PlantwisePlus Toolkit use and advice based on it	Global	0	2	2 tools (2 cumulative)	Data from Crop App Index and Factsheet Library App (Android) added to data collection system and dashboards developed.	6 tools
assurance and market intelligence	Feedback mechanisms being used for assessment of quality assurance processes	Global	0	0	0 (0 cumulative)	Planned for 2023.	1 mechanism for alerts
through PlantwisePlus Toolkit	Plantwise data management system upgraded	Global	0	1	1 significant upgrade (1 cumulative)	Plantwise Online Management System data handling improved to handle growing datasets, and a secure API developed to feed data to partners' own dashboards.	2 significant upgrades

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline S	Progress ma	Proof of concept target		
				Target	Achieved	Progress narrative	
1.3 Training and digital learning products created to support	Existing digital learning and other training products ready for roll-out in local languages to agricultural service providers	Global	0	0	0 (2 cumulative)	Iterative improvements made to the upgraded courses in 2022.	2 courses
capacity building of agricultural service providers	Feasibility of digital learning and training approach appraised	Global	0	0	0 (1 cumulative)	Prototype Skills for Agriculture website developed and draft design for full site developed.	1 assessment
	New digital learning products developed on the basis of existing course materials (e.g. use of natural enemies in sustainable agriculture)	Global	0	2	1 course, Introduction to Bioprotection (1 cumulative)	Bioprotection course developed, and Reducing Pesticide Risk course development started.	4 courses
	Climate-smart pest management and other plant health techniques integrated into new and existing materials	Global	0	50	52 new factsheets (52 cumulative)	Climate-smart agriculture practices identified and existing content assessed. New climate-smart content identified and published on PlantwisePlus Knowledge Bank.	152 factsheets
	Financing models assessed for digital learning products	Global	0	5	5 models for CABI Academy (5 cumulative)	Five approaches trialled – open access, paid access at country level, country-level free pilot, paid access by individuals, and free access with paid-for certificate.	6 models for CABI Academy

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (Proof of concept target		
				Target	Achieved	Progress narrative	
1.4 Agricultural service providers	Number of male and female agricultural service providers	Global	M: 0	M: 60,000	M: 108,349 (166,935 cumulative)	PlantwisePlus Toolkit, tools and digital learning courses promoted through	M: 300,000
equipped with new digital learning products	using PlantwisePlus Toolkit and digital learning products online and offline, per pilot country		F: O	F: 40,000	F: 79,609 (117,066 cumulative)	digital marketing and through Plantwise networks.	F: 200,000
and decision- making tools			<35: 0	<35: 55,000	<35: 103,761 (156,561 cumulative)		<35: 300,000
	Number of farmers supported with information about climate-smart agricultural techniques	All 27 programme countries	0	3,000,000 (total reach, including farmer-to- farmer sharing)	4,342,972 (all reach; details provided in narrative above)	Farmer reach was achieved through direct and indirect communication methods. Plant clinics were operating in at least 26 of the 27 PlantwisePlus countries. Plant health rallies and similar outreach activities were reported in 10 countries. 2 major mass extension campaigns were conducted: one on CBSD in Zambia and one on Banana Xanthomonas disease in Burundi. Digital decision support tools were promoted and taken up by advisors and other users around the world.	10,000,000 (total reach, including farmer-to- farmer sharing)
1.5 Improved provision of gender-sensitive agricultural	Number of agriculture service providers adopting innovative approaches to reach women farmers	Ghana, Pakistan	0	120	427 advisors trained (427 cumulative)	Trainings carried out in Ghana with 27 agricultural officers (training of trainers) and 400 extension staff.	1,000 advisors
extension services	Number of women farmers accessing extension advice	Global	0	118,000	169,901 (282,382 cumulative)	Women farmers received agricultural advice through the extension channels supported by PlantwisePlus (see narrative for second indicator of Output 1.4 above).	380,000

PlantwisePlus description	PlantwisePlus indicators	Focus countries		Progress made	Proof of concept target		
				Target	Achieved	Progress narrative	
Specific Objective	e 2						
Increased supply of and demand for safer, higher-	Proportion of domestic consumers willing to buy safer and higher-quality farm produce					n/a during proof of concept stage	
quality and locally produced food in	Change in farmer knowledge and		M:	M:	M:	n/a during proof of concept stage	M:
domestic markets	adoption of sustainable plant		F:	F:	F:		F:
	health practices disaggregated by sex and age		<35	<35	<35		<35
	Quantity of produce on domestic market from targeted crops complying with agreed standards					n/a during proof of concept stage	

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress ma	Proof of concept target		
				Target	Achieved	Progress narrative	
Outputs							
2.1 Domestic demand for safer produce increased aware of risks of pesticide	Kenya, Ghana, Pakistan	M: 0	M: 0	M: 0 (0 cumulative)	Behaviour prioritization workshop held in Kenya and behaviour change communication strategy for pesticide risk	M: 20,000 male consumers informed	
	residues in food (disaggregated by gender, age, etc.)	У F: н	F: 0	F: 0	F: 0 (0 cumulative)	reduction developed, with campaigns to be launched in 2023.	F: 30,000 female consumers informed
			<35: 0	<35:0	<35: 0 (0 cumulative)		<35: 10,000 young consumers informed
	Proportion of male and female consumers choosing and buying safer local produce	Kenya, Ghana, Pakistan	M: 0	M: 0	M: 0 (0 cumulative)	Planned for 2023.	M: 30% of male consumers informed
			F: 0	F: 0	F: 0 (0 cumulative)		F: 30% of female consumers informed
			<35: 0	<35: 0	<35: 0 (0 cumulative)		<35: 30% of young consumers informed

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (2022)				
				Target	Achieved	Progress narrative	target	
2.2 Farmers working to a voluntary crop production standard to	Number of production standards identified, adapted and adopted for pilot agricultural value chains	Kenya, Ghana	0	2	2 (Ghana Green Label standard GSA (GS 1054 & GS 1074) and Kenya KS1758) (2 cumulative)	Two production standards identified and selected for PlantwisePlus intervention following an analysis of the challenges farmers are facing in adhering to the standards.	2	
deliver safer, environmentally friendly produce	Number of male and female farmers producing standard-	Kenya, Uganda	M: 633	M:0	M: 0 (0 cumulative)	Initial activities focused on training trainers and sensitizing implementers	M: 150	
to higher-value markets	compliant food that is accessing new/higher-value domestic markets		F: 162	F:0	F: 0 (0 cumulative)	(farmer groups) on the respective standards.	F: 200	
				<35: 0	<35:0	<35: 0 (0 cumulative)		<35: 0
2.3 Job opportunities for	ortunities for age group) trained to become	Kenya, Uganda	M: 0	M: 50	M: 277 (277 cumulative)	Training was offered on various topics: IPM, safe use of pesticides, spray service	M: 574	
young men and women in rural communities	agricultural service providers, providing high-quality and appropriate climate-smart		F: O	F:50	F: 86 (86 cumulative)	provision and training on standards (under 2.2). These areas were identified as gaps in service provision within agribusinesses, thus providing earning opportunities, especially for women and youth.	F: 286	
to provide agricultural services to local	agricultural techniques		<35: 0	<35:100	<35: 130 (130 cumulative)		<35: 480	
producers Business models for agricultural service provision identified and tested, with the best-fit highlighted for roll-out Numbers of men and women (by age group) working in agricultural	service provision identified and tested, with the best-fit highlighted	Kenya, Uganda	0	3	3 (Kenya x2, Uganda) (3 cumulative)	15 models assessed in Africa and Asia and 3 best fitting piloted in Uganda and Kenya – spray service provider model, farmer service centre model, Zirobwe Agaliawamu Agri-business Training Association (ZAABTA) model.	5	
	Kenya, Uganda	M: 0	M:50	M: 101 (101 cumulative)	Trained service providers (especially youth) started providing services,	M: 400		
	service provision (or self- employed)		F: O	F:50	F: 36 (36 cumulative)	e.g. farmer linkage to inputs, opening agro-input shops, spray services, or plant health advice linked to various	F: 150	
		<35: 0<35: 100<35: 130agribusinesses.(130 cumulative)			<35: 250			

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Progress made (Proof of concept target	
			Target	Achieved	Progress narrative	
Specific Objectiv	e 3					
Improved management of plant production risks through targeted and cost- effective national pest prioritization, monitoring and management systems, using new	Number of targeted responses/ interventions per country	Burkina Faso, Kenya, Ghana, Pakistan, Zambia, Rwanda Bangladesh			n/a during proof of concept stage	
digital technologies and processes	Cost-effectiveness of assessed responses/interventions	Kenya			n/a during proof of concept stage	

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (2022)	Proof of concept target	
				Target	Achieved	Progress narrative	
Outputs							
3.1 Decision support system established to allow national authorities to prioritize pests for monitoring and management	In-country decision support system designed, refined and updated regularly	Kenya, Bangladesh, Burkina Faso, Ghana, Zambia, Pakistan	0	Horizon Scanning Tool in 4 countries PRA tool in 2 countries Insight reporting system in 1 country	Horizon Scanning Tool used by 4 countries (Bangladesh, Burkina Faso, Pakistan, Zambia) (6 cumulative) PRA tool used by 2 countries (Ghana, Kenya) (2 cumulative) Insight reporting system piloted in 1 country (Burkina Faso), (4 cumulative)	Horizon scanning conducted in Bangladesh, Burkina Faso, Pakistan and Zambia. PRAs conducted in Kenya and Ghana. Insight reporting piloted in Ghana, Kenya, Zambia and Burkina Faso.	2 pest prioritization tools used by 6 countries and 3 economic blocs
				Pest Risk Information System (PRISE) alert system in 3 countries	PRISE alert system used in 4 countries (Kenya, Ghana, Zambia, Malawi) (4 cumulative)	PRISE bulletins created and distributed in Kenya, Ghana, Zambia and Malawi.	

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (2022)		Proof of concept target
				Target	Achieved	Progress narrative	
3.2 Co- ordinated pest preparedness, prevention and management through use of newly established decision support	Number of pests prioritized by national systems	Kenya, Ghana, Zambia, Burkina Faso, Kenya, Zambia, Pakistan	0	3 pests prioritized	3 pests prioritized (Citrus canker, CBSD, Diaphorina citri, Liriomyza trifolii and L. sativae, banana bunchy top virus (BBTV)) (6 cumulative)	Following the horizon scanning, decision support was provided through national stakeholder consultations and the prioritization of key pests for surveillance. Surveillance was conducted for citrus canker in Kenya and BBTV and Asian citrus psyllid in Ghana.	8 pests prioritized
system			3 (Fall armyworm in Kenya, Ghana, Pakistan)	2 species targeted in mass extension campaigns	3 species targeted in mass extension campaigns (3 cumulative)	Mass extension campaigns conducted on CBSD in Zambia, on apple snail in Kenya, and on Parthenium in Pakistan.	4 species targeted in mass extension campaigns
	Number of pest prevention and management plans for high- priority pests using decision support systems agreed, implemented and regularly updated based on lessons learned	Burkina Faso, Ghana, Kenya, Zambia, Pakistan	0	2 evidence notes	4 evidence notes (CBSD, papaya mealybug, Apple snail, Limnobium) (4 cumulative)	Papaya mealybug impact study and apple snail study were conducted in Kenya. CBSD impact study was conducted in Zambia. Limnobium water weed evidence note was drafted.	5 evidence notes
			0	2 national prevention and management plans	3 national prevention and management plans (Liriomyza trifolii & L. sativae, BBTV, CBSD, apple snail) (5 cumulative)	Response plan for CBSD in Zambia and prevention plan for BBTV in Ghana. Management plan for apple snail in Kenya.	5 national prevention and management plans
	Number of biological control agent release applications submitted	Kenya, Burkina Faso, Uganda, South Sudan, Pakistan	0	1 release application submitted	3 release applications submitted (Pakistan Parthenium, Uganda , South Sudan papaya mealybug) (4 cumulative)	Applications submitted in Uganda and South Sudan for papaya mealybug biocontrol, and submitted in Pakistan for Parthenium biocontrol. Biocontrol of papaya mealybug in Kenya was expanded to 3 counties. Release of Parthenium biocontrol agent in Pakistan commenced.	5 release applications submitted

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress mad	ogress made (2022)		Proof of concept target	
				Target	Achieved	Progress narrative		
Specific Objective	4							
Enhanced	Number of trained agro-input		M:	M:	M:	n/a during proof of concept stage	M:	
availability, accessibility and affordability of low-risk plant protection products	dealers capable of delivering actionable information according to voluntary standard disaggregated by age and sex		F:	F:	F:		F:	
			<35	<35	<35		<35	
	Sales of low-risk plant protection products					n/a during proof of concept stage		
	Amount of agricultural land under application of low-risk plant protection products, disaggregated by farms managed by male and female farmers			M:	M:	M:	n/a during proof of concept stage	M:
		F:	F:	F:	F:		F:	
			<35	<35	<35		<35	

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (2022)			Proof of concept target	
				Target	Achieved	Progress narrative		
Outputs								
4.1 Enhanced	Number of agro-input dealers	Uganda	M: 0	M: 8	M: 0	Held discussions with MAIFF and	50	
capacity among	(disaggregated by gender, age,				(0 cumulative)	Makerere University regarding additional		
agro-input dealers following	etc.) trained on low-risk plant protection advice/products and accessing related information through the PlantwisePlus Toolkit,		F: O	F: 8	F: 0	training material on pesticide risk reduction for the mandatory agro-dealer	50	
voluntary standard					(0 cumulative)	training course. Results from the agro-		
on IPM and			<35: 0	<35: 2	<35: 0	input dealers needs assessment gave	10	
pesticide risk reduction digital learning courses, and other information sources Number of male and female agro- input dealers compliant within voluntary standard					(0 cumulative)	clear indications on where CABI can help with training.		
	input dealers compliant within	lumber of male and female agro- Ugan	Uganda	M: 0	M: 0	M: O	Uganda will add new training into the	M: O
				national regulation so no voluntary				
		F: O	F: 0	F: O	service will be set up. However, this does allow the training developed to be	F: O		
					(0 cumulative)	sustainable.		
			<35: 0	<35: 0	<35: 0		<35: O	
					(0 cumulative)			
	Business models for a voluntary standard for agro-input dealers developed and rolled out	Uganda	0	0	0	Uganda is adding training to the national	1	
					(0 cumulative)	regulation so no voluntary service will be set up.		
						Agro-input dealer survey carried out in Nepal and data analysis ongoing.		

PlantwisePlus description	PlantwisePlus indicators	Focus Bas countries	Baseline	Baseline Progress made (2022)			
				Target	Achieved	Progress narrative	
4.2 Regulators engaged towards registration of low-risk plant protection products and use, with a focus on specific crops	Recommendations on fast-tracked registration of low-risk plant protection products (for pilot agricultural value chains)	Pakistan Sri Lanka	0	1	1 (Pakistan) (1 cumulative)	 Working paper drafted on 'Enabling biopesticide registration in Pakistan'. This paper will be useful for CABI to help other countries wishing to carry out a similar activity Two discussions held with Sri Lanka to discuss interest from the Sri Lankan government. The government welcomes the opportunity to work with CABI on promoting biopesticide use. 	2
	One product registered through tested fast-tracked registration system (for biological-based products)	Pakistan	0	0	0 (0 cumulative)	Awaiting ratification of the amended registration process from Pakistani Government – which is now heavily delayed – before this activity can start.	1
	Policy briefs (crop-specific/ nationally adapted) produced and distributed	Pakistan, Sri Lanka	0	2	1 (Pakistan) (1 cumulative)	Progress in Sri Lanka delayed due to political unrest.	5

PlantwisePlus description	PlantwisePlus indicators	Focus countries	Baseline	Progress made (2022)			Proof of concept target
				Target	Achieved	Progress narrative	
	Functionality of newly established pilot production facilities assessed against agreed business plans	Kenya, Pakistan, Bangladesh, Zambia	0	1	1 (Kenya) (1 cumulative)	Very successful scale-up of papaya mealybug biocontrol agent production achieved in Kenya. Production facility set up in Pakistan and training course completed, with biocontrol agent production to start in 2023. Zambia and Bangladesh still at early stages of feasibility testing.	4
	(by age group) working on the production of low-risk plant protection productsPakistan(3 cumulative) (1 cumulative)papaya mealybug bio in Kenya. Of the train female manager and (1 cumulative)F: 0F: 1F: 1 (1 cumulative)F: 1 (1 cumulative)F: 1 (1 cumulative)F: 1 (1 cumulative)<35: 0		M: O	M: 3		10 trainees (3 females) were trained on papaya mealybug biocontrol production	M: 13
			F: O	F: 1		in Kenya. Of the trainees, 4 people (1 female manager and 3 male technicians) went on to run the facility with other	F: 3
		trained staff as back up and in the case of a second facility being established in	<35: 4				



PlantwisePlus enables countries to confidently face the challenges of plant health threats in a changing climate by empowering smallholder farmers to increase income, food security and food safety by producing more and higher quality food.

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