

A woman wearing a colorful, patterned headscarf and a matching shawl, holding a white plate filled with fresh green leafy vegetables. She is standing outdoors in front of a white wall and green foliage.

PlantwisePlus Annual Review 2023



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

BARI	Bangladesh Agricultural Research Institute
BBTV	Banana bunchy top virus
CBSD	Cassava brown streak disease
DGIS	Directorate General for International Cooperation of the Netherlands
DMMU	Zambian Disaster Management Mitigation Unit
EAC	East African Community
ECOWAS	Economic Community of West African States
EU	European Union
FAO	United Nations Food and Agriculture Organization
FCDO	UK Foreign, Commonwealth and Development Office
HST	Horizon Scanning Tool
INTPA	European Commission Directorate General for International Partnerships
IPM	Integrated pest management
KALRO	Kenya Agricultural and Livestock Research Organization
KEPHIS	Kenya Plant Health Inspectorate Service
KIT	Royal Tropical Institute
KPK	Khyber Pakhtunkhwa
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries (Uganda)
NPPO	National plant protection organization
PRA	Pest risk analysis
PRISE	Pest Risk Information Service
SADC	Southern African Development Community
SDC	Swiss Agency for Development and Cooperation
SMS	Short messaging service
TRF	Trichogramma rearing facility
TWG	Technical Working Group on Plant Protection Products for Trade
UK	United Kingdom
ZARI	Zambia Agricultural Research Institute



Executive summary

PlantwisePlus is a global programme, led by CABI, that contributes to food security and improving the incomes and livelihoods of smallholder farmers through sustainable approaches to crop production that deliver safer and higher quality food in domestic markets. Interventions under PlantwisePlus contribute to three “impact pathways”: (i) **pest preparedness**, (ii) **pesticide risk reduction** and (iii) **farmer advisory**.

2023 was a significant year for the programme as it ended the three-year proof of concept phase. The objectives of this phase were to demonstrate that the core principles and assumptions of the programme were correct, and that the approach to implementation was effective and could be scaled. Early in 2023, CABI commissioned the Netherlands Royal Tropical Institute (KIT) to assess whether these objectives had been met. The review found that PlantwisePlus is highly relevant, efficient, and well-aligned with national priorities, and that the majority of the programme’s activities align with CABI’s core strengths. However, the review flagged that further formal institutionalization would be necessary to ensure the sustainability of the interventions. As such, 2023 was also a year of introspection for CABI, providing valuable insights that CABI will leverage to increase the effectiveness and impact of PlantwisePlus in the coming years.

In 2023, as in previous years, programme implementation was mainly concentrated in six focus countries (Kenya, Ghana, Uganda, Zambia, Pakistan and Bangladesh). CABI implemented a tailored package of interventions in each country through collaboration with multiple in-country partners. These included gender-focused studies to identify the barriers that women and youth face in crop production. PlantwisePlus implemented social and behaviour change campaigns and collaborated with stakeholders to evaluate piloted business models engaging women and youth in agriculture. Across the other 21 PlantwisePlus countries, activities primarily focused on supporting plant health systems through plant clinics and related activities and building capacity in integrated pest management (IPM) principles among agro-input dealers and government agricultural extension services. The programme encountered some implementation challenges, such as complex processes for policy changes, delays in biological control (biocontrol) agent releases, as well as changes to legislation on digital tool user analytics. Nonetheless, PlantwisePlus achieved many successes whilst working with nearly 300 partners across the 27 PlantwisePlus countries spanning Africa, Asia and the Americas, and met most of the annual targets across the programme (see Annex I). Notable achievements included the following:

- PlantwisePlus reached an estimated 13.6 million farmers through a combination of plant clinics (148,718), plant health rallies and farmer field days (28,008), Pest Risk Information Service (PRISE) SMS alerts (724,883), mass extension campaigns (1,618,338), digital tools (208,589) and subsequent farmer-to-farmer sharing of information acquired (10,914,145).
- PlantwisePlus facilitated regional pest risk assessment workshops with the East African Community (EAC), the Economic Community of West African States (ECOWAS), and the Southern Africa Development Community (SADC), contributing to addressing pests of regional importance.

- CABI added 600 new digital decision support tools for crop production and plant health to the Crop App Index (www.croppappindex.org), taking the total number of tools to 1,101. A quality assessment methodology was also developed, based on similar assessments for medical apps, and initially applied to a subset of 100 tools to test its effectiveness.
- CABI added 10 more countries to the CABI BioProtection Portal (www.bioprotectionportal.com), bringing the total to 42. There were also significant upgrades to make the website more accessible and user-friendly.
- CABI made two CABI Academy courses (Crop Pest Diagnosis and Crop Pest Management) free to access for all 27 PlantwisePlus countries. The latest course, “Introduction to Bioprotection Products”, attracted over 3000 enrolments in 2023.
- CABI and partners gathered evidence that the release of the classical biocontrol agent *Acerophagus papayae*, a parasitic wasp, against the invasive papaya mealybug in Kenya caused significant reductions in mealybug populations and related damage. This successful, non-commercial, biocontrol programme led to Uganda granting permission for releases of the same biocontrol agent, with the first releases anticipated in early 2024.
- Construction commenced for two new rearing facilities, one in Pakistan and one in Bangladesh, for the augmentative biocontrol agent, *Trichogramma*, another parasitic wasp. These new *Trichogramma* rearing facilities will soon be providing lower-risk plant protection options directly to over 600 farmers, with the potential to benefit thousands more in the surrounding region.
- PlantwisePlus work in Bangladesh played a key role in influencing the Ministry of Agriculture to adapt its regulations around the licensing of agro-input dealers. Bangladesh announced a new mandatory training scheme for all new agro-input dealers in 2023. CABI is collaborating with local experts to develop a curriculum and training materials for the scheme.
- PlantwisePlus-facilitated advocacy for sustainable pest management and biopesticides in Pakistan led to the government’s approval of a biopesticide registration guidance document in November 2023. This significant milestone fills a previous gap in pesticide regulations, fostering the commercialization and wider adoption of biopesticides.
- Through the “Ukulima True” campaign in Kenya, on the safer use of pesticides, PlantwisePlus reached over 890,000 people through radio and the media, and facilitated training of over 2000 farmers, agro-input dealers and extension officers. Post-campaign surveys found that 93% of trained farmers felt confident in their ability to use pesticides correctly and in a safe manner because of the training they received.
- CABI worked with eight partners in Kenya and Uganda to support agribusiness initiatives for rural youth (women and men), with initial evaluations revealing that youths involved in this work have started generating more income through their bundled services (e.g. advisory, pesticide spray services), making their service to farmers more sustainable.

These and other achievements in 2023 showcase PlantwisePlus’s positive impact on plant health systems in general, and more specifically on enabling farmers to produce more and safer food using sustainable crop production practices.

Looking forward, PlantwisePlus will continue to invest in monitoring, evaluation and learning processes that enable CABI and its partners to capture and reflect on lessons learned, adapt approaches, and build on the successes achieved. Considering the findings from the external review, CABI has developed a new programme strategy for 2024 onwards that refines the PlantwisePlus approach to be **scalable, sustainable and innovative** in areas that hold the highest potential to generate positive outcomes and impact for smallholder farmers.

A photograph of a young man with short dark hair, wearing a grey and white striped t-shirt. He is holding a large bunch of green onions in his right hand, with the green stalks fanning out. He is looking directly at the camera with a slight smile. The background is a blurred green field.

Introduction

Food security, food safety, and agricultural sustainability are critical concerns for a growing global population. Poor crop management causes frequent and severe production constraints for major crops that are vital to food and nutrition security and income generation in developing countries. On average, 20–40% of crops worldwide are lost due to pests and diseases, with plant diseases alone costing the global economy over \$220 billion and invasive insects costing at least \$70 billion.

Crop losses due to pests and diseases can devastate livelihoods and undermine efforts to alleviate hunger and poverty. Smallholder farmers, who comprise a significant portion of the world's agricultural workforce, are particularly vulnerable to these threats, as they often lack reliable information and resources that would enable them to identify and respond effectively to crop problems. These limitations at the farm level are exacerbated by weak co-ordination mechanisms at national and regional levels for rapidly identifying plant health threats and delivering effective solutions.

Women make up just over half of the global agricultural workforce and empirical evidence shows that providing them with greater access to resources, knowledge, skills and economic opportunities boosts productivity. However, significant barriers to gender equality exist, such as women's unpaid care burden, their lack of mobility and their unequal access to financial services. Young people, despite being vital for sustaining agriculture and food security, also often face discrimination and high rates of unemployment or underemployment.

Due to increasing plant health problems and the pressures to produce, the use of pesticides rose by 60% between 1990 and 2020. Smallholder farmers and agricultural advisers are often unable to access information about the environmental and human health hazards linked to the misuse of pesticides. Furthermore, they lack information about mitigation measures, such as personal protective equipment, safe storage, pre-harvest intervals, and low-risk alternatives. Compounding the problem, in many countries few lower-risk products which could serve as viable alternatives are registered and available. These challenges can have significant downstream effects on consumers and a country's or region's trade opportunities, as studies show that produce available in markets across low and middle-income countries often contains pesticide residues that exceed safety thresholds. To tackle these challenges, there is an urgent need for effective and sustainable approaches to plant health management.

PlantwisePlus is a global programme, led by CABI, that contributes to improving incomes and livelihoods for smallholder farmers through sustainable approaches to crop production, leading to safer and higher quality food in domestic markets. Through digital and face-to-face approaches, the programme provides access to accurate information, training and support to a range of agricultural service providers who play a critical role in making agriculture a more productive and resilient business. These interventions ultimately help to empower farmers to safeguard their crops and livelihoods against the impacts of pests, diseases and climate change.

CHALLENGE

Smallholder farmers lack reliable information about **pest threats**, are unaware of **pesticide risks** and have limited access to advice on **lower-risk crop production practices**



IF

THEN

BECAUSE

VISION

PEST PREPAREDNESS

National and regional authorities are supported to coordinate and implement prioritised pest prevention actions and climate-resilient pest management plans

Pest, threats and outbreaks will be mitigated through stronger national and regional plant health systems

Relevant stakeholders will be better able to predict, prevent and prepare for priority pests and share alerts and advice with smallholder farmers

PESTICIDE RISK REDUCTION

Stakeholders are supported to learn about pesticide risks, and to identify lower-risk alternatives such as sustainable biocontrol and biopesticides

More smallholder farmers will apply safer crop production practices

Stakeholders will better understand IPM practices and will be empowered to promote these alternatives

FARMER ADVISORY

Agri-service providers are supported to improve their advisory capabilities on IPM through digital and non-digital approaches, and to pursue related income generating opportunities

More smallholder farmers will adopt sustainable crop production practices, producing more food

Agri-service providers will have better knowledge about IPM, and, through new business opportunities, will be empowered to support more farmers



Key assumptions:

Effectiveness of pest management plans for farmers

Uptake of introduced lower-risk plant protection products by farmers

Sustainability and appropriateness of digital approaches

Government and commercial partners commitment to improving plant health systems

Willingness and ability of young women and men to engage in agricultural service provision

Key stakeholders:

Rural advisory services

Research and education

Private sector

Agricultural service providers

National and local governments

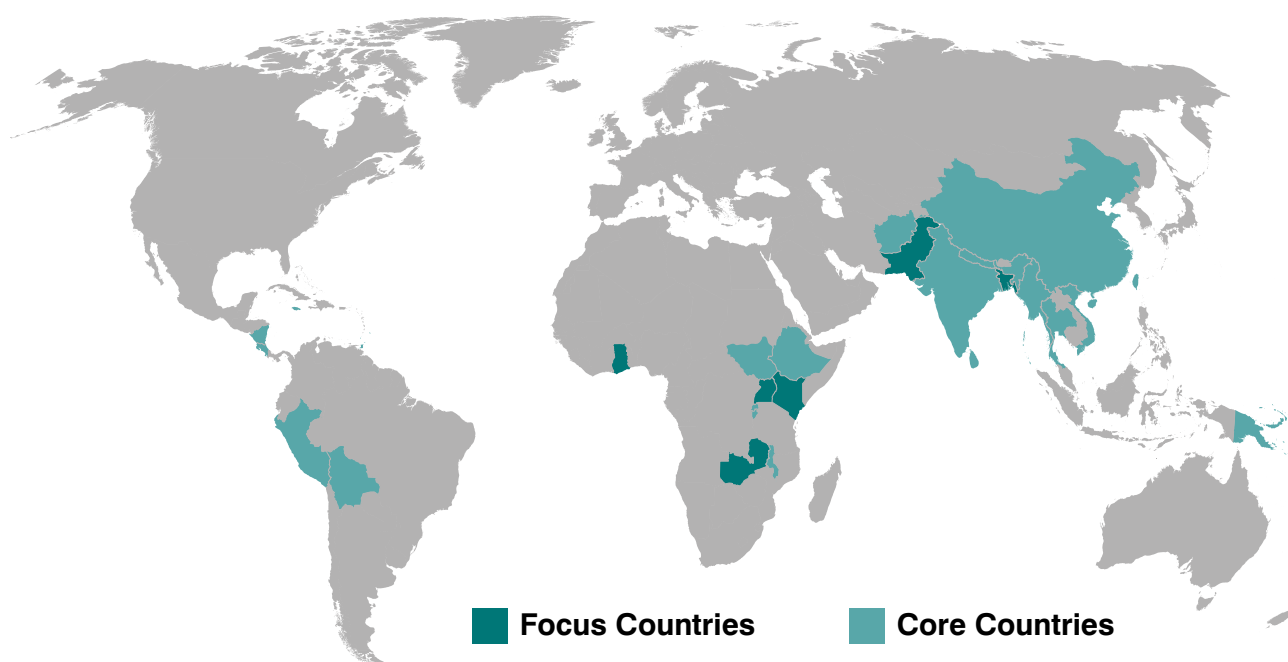
Extension including agro-input dealers

NGOs

Farmers

In addition to its focus on farmers and advisers, PlantwisePlus helps countries to predict, prevent and prepare for plant health threats by promoting systemic change and capacity building in national and regional plant health systems. The programme engages with government agencies, non-governmental organizations and other stakeholders to advocate for policies and investments that support sustainable agricultural systems.

PlantwisePlus includes both global and country-specific activities. The 27 programme countries are highlighted in the map below. In 2023, country-specific activities were concentrated mainly in six focus countries: Kenya, Ghana, Pakistan, Zambia, Uganda and Bangladesh. In addition, the programme continued to support 21 core countries across Africa, Asia and the Americas to strengthen their plant health systems and build capacity across agricultural service or extension providers.



The following donors contributed to the global implementation of PlantwisePlus in 2023: the Directorate General for International Cooperation of the Netherlands (DGIS); the Swiss Agency for Development and Cooperation (SDC); the European Commission Directorate General for International Partnerships (INTPA); the UK Foreign, Commonwealth and Development Office (FCDO); and the Australian Centre for International Agricultural Research. Furthermore, the Embassy of the Netherlands in Burundi provides exclusive and country-specific funding. In addition, the Ministry of Agriculture and Rural Affairs of the People's Republic of China provides exclusive financial contributions for programme activities in China.

This report presents an update on PlantwisePlus's implementation between January and December 2023. The report describes selected highlights, challenges and progress relating to the 11 outputs of the programme's proof of concept, following the three-impact-pathway structure. Annex I provides a comprehensive update on results against programme indicators and specific targets for the proof of concept. Annex II provides an overview of PlantwisePlus indicators with relevance to donor-specific progress monitoring indicators. Annex III provides a pre-audit overview of expenditure in 2023. Annex IV presents the annual budget plan for 2024. Finally, a summary of the external review findings and the scale-out phase plan is available in Annex V.

In addition to this report, CABI compiles technical reports on implementation under each of the programme's outputs. These are available upon request.



**Programme
highlights**



Pest preparedness

Increasing trade and travel between nations, compounded by changing weather patterns, are exacerbating the spread of invasive pests and causing unpredictable outbreaks of existing pests. Unfortunately, national and regional co-ordination for effective pest surveillance, detection and response is often lacking, especially in low-income and lower middle-income countries, leading in many cases to significant but avoidable crop losses. In response, PlantwisePlus launched multiple initiatives in 2023 to mitigate the spread of invasive pests and bolster community preparedness for future outbreaks. These efforts include promoting the adoption by multiple countries and regional bodies of climate-adapted tools and services to assess pest risks. Additionally, expert working groups have been established to facilitate collaboration and knowledge-sharing across different countries. Through horizon scanning, CABI and its national partners have assessed numerous pests for risk, contributing to the development of operational risk registers in several countries.

Identifying and prioritizing national and regional pest threats

Identifying and prioritizing highly damaging pests and diseases before their arrival in a country is critical for formulating effective management strategies. PlantwisePlus **develops and disseminates decision support tools** that support national and regional governments and institutions to develop these strategies. CABI's Horizon Scanning Tool (HST) facilitates the quick identification of potential threats at regional levels and provides criteria for prioritizing invasive species. Similarly, the Pest Risk Assessment (PRA) Tool generates a commodity pest list, aiding governments to assess the likelihood of pest entry, spread and impact, and recommending appropriate risk reduction measures. These measures can then be integrated into pest risk registers, which enable comprehensive risk management.

To date, CABI has provided direct support to national plant protection organizations (NPPOs) and country-based subject matter experts to use the HST and PRA tools in 10 PlantwisePlus countries,¹ as well as providing free access to the tools for 117 NPPOs in low- and middle-income countries. In 2023 PlantwisePlus facilitated the updating or production of horizon scanning assessments for high-risk pests in Bangladesh, Kenya, and Pakistan, identifying species for detailed PRA. CABI helped partners to set up prototype registers based on previous horizon scanning activities, overseen by dedicated working groups and/or committees.

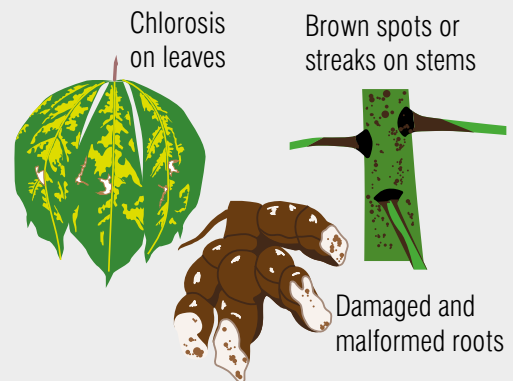
In 2023, PlantwisePlus, in collaboration with the Inter-African Phytosanitary Council and the United Nations Food and Agriculture Organization (FAO), took a step towards addressing the needs relating to managing pests of regional importance. It did so by facilitating **three regional PRA workshops**: one with EAC, one with ECOWAS, and one with SADC. Combined, these regional organizations involve 37 different countries across Africa, including nine PlantwisePlus countries. New features in the PRA Tool complemented this expanded use of the tool, including assessments for intentional introductions, a French-language interface, and enabling offline workflows.

1. Bangladesh, Barbados, Burundi, Ghana, Grenada, Jamaica, Kenya, Pakistan, Rwanda, and Trinidad and Tobago.

Curbing cassava brown streak disease in Zambia

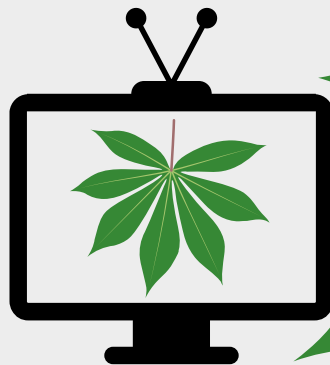
In Zambia, cassava is a staple crop for nearly six million people. Cassava brown streak disease (CBSD) is a viral disease that has been decimating cassava crops in the country since 2018, resulting in up to 100% yield loss. CBSD first emerged in the North-Western Province and has since spread rapidly. However, it has yet to be detected in most of Zambia's ten provinces, necessitating urgent containment efforts across the country. PlantwisePlus supported farmers in the fight against CBSD through education and a **multi-faceted awareness-raising campaign** on how to avoid spreading the disease.

Communication activities focused on how to manage the disease, including discouraging the common practice of sharing planting materials, as that spreads infection. The campaign kept CBSD high on public and private sector agendas by supporting dialogue and media awareness.



Symptoms of CBSD can be observed on leaves, stems and cassava roots.

146,126
People reached
through television



“The media landscape in Zambia underwent a significant change due to the campaign. It shifted the media's focus towards cassava, improving the quality of reporting and promoting sustainability. Journalists now engage directly with affected communities.

Journalist, Kamnet Television, Zambia

PlantwisePlus also supported a partnership between the Disaster Management Mitigation Unit in the Office of the Vice President and the FAO to distribute clean planting materials to stop the spread of the disease. This included providing information and training on managing seed plots to minimize the risk of CBSD re-infection.

Disease-free planting materials distributed to 500 farmers



CABI also updated the HST, integrating climate change data and enabling users to make more informed decisions regarding pest and disease management strategies in response to changing climatic patterns. Additionally, the tool development team adjusted the definition of regions within the HST to align with different economic zones and the mandates of regional plant protection organizations. This adjustment ensures that the HST's recommendations are aligned with the specific agricultural contexts and regulatory frameworks of different regions, thereby enhancing its relevance and applicability.

A further development was CABI developed a **pest insight reporting management hub**, which uses a machine learning model to streamline the production of insight reports for NPPOs by reducing the resources required to source data on pests. In 2023, CABI used the hub to generate reports for NPPOs in Kenya, Ghana and Zambia, and the machine learning model will be expanded with new pests in future for the existing countries and for new country and regional organizations.

Pest evidence notes are crucial to effective pest and disease management, as they provide scientifically grounded information for decision-making. They assess the occurrence of invasive species in selected countries, examine existing management practices and their impacts on farmers, and provide recommendations to governments for the most effective management strategies moving forward. In 2023, CABI prepared two evidence notes: one focusing on the virulent Ug99 strain of wheat stem rust fungus (*Puccinia graminis* f. sp. tritici) in Kenya and Uganda, and the other on the aquatic weed *Hydrocharis laevigata* in Southern Africa. Modelling of *H. laevigata* indicates that large areas of Southern Africa are at high-risk of invasion, including biodiversity hotspots like the Okavango Delta (Botswana), Caprivi Strip (Namibia), the Rift Valley lakes (stretching from Ethiopia in the north to Malawi in the south), and the Bangweulu Swamps (Zambia).

The evidence note development process brings together a multi-disciplinary team which covers both natural and social sciences. In this way, both **the biology of the pest and the socio-economic impact** are clearly understood, increasing the relevance and potential for adoption of the recommendations. For example, the study on wheat stem rust showed that there is a growing gap between the production of wheat in Sub-Saharan Africa, which is affected by Ug99, and the increasing demand driven by growing populations and urbanization. The evidence note suggests that supporting farmers with training on appropriate agronomic technologies, and with adopting Ug99-resistant varieties, will be necessary to control the fungus. In parallel to the work informing government, PlantwisePlus is exploring how the programme can best support farmers to sustainably manage the disease.

Supporting governments to prepare and protect countries

Following the identification and prioritization of pest threats, and studies on their potential impact, CABI works closely with national partners to develop pest response plans. These plans provide structured frameworks that enable national systems to respond to pest outbreaks in a timely and co-ordinated manner.

In 2023, PlantwisePlus facilitated a workshop involving partners from 17 Bangladeshi institutions representing the government, researchers, non-government organizations, and the private sector. The aim of the workshop was to jointly develop a National Action Plan for Bangladesh to enhance their system for pest preparedness and management. The catalyst for this meeting was a second national review into Bangladesh's response to the incursion of fall armyworm. This review expanded upon a 2020 assessment conducted by PlantwisePlus that identified areas for enhancing the system and that established a baseline for measuring improvements in its responsiveness. The 2023 study concluded that there had been an effective response to the fall armyworm outbreak, with good co-ordination, brought about by the creation of a national task force. The task force responded by implementing emergency registration for bioprotection products, thereby promoting sustainable management practices, and developing briefs to raise awareness about invasive species across various sectors within the country. The study also highlighted certain weakness and offered recommendations for improvement, which have been integrated into the National Action Plan. This collaborative and comprehensive approach to planning lays the foundation for a **resilient and adaptive pest preparedness and management system** in Bangladesh, ensuring a sustainable and secure future for the nation's agriculture and ecosystem.

PlantwisePlus also provided important support for a national response plan for cassava brown streak disease (CBSD) in Zambia in 2023. Following the government's recognition of the impact of CBSD on food security and farmer livelihoods, the Zambian Disaster Management Mitigation Unit (DMMU) led efforts to train farmers in good agronomic practices and to make clean planting materials available in affected areas so that farmers can mitigate their losses. PlantwisePlus supported this by distributing clean planting materials to 500 farmers, including 16 lead farmers, in the Nsama district.

Providing farmers with direct, timely and accurate information

In addition to working with governments, PlantwisePlus develops targeted, **large-scale communication campaigns** aimed at farmers, to provide information on sustainable pest management using IPM approaches. In 2023, PlantwisePlus undertook communication campaigns in Kenya, Pakistan and Zambia. In Kenya, one campaign focused on providing farmers with the latest pest management practices to minimize losses caused by the invasive apple snail, and another aimed to raise awareness and encourage the widespread adoption of the biocontrol strategy for papaya mealybug. In Pakistan, the objective was to promote conservation biocontrol practices for Parthenium, also called “famine weed”. The goal in Zambia was to increase awareness about using clean cassava planting to combat CBSD. Communication channels included stakeholder meetings, flyers, SMS, radio and social media. The programme also engaged local figures for TV programmes advising farmers against sharing planting materials. This campaign transformed media coverage of CBSD, improving journalists’ understanding of cassava’s importance and leading to more comprehensive reporting on the challenges faced by cassava farmers. As part of this effort, CABI partnered with FAO and the Zambian DMMU to train the cassava farmers and lead farmers who received the cuttings on how to plant and maintain them to minimize the risk of re-infection.

Alongside communication campaigns, PlantwisePlus also reaches farmers directly and indirectly through the PRISE. By delivering pest bulletins to plant doctors and disseminating SMS messages directly to farmers, PRISE empowers farmers in Zambia, Ghana, Kenya and Malawi to make informed decisions and proactively manage risks.

The PRISE system uses a novel combination of earth observation technology, real-time field observations and plant-pest lifecycle analysis to deliver science-based advice that is tailored for **specific agro-climatic conditions** in each country. In Kenya, CABI’s collaboration with the Kenya Meteorological Organization and Kenya Agricultural and Livestock Research Organization (KALRO) has proven highly beneficial. Leveraging their big data platform, CABI was able to reach over 724,000 farmers in 2023 alone. More details on this service are provided in the “Farmer advisory” highlights section.

In 2023, PlantwisePlus also launched a randomized control trial assessing PRISE’s impact, focused on the tomato leaf miner model. The study engaged 1650 farmers across seven counties in Kenya. This study aims to evaluate the effect of PRISE’s time-to-act messages on farm performance and farmer behaviour. The end-line survey is scheduled for March 2024.



Pesticide risk reduction

There is increasing awareness of pesticide risks on a global level. However, the adoption of risk-mitigating production practices by farmers, particularly those in developing countries, is not progressing at the pace required to prevent further damage to human, livestock and environmental health. Reducing the use of chemical plant protection products that pose serious hazards to human and environmental health is a key part of transforming the global food system to make it more resilient, healthier and more sustainable.

In 2023, under the programme's pesticide risk reduction impact pathway, PlantwisePlus undertook several strands of activity to address the different – and often complex – market pressures that drive the use of hazardous products. The goal was to work across the plant health system, from farmers to regulators, to encourage the adoption of safer, lower-toxicity alternatives, including biological solutions, and to reduce the indiscriminate use of the most toxic products.

Informing policy change on the use of low-risk plant protection products

Governments employ a range of public policies to regulate the use of plant protection products, aiming to encourage farmers to reduce their reliance on conventional chemical pesticides and prevent their misuse. CABI partners with national decision-making bodies, such as regulators, 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 and biocontrol solutions. In 2023, CABI made **significant progress in influencing policy dialogue** and outcomes related to pesticide risk reduction.

In Pakistan, CABI's efforts to promote sustainable pest management solutions and biopesticides contributed to the Government of Pakistan approving a biopesticides registration guidance document in November 2023. This major achievement addresses a gap in the previous pesticide regulatory system, where the focus on chemical pesticides hindered the commercialization and widespread use of biopesticides.

In 2019, through the previous Plantwise programme, CABI initiated discussions with regulatory authorities in Pakistan, including the Department of Plant Protection, on registration processes for biologically-based plant protection products. Subsequently, a team of biopesticide experts from CABI, the United States Department of Agriculture and the Pakistan Agricultural Research Council jointly developed a national registration guidance document. The guidance document included new application forms for the **registration of biopesticides** and relevant information, particularly minimum data requirements for the registration of active ingredients and formulated products; exemptions from registration; and guidance for waivers.

After extensive consultations and review processes, the Agricultural Pesticides Technical Advisory Committee approved the biopesticides registration guidance document in November 2023. In January 2024, a meeting of the Cabinet Committee on Legislative Committee approved this registration guidance document. This milestone marks significant progress towards promoting safer pest control methods and enhancing food safety in Pakistan.

As a next step, PlantwisePlus will deliver a Bioprotection Roadshow that will communicate the change in regulations to international and national companies and that will share with Pakistani farmers what biopesticides are available. The Roadshow will also serve as an opportunity to facilitate closer collaboration between Pakistan and several selected biocontrol manufacturers from Europe and China in regard to the introduction and application of biological pest management approaches.

In Kenya, during 2023 CABI took on the role of Secretary of the multi-institutional Technical Working Group on Plant Protection Products for Trade (TWG).² The TWG brings together technical professionals from various stakeholders across agriculture and trade. It aims to finalize the Kenyan listing of plant protection products of concern, in line with European Union (EU) import regulations. For each pesticide of concern, the TWG systematically collected data to assess whether any maximum residue levels had been violated, whether there are any alternative authorized pesticides for the treated crops, and which of those, if any, are registered for use in both Kenya and the EU.

The TWG is an example of **inter-agency collaboration** fostered by CABI that has been more successful than anticipated. Indeed, the group has decided to work together on an ongoing basis, rather than stopping at one set of analysis, as originally planned. This activity demonstrates the value-add that CABI can bring to national processes on reducing pesticide risk and increasing harmonization.

Another notable achievement in 2023 was PlantwisePlus's collaboration with Sri Lanka's Department of Agriculture on pesticide risk reduction activities. Together, PlantwisePlus and the Department conducted desk studies to identify potential challenges in enabling the use and registration of safer products in the country. Moving forward, CABI will support Sri Lanka to create a database of classification information on registered pesticides and share initial information on best practice in biopesticide registration.

Biocontrol of invasive species

Biocontrol is the use of living organisms, such as insects or pathogens, to manage or reduce the population of invasive species. This method has been used effectively against invasive species for over 100 years. Biocontrol aims to restore ecological balance by reducing the negative impacts caused by invasive species on native ecosystems and agriculture. It also provides a **sustainable and environmentally friendly method** of managing invasive species, especially when other control methods are limited or not feasible. PlantwisePlus promotes three forms of biocontrol as lower-risk solutions to pest threats:

- **Classical biocontrol** is a long-term or permanent solution that targets invasive species. A natural enemy from the pest's area of origin, which has co-evolved with the pest, is introduced to the invaded region to suppress the pest population. In classical biocontrol, the agent permanently establishes and sustains itself in the ecosystem. By selecting biocontrol agents that specifically target the focus pest, scientists can ensure that there is minimal risk to other species. CABI works with government organizations to obtain the necessary approvals to release such agents and to introduce them into the target environment.
- **Augmentative biocontrol** is a shorter-term solution, whereby large numbers of a selected biocontrol agent are reared and released to suppress the pest population. The natural enemy needs to be reintroduced regularly to control pest populations because it does not persist in high enough numbers to maintain the desired level of control. CABI works with government and private sector organizations on the research, development, and commercialization of augmentative biocontrol solutions.
- **Conservation biocontrol** involves enhancing populations of existing biocontrol agents by stimulating their population through landscape and crop management practices aimed at protecting, maintaining or increasing their numbers.

In 2023, CABI supported multiple PlantwisePlus countries to investigate and implement biocontrol solutions against some agricultural pests that cause significant crop losses. Some examples are given below.

***Parthenium hysterophorus* – famine weed**

Parthenium is a highly invasive plant species that spreads rapidly and, if left unchecked, can reduce pasture carrying capacities by up to 80–90%. This is why it is commonly referred to as “famine weed”. The plant can also cause health problems in both humans and animals.

2. The TWG Committee brings together experts from the Kenya Plant Health Inspectorate Service (KEPHIS), the Pest Control Products Board, the Committee Linking Entrepreneurship-Agriculture-Development, CropLife International, the Agrochemical Association of Kenya and the Fresh Produce Exporters Association of Kenya.



PlantwisePlus supports the Parthenium biocontrol programme in Pakistan, which made significant strides in 2023. A classical biocontrol agent (stem boring weevil, *Listronotus setosipennis*) was released across five provinces (Punjab, Khyber Pakhtunkhwa (KP), Sindh, Balochistan, Azad Jammu and Kashmir). The programme partnered with local governments, universities and research institutes to **establish 10 production facilities** in three provinces (KP, Punjab and Sindh), bolstering rearing expertise and output in the country.³ Successful establishment of the weevil was observed at four sites just months after release. This outcome indicates a promising start for the classical release programme. Long-term, effective control hinges on the ability of weevils to complete multiple generations in the field, which will lead to an increase in their numbers and a decrease in Parthenium populations.

***Paracoccus marginatus* – papaya mealybug**

Papaya mealybug is an invasive insect pest that spreads rapidly, forming large infestations on leaves, fruit and stems of host plants such as papaya, as well as other fruits, vegetables and ornamentals. It is a threat to commercial papaya production. Use of chemical pesticides is not very effective at controlling the pest and could lead to residues on the papaya fruit.

In Kenya, significant progress has been made in the classical biocontrol of papaya mealybug. Starting at the end of 2021, CABI and its partners KEPHIS, KALRO and National Museums of Kenya began introducing an exotic biocontrol agent (a parasitic wasp, *Acerophagus papayae*) to help manage the pest in Kenya. By the end of 2023, the biocontrol agents had been released on papaya-producing farms in 12 sub-counties in coastal Kenya.⁴ Within two years of the first releases, the tiny parasitic wasps are causing up to 75% mortality of the papaya mealybug, which means a **significant reduction in the pest populations** and

related damage. Preliminary economic studies conducted in late 2022 show that the average amount of papaya harvested was almost double in the treatment farms than in the control farms. This was also reflected in average income, which was approximately 20% higher in the treatment farms than in the control farms.



PlantwisePlus also facilitated awareness-raising activities with local partners in 2023 about the classical biocontrol of papaya mealybug and helped to build the capacity of farmers, extension officers, researchers, input suppliers and policymakers to manage the pest. As of December 2023, 346 direct beneficiaries⁵ had been informed about classical biocontrol and how to manage their papaya crops without harming the biocontrol agent, such as by reducing chemical pesticide use. In some areas, PlantwisePlus also encouraged farmers to trial the use of natural enemy field reservoirs (NEFR) to enhance the establishment and spread of the agents. This simple technology enables farmers to bolster the number of parasitic wasps.

The rapid biocontrol success in Kenya contributed to Uganda granting permission for release of the same agent within its borders. With CABI's support, the National Agricultural Research Laboratories in Uganda set up their own production at the local quarantine facility, which will facilitate releases of the natural enemies in affected areas.

“I believe that my children’s education will be guaranteed, and my life will be transformed compared to how I previously lived.”

Omar Mwandaro, a farmer in Kenya reflects on the positive impact of the biocontrol release on his papaya.

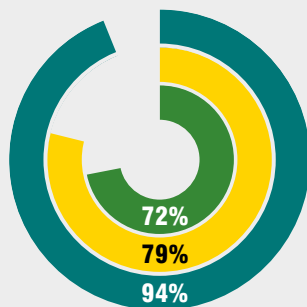
3. Department of Agricultural Research, Tarnab, Peshawar, KPK; Abdul Wali Khan University, Mardan, KPK; University of Swabi, KPK; Agricultural Research Institute, Mingora, KPK; University of Agriculture, Faisalabad, Punjab; University of Arid Agriculture, Rawalpindi, Punjab; University of Sargodha, Punjab; MNS-University of Agriculture, Multan, Punjab; the Islamia University of Bahawalpur, Punjab; Sindh Agriculture University Tandojam, Sindh.

4. <https://blog.plantwise.org/2024/02/23/how-a-tiny-wasp-can-save-the-livelihoods-of-papaya-farmers/>

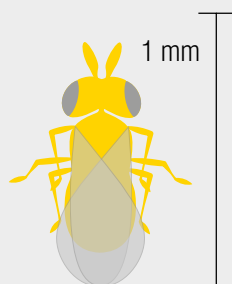
5. 198 papaya farmers, 119 extension officers and 29 crop inspectors.

Using biological control to combat the invasive papaya mealybug

Only 51% of 383 Kenyan farmers surveyed in a PlantwisePlus baseline study in 2021 had heard of biocontrol. The programme is aiming to increase that awareness through successful biocontrol interventions and through the CABI BioProtection Portal.

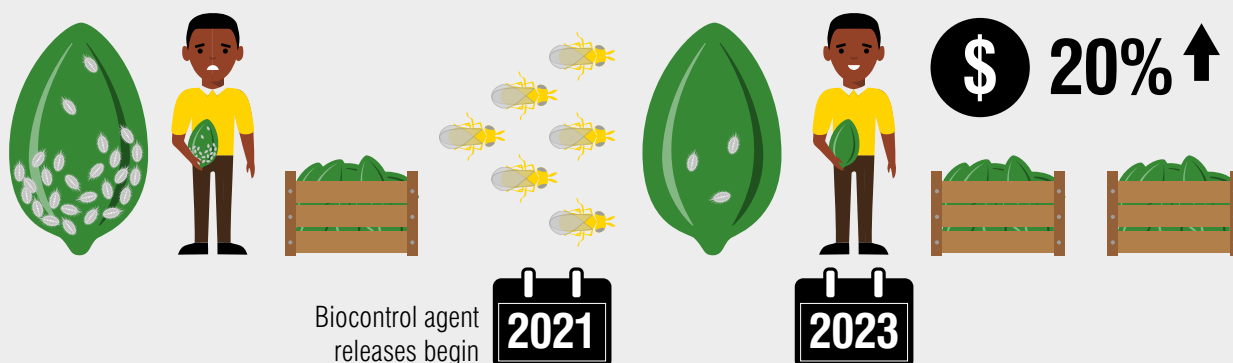


Of the farmers aware of biocontrol:
94% viewed the practice as safe
79% as affordable
72% as effective.



CABI worked with KEPHIS, KALRO and National Museums of Kenya to **release a tiny** – less than 1mm in length – **parasitic wasp** (*A. papayae*) as a classical biological control agent to fight the destructive papaya mealybug on Kenya's coastline.

Within two years of the first release, the parasitic wasps were causing up to 75% mortality of the papaya mealybug and average papaya harvests almost doubled between treatment and control farms. With higher yields, the average income of farmers on treatment farms increased by approximately 20%.



To complement field releases of the wasp and aid its establishment and spread, PlantwisePlus also assisted farmers in constructing simple **Natural Enemies Field Reservoirs (NEFRs)** in their fields. These act as on-farm mass rearing facilities. Farmers manage the NEFRs, helping to increase their understanding of biocontrol and how the wasp works.



The NEFRs also supported other natural enemies besides the wasp. Several ladybird beetle species were observed eating the papaya mealybugs.



***Spodoptera frugiperda* – fall armyworm**



Fall armyworm is a highly destructive invasive pest that has recently spread to many parts of the world. This caterpillar pest causes significant damage, particularly to maize and rice crops. Efforts to combat fall armyworm in Africa have been focused on developing potential biocontrol solutions with partners in Ghana, Pakistan, Rwanda and Zambia. These include different types of biocontrol (classical, augmentative and conservation), as well as different types of biocontrol agents (insects, nematodes and fungi).

One of the most significant developments of 2023 has been the augmentative biocontrol of fall armyworm **using a fungal pathogen**. CABI and the Zambia Agricultural Research Institute (ZARI) conducted tests with *Metarhizium rileyi*, a naturally occurring fungus that infects and kills fall armyworm caterpillars. Mass production and formulation studies

progressed at CABI's facility in the UK, with scientists characterizing and developing molecular markers for the fungus. At the same time, field trials on the efficacy of the agent were set up in collaboration with ZARI camp officers in the local areas. Due to some weather-related setbacks early in 2023, the first results will be available in 2024, following the 2023–2024 cropping season. This *Metarhizium*-based concept is very closely related to a biocontrol product originally developed by CABI called “Green Muscle” that controls the destructive desert locust. In recent years, a *Metarhizium*-based product similar to Green Muscle has been supplied to authorities in multiple countries in East Africa, as well as Pakistan and India, for desert locust management. It is hoped that there will one day be similar products available for the widespread and destructive fall armyworm.

Alongside researching potential products and their efficacy, PlantwisePlus investigates how gender interacts with attitudes, perceptions and willingness to use biocontrol solutions. A 2023 survey among maize farmers in Zambia found that maize production is a gendered activity, and that the barriers to uptake of biocontrol to combat fall armyworm are also gendered, including access to inputs, services, information, markets and income. More detailed results from this study will be available in 2024 and will inform how PlantwisePlus designs biocontrol campaigns.

Establishing low-tech local rearing facilities for augmentative biocontrol

The production of biocontrol solutions is not limited to large enterprises like those that dominate the biological pest control market. Particularly for regions that do not have access to commercialized lower-risk plant protection products, there may be opportunities to **establish local production** of certain natural enemies. The success of a local biocontrol agent production facility rests on the ability of in-country partners to produce high quality natural enemies in a cost-effective manner. For certain augmentative biocontrol agents that have already proven to be highly effective, simple, low-tech production systems with modest set-up and running costs are sufficient to produce the necessary supply. They also provide the basis for a sustainable business model in which income generated from sales of the agent provides an attractive return on limited upfront and ongoing investment.

In 2023, PlantwisePlus built on the success of the *Trichogramma* rearing facility (TRF) in KP province, Pakistan, by starting to establish additional facilities in other regions. Working with provincial government partners, the programme set up two new facilities in Pakistan to rear this parasitic wasp: one in each of Punjab province and the Azad Jammu and Kashmir region. In Bangladesh, CABI initiated the same process with the Bangladesh Agricultural Research Institute, with the aim of having a fully functional biocontrol rearing facility by mid-2024. As well as increasing the availability of natural plant protection solutions at an affordable price for many smallholder farmers (each facility should be able to supply at least 200 farmers), this development of local agribusinesses also creates opportunities for **gainful employment for rural women and youth**.

Changing farmers’ perceptions and behaviours around safer use of pesticides

Alongside work with regulators, in 2023 CABI continued to engage with government, civil society, public health, consumer organizations, retailers, and wholesalers, to plan and run social and behaviour change campaigns. These campaigns are designed to raise public awareness of safer, higher quality and locally produced food, and to drive behaviour towards more sustainable practices.

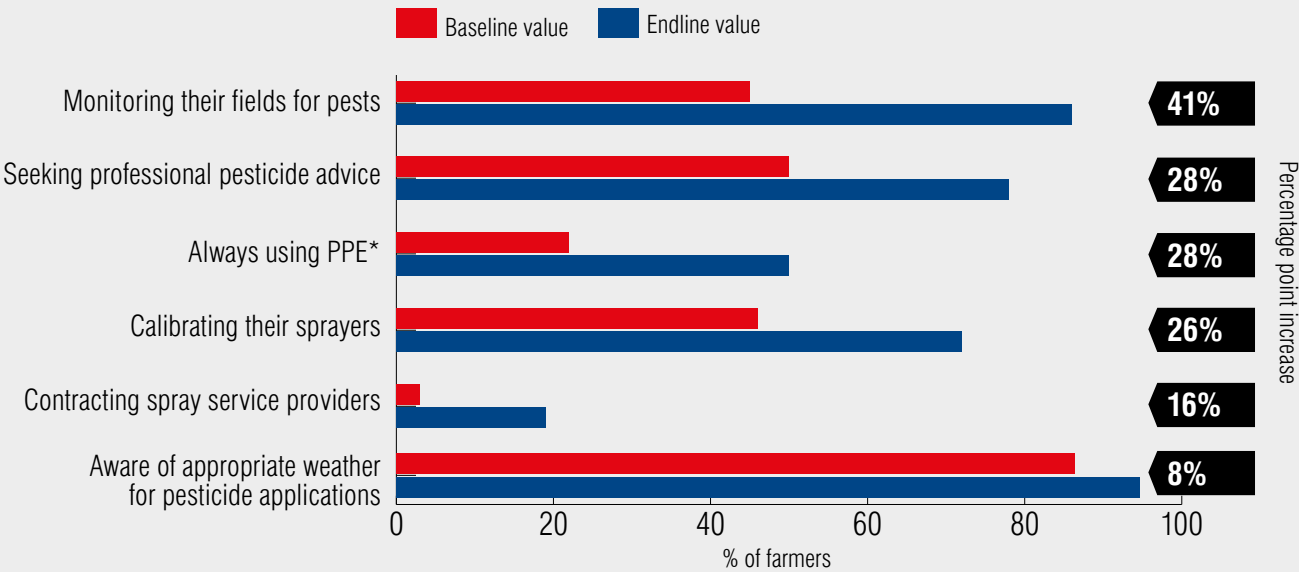
A major success was the launch of the pilot “Ukulima True” initiative in Nakuru County, Kenya, in July 2023. This collaborative effort involved CABI, the Nakuru County Department of Agriculture and the Centre for Behaviour Change and Communication. The initiative represents the initial phase of implementing the County Social Behaviour Change Strategy on Pesticide Risk Reduction, which was validated in April 2023.

Shifting societal and farmer behaviours to reduce pesticide risk

In 2023 PlantwisePlus engaged the Centre for Behaviour Change and Communication and the Department of Agriculture of Nakuru County, Kenya to pilot **Ukulima True**, a social and behaviour change campaign to reduce risks associated with pesticides.

Meaning ‘true farmer’ in Swahili, Ukulima True aimed to encourage everyone involved in the food value chain in Nakuru County – one of Kenya’s biggest for fruit and vegetable production – to support farmers to use pesticides more safely.

The participatory campaign delved into the reasons for ignoring pesticide risk and drivers for behavioural change. An early assessment found indications of positive change across a number of behaviours.



Jingle used on radio during the campaign

Mkulima True huzingatia maadili, akitumia dawa za kuuwa wadudu
A true farmer practices safe and correct use of pesticides

Anaweka mbele njia mbadala kama biotrap na biopesticides
They prioritize the use of safer alternatives like biotrap and biopesticides

Hakuna shortcuts, havuni mazao yenye dawa kando na ilivyo agizwa
They do not take shortcuts, and he observes pre-harvest intervals

Anajali kizazi cha baadaye, anafanya kilimo endelevu
They care about the future generation, he practices sustainable agriculture

*PPE: Personal protective equipment

The primary objectives of the initiative are as follows: to increase awareness among farmers, value chain actors and the public on **the importance of the correct use of pesticides**; to motivate farmers to use pesticides correctly and to access and use alternative pest control measures to synthetic pesticides; to increase farmers' confidence in using personal protective equipment and demand for service spray providers; and to lobby for improved linkages to markets for farm produce. The initiative also raises awareness about safer-to-use and more sustainable biopesticides, as well as the need for monitoring to identify and manage crop pests and diseases early as part of an IPM plan. CABI and its partners trained agro-input dealers, extension workers, and engaged with farmers through farmer groups and wider community meetings, using talking books, videos, posters and radio to convey key messages.

PlantwisePlus facilitated an assessment of the Ukulima True campaign in December 2023, using a mix of quantitative and qualitative measures to determine what effects the intervention had on knowledge and behaviour. The assessment found that during the campaign, over 890,000 people were reached through radio media, and 2000 farmers, agro-input dealers and extension officers were trained. A comparison of baseline and endline figures reveals **improvements in many aspects of farmer knowledge and behaviour** in relation to pesticide risk reduction. Farmers who had been reached by the campaign reported increases in pest monitoring prior to applying pesticides, seeking advice from professionals on pesticide use, using personal protective equipment when handling pesticides, correctly calibrating their sprayers, etc. In total, the study results show that Ukulima True was successful in disseminating several complementary messages to a wide audience, and that retention of the information was strong.

Enhancing consumer awareness about pesticide residues in fresh produce, and their associated risks, can contribute to increased demand for safe food in domestic markets. During 2023, as part of the proof of concept activity plan, PlantwisePlus implemented activities aimed at creating awareness and encouraging stakeholder collaboration on reducing the risk of pesticides in food for domestic markets. The focus of the activities was on **safeguarding farmer and consumer health**, as well as protecting biodiversity and the land on which farmers rely. Work in 2023 built on the reports of pesticide residue analyses, consumer surveys, and situation analyses initiated in 2022. Partner agencies presented these findings in high-level national fora, such as the Technical Working Group on Plant Protection Products for Trade and the Ministry of Agriculture in Kenya, the National Food Safety Commission in Ghana, and similar bodies in Pakistan, generating recommendations for the next steps under PlantwisePlus and within the national system. The findings also informed the creation of an enabling environment for policy and action on pesticide risk reduction through the co-development of behaviour change campaigns and appropriate communication materials that have been disseminated through various platforms in those three countries. Residue analyses continued in 2023, with results expected in early 2024.

Regarding the use of biocontrol for plant protection, PlantwisePlus research demonstrates significant **differences in farmers' perceptions** between regions and by gender. The programme will use this information to help focus its resources going forward. Studies conducted in Kenya have found that more men than women perceive biocontrol to be useful and necessary, suggesting a need to increase women's awareness and understanding of biocontrol. In contrast, a 2023 PlantwisePlus study in Pakistan found that female farmers were more receptive to biocontrol methods for pest management, due to their roles in agricultural production. The reduced health risks of the biocontrol method were found to be important for female farmers, while male farmers were more concerned about the effectiveness of the biocontrol method compared with pesticides. The study found that using an augmentative biocontrol solution like *Trichogramma* helped to reduce the time and labour spent by men on pest management and improved their yield and income; however, it increased the demand on women's time and labour, while their decision-making roles regarding the income from tomato production remained low. These results can inform future communication campaigns, including ensuring messaging is tailored and that social and behaviour change campaigns encourage changes to social norms and improve women's decision-making abilities regarding income and production.



Farmer advisory

Many smallholder farmers still lack access to reliable best practice information, including how to manage the multitude of crop health problems that can arise. Government extension plays an important role in supporting smallholder agriculture, but there are not enough public sector advisers to meet the needs of smallholders. Therefore, farmers often seek plant health advice from agro-input dealers and other service providers in their communities who are less well-equipped to provide accurate guidance. Through the PlantwisePlus programme, CABI works with in-country public, private and civil society partners to strengthen the capacity of diverse agricultural service providers to deliver objective, science-based advice to smallholder farmers. Through a combination of approaches built around learning and decision support tools, PlantwisePlus develops the base of personnel in rural areas who can enable farmers to become more resilient to challenges in agriculture.

Building knowledge in agricultural advisory

PlantwisePlus creates a number of opportunities for building the capacity of agricultural service providers, particularly to improve the delivery of plant health advice to farmers. Several of the programme outputs include activities that target intermediaries who have the greatest access to smallholder farmers and are therefore a critical link in addressing the “last mile” challenge.

CABI continues to support country partners to maintain plant clinics and related processes. This sustained partnership enables CABI to monitor operations in the various countries. There continues to be a **strong use of the plant doctor training modules** that had been developed under the previous Plantwise programme. In nearly all cases, this training is conducted by national trainers from government extension and plant protection departments for their field staff. In 2023, PlantwisePlus trained more than 1500 people across 12 countries in Africa, Asia and the Americas using these highly popular, face-to-face short courses. This training was associated with the establishment of 240 new plant clinics across 10 countries (Bangladesh, Bolivia, China, Costa Rica, Ghana, India, Jamaica, Nicaragua, Pakistan and Sri Lanka), thereby increasing the number of agricultural service providers who can assist farmers with the identification of crop problems and IPM-based solutions.

The programme's traditional plant doctor training aims to establish a basic capability to provide diagnoses and recommendations for plant health management. In many countries, the plant doctors also took part in training and exercises on monitoring, evaluation and learning. The intention was to encourage them to critically assess their service and its relevance to the farming community (e.g. accessibility and inclusiveness, appropriateness of advice). In recent years, CABI has taken this a step further by developing specific **training on gender sensitivity**. So far, this has been used most extensively with government extension workers in Ghana and Pakistan. In 2023, the programme trained a total of 356 extension staff in 14 districts in Ghana. With the support and endorsement of the Directorates of Agricultural Extension Services and Women in Agricultural Development of the Ministry of Food and Agriculture, CABI led the development of a gender handbook as an ongoing

reference for extension staff. In Pakistan, where the process is at an earlier stage, 88 lead trainers from the KP and Punjab provinces participated in a training of trainers in preparation for a roll-out of the training starting in 2024. As with other programme courses that are intended for large audiences around the world, there is a limitation in the scalability of face-to-face training. CABI is therefore planning to develop a digital learning module to extend the training's reach and impact. Feedback from the training has been positive and the lead trainers remain in contact with CABI, which will provide opportunities to understand how their new knowledge is being used and the impacts of this on extension practice. A gender handbook is being approved by the government Agriculture Director General Extension departments in both KP and Punjab provinces.

PlantwisePlus goes beyond strengthening traditional agricultural service providers (i.e. government extension). The programme is working with partners in Kenya and Uganda to support **agribusiness initiatives for rural youth**. These included six initiatives in Kenya (Makueni Fruit Processors Association, Keitt Exporters, Starlight Cooperative, Nakuru County Government, Food to Market Alliance, and the Micro Enterprises Support Programme Trust) and two in Uganda (the Rubanga Cooperative Society and Ziobwe Agaliawamu Agribusiness Training Association). One of the foundational aspects of the training facilitated by the programme relates to providing good plant health advice to farmers. In these two countries in 2023, CABI and partners trained a total of 255 service providers, nearly all of whom were youths (239 under 35 years

old; 74 women) in various topics primarily related to crop management. Many of those trained have already begun putting their new knowledge and skills to work in support of the farmers in their communities. Some initial evaluations have revealed that, in both Kenya and Uganda, these youths generated between \$100 and \$2000 in commissions or income in six months of work as IPM champions or spray service providers. Some youths trained as spray service providers invested in motorized spray pumps and employed other young men to support them.

The role of agro-input dealers is first and foremost to distribute and sell agricultural inputs to farmers. While they are typically not regarded as an official advisory service, farmers can and do seek their advice when a crop health problem arises. Based on extensive observations garnered through Plantwise and PlantwisePlus, agro-input dealers often lack the knowledge to provide accurate diagnoses of the problems farmers face, and appropriate management advice. PlantwisePlus therefore aims to set up systems in countries that move towards ensuring that smallholder farmers are provided with accurate and best-practice advice, especially with regard to IPM and pesticide risk reduction. In 2023, PlantwisePlus shifted the focus of this work area away from supporting the establishment of voluntary standards for agro-input dealers to **strengthening existing mandatory systems for agro-input dealer training and licensing**. In Uganda, the programme supported the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Makerere University (the certification body) to develop two hours of new training content on safer plant protection products, which will be added to the current, official agro-input dealer training curriculum. Positive feedback from the local partners on CABI's contribution to modernizing the training led to MAAIF expressing interest in further content revision and improvement.

One very significant highlight from 2023 comes from Bangladesh, where there was previously no training for, or evaluation of, individuals who become licensed agro-input dealers. Earlier groundwork by PlantwisePlus was key to influencing the Ministry of Agriculture to adapt its regulations around the licensing of agro-input dealers. In 2023, the Additional Secretary of Agriculture announced the introduction of obligatory and systematic training for all new agro-input dealers in Bangladesh. Since that announcement, CABI has been collaborating with a working group of local experts to develop a curriculum and the necessary training materials.

“I have significantly improved my living standards, positively influenced my community, and expanded my professional network. Thanks to CABI’s teachings, I’ve learned the importance of identifying gaps in agribusiness and offering practical solutions.”

Alex Macharia was trained under PlantwisePlus as an IPM champion and spray service provider.

In addition, there is strong evidence of the sensitisation of stakeholders about lower-risk plant protection products through the PlantwisePlus digital tools, courses and other activities. Discussions on the limited availability of bioprotection products at local level in Bangladesh resulted in a directive from the Director General of the Department of Agricultural Extension stating that every agro-input shop must have a dedicated shelf for biological products for their distinct visibility and availability.

Tailoring the programme's digital tools and learning products

Digital tools and learning products have the potential to reach a larger audience than face-to-face training sessions. By leveraging digital decision support tools and online learning products, PlantwisePlus can provide a wider audience of agricultural service providers and farmers with the necessary information to make better crop management decisions.

CABI makes **high quality digital learning courses** available to PlantwisePlus countries through the CABI Academy platform. In 2023, there were nearly 7000 new Academy account registrations. The two existing courses (Crop Pest Diagnosis and Crop Pest Management) were available for free to all 27 PlantwisePlus countries. This has had a significant impact on participation, particularly in Bangladesh and Pakistan. The completion rate of the courses is around 13%, a figure which compares favourably against the market average of 7–10%. The release of the “Introduction to Bioprotection Products” course in 2023 gained significant interest, with over 3000 participants already enrolled. Partner governments recognize the value of the digital learning products, notably in Bangladesh, where the certifications have become mandatory for Sub-Assistant Agricultural Officers in the extension service.

“I have already recommended it to my colleagues. An easy way of learning about biological control agents. It is easy to navigate and engages you through their examples. It developed me to be better and I want to take more courses”

CABI Academy user

In 2023, the CABI Academy team also continued the development of four new digital learning courses and their associated certification assessments, which will be launched in 2024: on water management, on soil management, on seed and planting materials, and on reducing pesticide risks. Finally, CABI began the design process for a fifth course, “Introduction to crop nutrition”, which will be developed in 2024. There were some small delays in this process, partly due to the extra time taken to find and contract subject matter experts and partner organizations. For certain complex topics, the process for obtaining scientific consensus can be complicated, with a risk of developing messaging that is ambiguous and highly caveated, which is difficult for participants to understand.

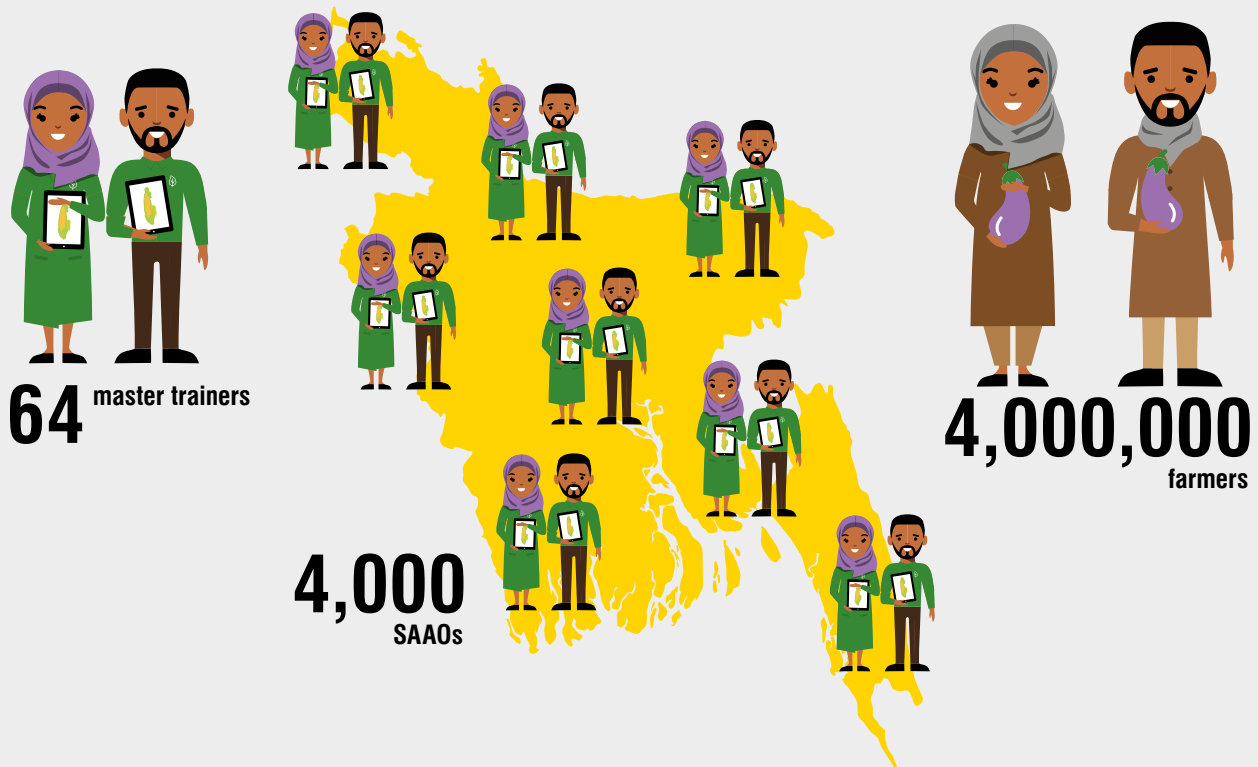
In such cases, user feedback is very important to ensure the courses are having the intended impact. User interviews and feedback questionnaires contributed to a detailed user experience review in 2023, and a major upgrade to the Moodle 4.1 platform for the courses, with significant navigation improvements.

Work also continued in 2023 to develop the Crop App Index, launched in 2022. The index provides a filterable catalogue of existing crop health-related mobile apps and websites, along with information on their content and a link to the website or app store. CABI added around **600 new digital decision support tools** for crop production and plant health in 2023, taking the total number of tools in the index to 1101. A key development in 2023 was the creation of a Crop App Assessment Methodology, based on similar assessments for medical apps, to assess the quality of the many digital advisory tools available and to decide if they should be integrated into the PlantwisePlus digital offering. External reviewers from Africa and South Asia reviewed the apps based on criteria including the credibility of the app owner, the download experience, the visual design, app accessibility, usability, content quality, and commercial features.

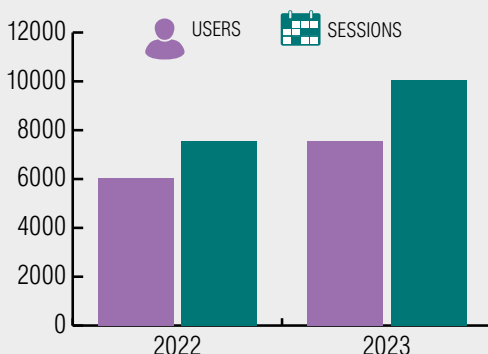
Accelerating adoption of PlantwisePlus digital tools and courses in Bangladesh

PlantwisePlus delivers digital advisory tools and distance learning courses that improve the capacity of those supporting smallholder farmers to **manage plant health problems with sustainable solutions**. In Bangladesh, the programme held several training sessions to raise awareness and increase uptake of these intuitive decision-support tools and digital learning platforms.


One agricultural extension officer (AEO) from each of Bangladesh's 64 districts became a master trainer on the PlantwisePlus digital tools and courses. The newly launched 'Introduction to Bioprotection Products' course was the main focus as there had already been significant uptake of earlier courses the previous year. The AEOs then introduced 4,000 sub-assistant agricultural officers (SAAOs) to the bioprotection course. Now, more farmers – around 1,000 per SAAO – are able to receive advice on sustainable plant protection options.

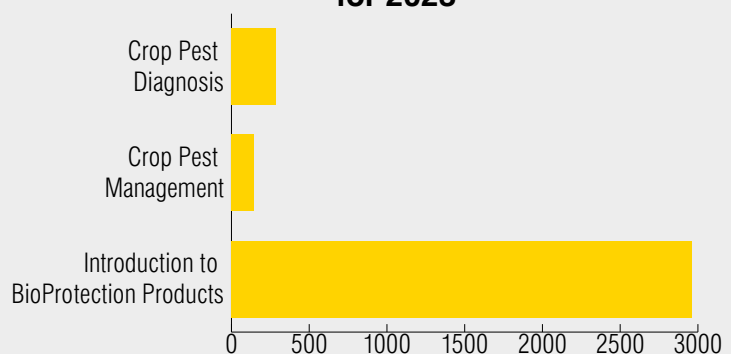


 Knowledge Bank usage and engagement in Bangladesh in 2023



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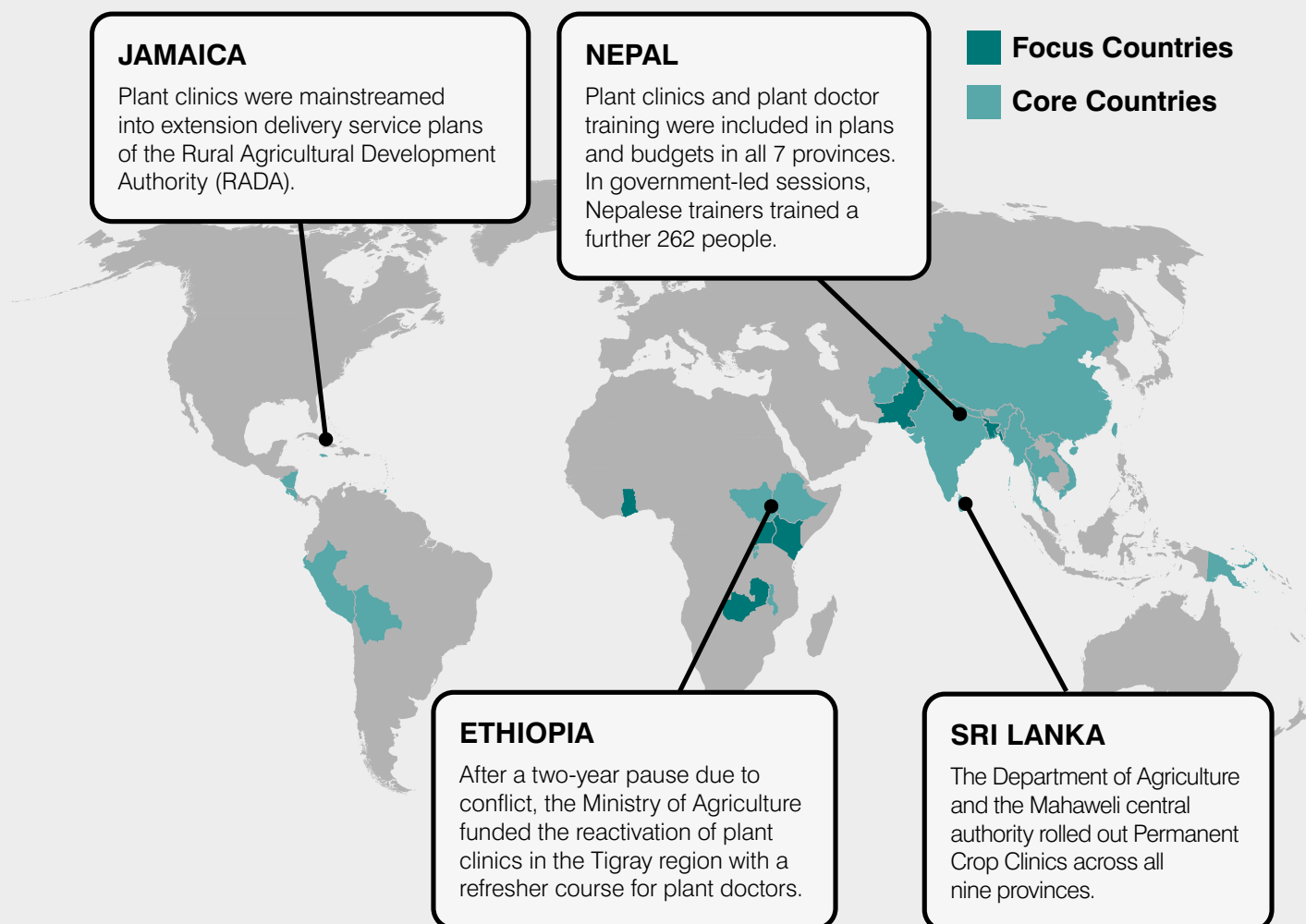
 CABI Academy course enrollments in Bangladesh for 2023




Data shows the positive effect of the training sessions on the uptake of the bioprotection course

Continuation of the plant clinic approach


Plant clinics and related activities continue to support farmers in PlantwisePlus countries across Asia, Africa and the Americas. This demonstrates the **sustainability and continued importance** of the concept to countries and smallholder farmers.



In 2023



1,587
Plant doctors trained



176,726
Farmers reached through plant clinics and plant health rallies.



4,363
Clinics operating

2023 also brought notable achievements for the CABI BioProtection Portal. In a strong sign of **increasing recognition and global relevance**, the portal attracted one new partner (GroPro Corporation), two new sponsors (Kaeltia and the International Centre for Genetic Engineering and Biotechnology), and one new associate (Biological Products Industry Alliance). Ten new countries were made live on the portal: Jamaica, Mexico, USA (to state level), Malawi, Mozambique, Tanzania, Zimbabwe, Indonesia, Malaysia and New Zealand (of which Jamaica and Malawi are PlantwisePlus countries), bringing the total number of countries to 42. More countries have granted permissions and will go live in the first quarter of 2024.

In July, CABI held a launch event in Jamaica to celebrate the 40th country on the Portal. This event was attended by representatives of Jamaica's Pesticide Control Authority, the Ministry of Agriculture, Fisheries and Mining and the Rural Agricultural Development Authority, who noted that reducing reliance on hazardous pesticides for crop protection is an important step towards ensuring safe and sufficient food for the country. The portal team also improved the accessibility of the portal, by launching a faster and easier-to-launch version of the site and releasing an updated CABI BioProtection Portal offline app on Google Play.

Promoting the programme's digital tools and learning products

Activities to boost usage of the PlantwisePlus digital learning products and decision-making tools continued in 2023. Alongside CABI team members, **specialist agri-digital tool co-ordinators** based in PlantwisePlus countries made significant progress in promoting the digital training courses and advisory tools generated by the programme to in-country networks. CABI produced promotional materials, including flyers, posters and presentations, to support the in-person and online communication of the tools. Work is underway to translate marketing resources into PlantwisePlus focus country languages. In addition, CABI created introductory videos for the CABI Academy, PlantwisePlus Toolkit, PlantwisePlus Knowledge Bank and Crop Sprayer app. More specifically for the Crop Sprayer app, short instructional videos were produced to demonstrate the tool's functionality.

The videos and flyers were used at in-person events throughout the year. These events allowed CABI and its partners to demonstrate and talk about the digital tools and e-learning courses with attendees. They also provided an opportunity to network with potential PlantwisePlus partner organizations who can promote the digital tools and e-learning courses to their staff and stakeholders. Notable conferences in 2023 included the African Food Systems Forum, the International Congress of Plant Pathology and the Annual Biocontrol Industry Meeting.

A focus for 2023 was to ensure that user data collected through the tools was collected and analysed effectively. These analytics are an important source of insights for understanding trends in information access and use, and to inform future developments. They also form part of the **sustainability model for the digital tools**, which will continue to be at the forefront of design thinking into 2024. Google Analytics is leveraged to monitor usage for all PlantwisePlus digital products. The vast amount of data generated across platforms, such as social media, websites, and mobile applications, holds valuable insights that enable CABI to shape strategic decision-making. In 2023 CABI set up a dashboard capturing use of the digital tools in key countries to demonstrate user engagement and facilitate learning on which promotional approaches, including face-to-face interventions, are resulting in better engagement with the tools.

Increasing the uptake of IPM by farmers

In 2023, PlantwisePlus facilitated a range of farmer outreach initiatives across programme countries. These encompassed diverse forms of face-to-face engagement, such as plant clinics and plant health rallies, and complementary approaches, such as mass extension campaigns, digital decision support tools, and digital learning. The total number of farmers reached through these activities in the year is estimated at 2.7 million. When counting the sharing of information between farmers, the figure increases to 13.6 million.

Plant clinic operations continued throughout 2023, with the programme supporting partners to operate 4,363 plant clinics across all 27 countries, serving over 148,000 farmers. The clinic reach figure for 2023 closely mirrors the reach from the previous year. This suggests that **clinic reach may be stabilizing** following the declines observed during the COVID-19 pandemic. The countries that saw the largest numbers of clinic users were Pakistan, China, Ethiopia, and Sri Lanka.

In 2023, more than 28,000 farmers 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 topics for these plant health rallies covered both insect pests and diseases, with the focal subjects being identified based on plant clinic data.

Nearly 210,000 farmers are estimated to have been reached through digital decision support tools in 2023. This analysis is based on data from the current 27 PlantwisePlus countries and other low- or lower middle-income countries. It counts farmers using the tools themselves and agricultural service providers using the tools to **improve their support to farmers**. The main tools used were the PlantwisePlus Knowledge Bank (48% of all use) and the CABI BioProtection Portal (43%). The remaining 9% were the PlantwisePlus Factsheet Library app, the Fertilizer Optimization Tool and the Crop Sprayer app. The PlantwisePlus digital tools are available globally, including to audiences not targeted by the programme. When including these users, there were over 745,000 users in 2023. This means that approximately 28% of the usage is by the key target groups (advisers and farmers) in the target countries.

In 2023 PlantwisePlus undertook several large-scale, targeted communication campaigns aimed at farmers, providing information on **sustainable pest management using IPM approaches**. The campaigns, detailed in the “Pesticide risk reduction” highlights section of this report, took place in Kenya, Pakistan and Zambia and focused on the management of invasive apple snail, the adoption of biocontrol for papaya mealybug, the promotion of conservation biocontrol practices for Parthenium, and awareness about using clean cassava planting to combat CBSD. In total, these campaigns reached over 1.6 million people.

Alongside communication campaigns, PlantwisePlus also reaches farmers through PRISE, as detailed in the “Pest preparedness” highlights section of this report. In 2023 alone, 724,000 farmers received SMS messages providing crucial alerts on impending pest threats and advice on management strategies.

Earlier studies conducted under PlantwisePlus show that 90% of plant clinic users fully or partly adopt recommendations given by plant doctors,⁶ and that 94% of stakeholders who received information through mass communication campaigns adopted new cultural practices.

Outreach method	Total farmers reached	Male (<35)	Male (35+)	Male (unknown age)	Female (<35)	Female (35+)	Female (unknown age)	Unknown gender/age
Plant clinics, trainings	148,718	124	4,076	46,705	56	1735	15,744	80,287
Plant health rallies, farmer field days	28,008	-	-	14,277	-	-	8854	4877
PRISE SMS pest alerts	724,883	-	-	327,925	-	-	396,836	122
Digital decision support tools	208,589	24,661	22,937	-	21,074	18,860	-	121,057
Mass extension campaigns (e.g. radio)	1,618,338	267,815	148,936	430,342	270,239	149,532	341,920	9554
Subtotal	2,728,536	292,600	175,940	819,249	291,369	170,127	763,354	215,897
Farmer-to-farmer sharing	10,914,145							10,914,145
Total farmers reached	13,642,681	292,600	175,940	819,249	291,369	170,127	763,354	11,130,042

⁷ If a conservative figure of 90% adoption is used and applied to all programme beneficiaries globally, **around 2.4 million farmers have applied new technologies or practices** with the potential to transform food systems towards desirable outcomes as a result of advice delivered through plant clinics, mass communication campaigns and other complementary methods.

6. Tambo et al. 2021. Gender-differentiated impacts of plant clinics on maize productivity and food security: Evidence from Zambia. <https://www.sciencedirect.com/science/article/pii/S0305750X21001315?via%3Dihub>

7. Tambo et al. 2022. Sustainable management of fall armyworm in smallholder farming: The role of a multi-channel information campaign in Rwanda. <https://onlinelibrary.wiley.com/doi/full/10.1002/fes3.414>



Partnerships


Delivery of PlantwisePlus requires **co-ordinated collaboration** with partners across the public, private and civil sectors, including with in-country, regional and international organizations. PlantwisePlus currently operates through 290 such partnerships, the majority of which are with the government sector, and approximately 21% of which are with the private sector. In 2023, CABI reviewed the PlantwisePlus Partnership Agreements to ensure reciprocity in the signatories' responsibilities and to actively establish sustainability plans. These partnerships ensure that the programme maintains its relevance to target groups and stakeholders, its coherence with other actors in the plant health system, and the sustainability of programme outcomes.

In October 2023, CABI signed an agreement with FAO to work together and improve the livelihoods of 500 million smallholder farmers, while easing the global food crisis. The agreement will see the organizations collaborate on many areas that will leverage PlantwisePlus' work, including improving science and evidence-informed policy processes and science communication, research and development and agricultural advisory services, early warning for pest outbreaks, and pesticide risk reduction.

The value of **public-private partnerships** to support PlantwisePlus' objectives is particularly clear in the work of the CABI BioProtection Portal. Twice a year, the portal's 15 private sector partners are invited to a development consortium meeting, along with representatives from the four governments that fund the portal's work as part of PlantwisePlus: Switzerland, the United Kingdom (UK), the Netherlands and the European Commission. Together, these key stakeholders review the Portal's progress and determine its strategic direction, including which countries should be prioritized for data acquisition. The success of this process echoes findings in the programme's external review that CABI is a well-respected and neutral partner, and thus well placed to play a role in mediating and aligning parties towards the pursuit of a common goal.

“Together, we are supporting the national system in adopting the best practices in plant health – improving the safety, resilience and quality of crops, leading to greater food security and livelihoods for smallholders.”

Chairman of the Pakistan Agricultural Research Council (PARC), Dr Ghulam Muhammad Ali



External review of the proof of concept phase

In January 2023, CABI commissioned the Netherlands Royal Tropical Institute (KIT) to conduct an external review of the 2020–2023 PlantwisePlus proof of concept phase, combining desk research with site visits in three countries.

The review highlighted the strengths and weaknesses of the programme's proof of concept, including whether it met its original goals. It also assessed the programme's performance against the Organisation for Economic Co-operation and Development's Development Assistance Committee criteria. The review found that **PlantwisePlus is highly relevant, efficient, and well-aligned with national priorities**. According to the review, the programme's strength lies in CABI's position as a central co-ordination body between multiple stakeholders, as demonstrated by CABI's role in facilitating national fora and public–private partnerships. Nevertheless, the review found that further work is needed in areas such as long-term sustainability, including institutionalization, and the integration of women and youth into activities.

These findings have paved the way for a streamlined second phase of the programme, which will focus on scalable, innovative interventions, developed with and for programme partners, that demonstrate the highest impact possible for smallholder farmers. A summary of the review and the associated changes to the programme for 2024 onwards can be found in Annex V.



Challenges encountered and measures taken to address them

Pest preparedness

Supporting partners to embed tools and processes

A key challenge in Ghana, Kenya and Zambia has been getting the agreed actions for pest risk prioritization embedded in normal workflows within the NPPOs in these countries. All of the NPPOs were keen for a pest risk register to be created for their respective countries because they saw value in it; however, none had the institutional structure or mechanism, such as a task force, committee, working group or even a regular team meeting, which could take on the responsibility of managing/maintaining the register. Some of the barriers in this area include a lack of sufficient human resources, and more effort being devoted to import/commodity/pathway risk analyses to facilitate trade, which is considered a higher priority. Organizational capacity to run a risk register and the general institutional context are also key barriers.

Despite these constraints Zambia, Ghana and Kenya have each set up a prototype register based on the output of the previously conducted horizon scanning activities (not yet completed in Zambia). CABI is deploying its staff with the right expertise to support the key contacts in the NPPO to oversee the regular functioning of risk registers. Further, PlantwisePlus has helped to semi-formalize a newly created committee/working group in each NPPO. CABI is working with the NPPOs to ensure that the operation of these working groups will become part of normal work objectives. Each committee/working group has been approved by the head of the NPPO, and, by establishing terms of reference, this should provide a basis for further support in operationalizing the risk registers.

Pesticide risk reduction

Shifting support from voluntary to mandatory certification standards

Certification standards can be an effective way to promote best practice. Such standards may be mandatory or voluntary. Following discussions with government agencies in Uganda, Bangladesh and Sri Lanka, CABI noted that there was resistance to the idea of establishing a voluntary scheme, as there is a much more urgent need to strengthen the official government-led training and licensing processes. CABI therefore decided to shift the programme focus towards assessing and supporting these mandatory systems in Uganda, Bangladesh and Sri Lanka, and will take this focus as a starting point for engagement in more countries going forward.

A similar programme decision was taken with respect to production standards for farmers. An analysis of the challenges surrounding the implementation of different types of standards led CABI to focus more heavily on mandatory standards for agricultural production and to support, in particular, the pest management-related elements of such standards. One of the key concerns with support for voluntary standards was that this was not an easily scalable intervention and that it had been pulling the PlantwisePlus programme too far away from its food security and food safety focus.

Overcoming challenges for biocontrol introductions

Shortly after PlantwisePlus began work to introduce a classical biocontrol agent against papaya mealybug in Kenya, Uganda also showed an interest in following suit, as it is also suffering from this invasive pest. However, the introduction of the agent to Uganda was delayed for two reasons. First, the procedures for obtaining an import and release permit, following the International Standards for Phytosanitary Measures (ISPM3), can require considerable time. Following early signs of success of the biocontrol agent in Kenya, the authorities in Uganda eventually waived the requirement to undertake additional risk assessments by accepting the equivalent data that had been obtained from Kenya. The second challenge was how to establish a mass rearing facility in Uganda and how to train the staff, since the release permit conditions forbade regular shipment of the biocontrol agent from the mass rearing facility in Kenya, for direct releases in the field. To address this issue, PlantwisePlus invested in the refurbishment of an insect mass rearing facility in Uganda operated by the National Agricultural Research Laboratories. This will become operational in 2024. In the meantime, the Ugandan NPPO agreed to direct releases, for a limited period, of the biocontrol agents produced in Kenya to deal with the urgency of the papaya mealybug problem.

This year, PlantwisePlus supported the construction of a TRF in Bangladesh by the Bangladesh Agricultural Research Institute (BARI). The facility was intended to support eggplant farmers to combat eggplant leaf borer (*Leucinodes orbonalis*). Previous discussions with BARI in 2022 had identified the Spice Research Centre in Gazipur as the preferred site for the TRF, particularly as there was a relatively new building, which required minimal adaptation. In early 2023, before the work had commenced, BARI proposed a new location at the Regional Agricultural Research Station, in Rangpur. During an assessment of the facility, it became clear that substantial adaptation would be required, which would be outside the scope of the project budget. This then led to lengthy negotiations between CABI and BARI about the scope and costs of renovations that the building required, to be suitable for insect rearing. This delay led to CABI and BARI signing a Letter of Agreement in November 2023. PlantwisePlus will continue to support the TRF in 2024, with the aim of completing the work on the facility by mid-year. CABI is in the process of finalizing a new PlantwisePlus Partnership Agreement with the Government of Bangladesh and it is hoped that this high-level endorsement of CABI's work will support ongoing discussions with BARI and accelerate the work.

Farmer advisory

Maintaining compliance with data regulation

PlantwisePlus digital tools interface with several third-party tools and regulations. As these third-party products and regulations evolve, the PlantwisePlus tools need to evolve with them to remain compliant and functional. This relates to three main areas: analytics, search engine optimization and the app stores. One significant challenge experienced in 2023 was changes in legislation for user data tracking ('cookies'). To maintain compliance with the European Community Privacy and Electronic Communications (EC Directive) Regulations 2003 and the UK General Data Protection Regulation many of the PlantwisePlus digital tools were updated with new cookie banners. This resulted in more users opting out of tracking. This presents challenges for monitoring, reporting and understanding the use of the tools and content. For the CABI BioProtection Portal, for instance, relying on Google Analytics for user analytical data is not sustainable and investigations into other data acquisition methodologies is critical to ensure that key site metrics on usage, and the value of the portal, can continue to be reported. Therefore, while making the changes required to remain compliant, alternative approaches will be analysed, to understand whether there is a better way for CABI to gather key metrics to demonstrate successful uptake of digital advisory tools.

To help monitor benefits across tools on a continuous basis, the CABI monitoring, evaluation and learning team developed a theory of change specific to digital advisory tools, which shows how the suite of digital tools are complementary in providing decision support, leading to the programme's outcomes within the farmer advisory pathway. Impact assessment takes place via a survey that collects users' feedback on the tools. Users can access the survey directly from the tools, and data can be logged dynamically, which allows for continuous data collection and feedback, thereby providing more insights than can be gleaned from analytics data. This continual collection of feedback fits better with CABI's agile approach to the development of digital tools. The survey has supported previous findings on barriers to use, such as lack of awareness of the tools, limited internet access in the field, and device compatibility.

Monitoring the global development of digital tools

Although there are many apps available on the Google Play Store, not all of them are accessible on every Android device or in every country. It can be very difficult to ascertain from the Play Store which apps will work on a certain device. This causes challenges and limitations for CABI's app assessment process, but also for users of the Crop App Index, and there is no clear way for CABI to help make this process more transparent to those seeking apps. These challenges are likely to have an impact on CABI's prioritization of apps for integration into the Crop App Index, with those that are not accessible for testing on different platforms being downgraded. In 2024, CABI will aim to prioritize testing apps on devices that align with the most common Android versions possessed by users of the PlantwisePlus digital tools.

Making digital advisory services more accessible

In 2023, PlantwisePlus increased the pace of its activities that aim to improve the gender sensitivity of agricultural advisory services, particularly in Ghana and Pakistan, where the most rigorous interventions were deployed. In both countries, the programme established gender stakeholder working groups, overseeing a growing portfolio of activities, including a review of the gender-related aspects of agricultural policies and gender training for extension officers. In Ghana, the programme launched a social and behaviour change campaign pilot to address the social norms and barriers preventing women's participation at the community and individual level. To assess the gender sensitivity of digital advisory services, CABI carried out a gender and digital tools assessment in Ghana and Bangladesh. The findings demonstrate that challenges with access to digital tools include infrastructure (internet access, the cost of mobile data), as well as factors that could be addressed to a certain extent within digital tools. These include a lack of (digital) literacy and sometimes insufficient gender-sensitivity in the advice given. These are obstacles that CABI and partners are continuing to address, such as using local languages as one way to increase women's ability to use the digital tools, as their literacy in their own language tends to be higher than in English (the language of most of the digital tools at present).

Keeping pace with policy shifts

Bangladesh is one of the few countries where there is currently no minimum educational qualification or mandatory training requirement for registering agro-input dealers. CABI therefore considered it a major success when the Additional Secretary of Agriculture announced that the government would be finalizing a new plant protection regulation that would include mandatory training as part of the registration of agro-input dealers. Although this was clearly a step in the right direction, the ambition of the transformation and the remarkably short timeline presented a significant challenge to the Department of Agriculture's Plant Protection Wing and, by extension, to PlantwisePlus. A working group was set up, tasked with developing the curriculum, training materials and training manual, but was only given three months to do this.

Currently, the majority of the existing 90,000 agro-input dealers in Bangladesh are illiterate or semi-literate. This poses a serious challenge for developing training for a profession that ought to require literacy, considering the highly technical – and potentially dangerous – nature of agricultural inputs. Discussions with key stakeholders led to an agreement that, as a first step, formal training and a minimum educational qualification would be required only for new agro-input dealers, with any form of training and relicensing of the already-existing agro-input dealers to be addressed subsequently. Even with this reduction in the scope of the training and certification, the process took longer than had been hoped. This became clear by quarter four of 2023, when a revised contract and timelines for delivery were agreed between the Ministry and the working group. The next steps will include finalizing the required curriculum and training documents, followed by a pilot of the mandatory training scheme in 2024.



Communication and visibility

A key lesson from the proof of concept phase was that PlantwisePlus's visibility and approach to communications could be improved at both the activity and programme levels.

CABI has taken strides towards enhancing the programme's visibility, in particular by improving communication channels and focusing on sharing evidence of the programme's outcomes and impact.

Press, public relations and events

PlantwisePlus had a physical presence at many more events in 2023, after several years of no travel or online-only events due to the COVID-19 pandemic. CABI staff delivered presentations about their work at several events, including the 4th International Phytosanitary Conference in Kenya and the AgTech Conference in India. The programme used **exhibition stands to showcase the digital tools**, giving attendees a chance to try out the tools and allowing CABI representatives to gain real-time feedback. This was also the approach applied at the International Congress of Plant Pathology, where the programme's tools and digital learning courses were highlighted.

Event highlights include CABI's CEO, Daniel Elger, highlighting PlantwisePlus at the Global Food Security Summit in London (November). In addition, PlantwisePlus was part of CABI's large-scale presence at the annual Africa Food Systems Summit in September in Dar es Salaam, Tanzania. Over 3000 participants, including the continent's leading thinkers, policymakers, and innovators, attended the summit to explore the latest breakthroughs and best practices in agriculture and food systems. CABI's attendance at the Summit provided an opportunity to raise awareness of the PlantwisePlus programme, as well as to showcase the programme's digital tools and online learning products. The event was also an opportunity to cement relationships with key PlantwisePlus organizations and governments within Africa, and to generate new partnership leads. **Social media posts about event attendance performed best in 2023.** Using social media to support events helps to foster networking opportunities and showcase the programme's active involvement in meaningful discussions with peer organizations, especially on LinkedIn.

In 2023, PlantwisePlus also hosted invite-only stakeholder meetings and national forums in Kenya, Uganda and Pakistan to strengthen local partnerships and raise the profile of the programme's work in-country. Communication activities supported these events with banners, flyers, videos, and news stories.

In terms of press, the programme had 80 pieces of coverage, garnering an estimated 314,000 views, with an audience reach of approximately 1.25 million people. Stories which received widespread press coverage included the pest risk analysis training for ECOWAS and the damage caused by the invasive apple snail in Kenya.

Finally, CABI is also looking to produce country-specific reports on PlantwisePlus activities, which will be updated on a regular basis and circulated quarterly. The first report, on activities in Ghana, was shared with key stakeholders in late 2023, and a second, on Bangladesh, will be circulated in early 2024.

Digital communications and materials

At the end of 2023, PlantwisePlus improved its website and migrated it to a domain where content and functionality can be shared with cabi.org and invasive-species.org. This has a number of benefits, such as **leveraging CABI's search authority**, making the programme website more discoverable and improving organic traffic. The programme and digital tools are now positioned closer to the rest of CABI's work.

The programme is also piloting a live dashboard that presents key data drawn from the CABI monitoring, evaluation and learning system. Initially targeted at current and potential donors, the dashboard will give greater visibility of the programme activities in country between official reporting periods.

CABI also sent out programme newsletters throughout the year. This had historically been a bi-monthly communication, but as the number of stories increased, CABI increased the frequency of the newsletters to monthly towards the end of the year. Over the course of the year, the newsletters were sent to 51,096 contacts, with an overall click-to-open rate of 22%.

Video continues to be the dominant content format. In 2023, the Communications team produced several videos, all published on the programme's [YouTube channel](#), which had over 10,683 views in 2023. The most viewed video from 2023 was an animation on the lifecycle of invasive apple snail, created to support the programme's work on this pest in Kenya. Other popular videos included work to support young farmers in Jamaica and an introduction to the CABI Academy website.

In total, CABI published 105 blog articles on the PlantwisePlus website, a 57% increase on 2022, with 59,965 users recorded as accessing the blog (48% increase on 2022). All blogs are optimized for organic search, which has played a key role in increasing the views. The most-read articles in 2023 included:

- [Women farmers in Pakistan](#)
- [The bioprotection course on CABI Academy](#)
- [Biocontrol of papaya mealybug in Kenya](#)

The PlantwisePlus LinkedIn channel saw massive growth in 2023, with a 64% increase in followers, a 40% increase in impressions, and a 59% increase in engagement. Performance on X (formerly Twitter) has reflected the platform's somewhat turbulent year, with a small 7% rise in followers but a decrease in impressions and engagement.

Selected PlantwisePlus publications

Every year, CABI staff and partners publish the findings of scientific, social and economic studies conducted under PlantwisePlus in peer-reviewed journals, and in working papers and study briefs in non-peer-reviewed publications. Selected publications from 2023 are as follows:

Key:

Journal impact factor > 2.0: ↑

Open access: ☞

Peer-reviewed papers

Agboyi, L.K., Nboyine, J.A., Asamani, E., Beseh, P., Badii, B.K., Kenis, M. and Babendreier, D. (2023) Comparative effects of biopesticides on fall armyworm management and larval parasitism rates in northern Ghana. *Journal of Pest Science* 96(4), 1417–1428. <https://doi.org/10.1007/s10340-023-01590-z> ☞↑

Compaoré, I., Sanou, M.R., Badolo, A., Agboyi, L.K. and Sanon, A. (2023) Analysis of fall armyworm infestations on rainy season crops under different cropping systems in two agroecological zones in Burkina Faso, West Africa. *Journal of Plant Diseases and Protection* 130, 1207–1216. <https://doi.org/10.1007/s41348-023-00800-1>

Constantine, K.L., Makale, F., Mugambi, I., Chacha, D., Rware, H., Muvea, A., Kipngetich, V.K., Tambo, J., Ogunmodede, A., Djeddour, D., Pratt, C.F., Rwomushana, I. and Williams, F. (2023) Assessment of the socio-economic impacts associated with the arrival of apple snail (*Pomacea canaliculata*) in Mwea irrigation scheme, Kenya. *Pest Management Science* 79(11), 4343–4356. <https://doi.org/10.1002/ps.7638> ☞↑

Constantine, K., Makale, F., Mugambi, I., Rware, H., Chacha, D., Lowry, A., Rwomushana, I. and Williams, F. (2023) Smallholder farmers' knowledge, attitudes and practices towards biological control of papaya mealybug in Kenya. *CABI Agriculture and Bioscience* 4, 18, 15 pp. <https://doi.org/10.1186/s43170-023-00161-7> ☞↑

- Durocher-Granger, L., Fiorito, S., Mudenda, S.K., Chiboola, M.M., Kansime, M.K., Ludwig, D. and Leeuwis, C. (2023) Investigating the feasibility of developing a collective action for biological control of fall armyworm among smallholder farmers in rural communities of Zambia. *CABI Agriculture and Bioscience* 4, 14, 15 pp. <https://doi.org/10.1186/s43170-023-00154-6> ✨↑
- Fazlullah, Shahid, H., Muzammil, F., Aslam, M.N. and Zada, N. (2023) Insecticidal potential of eco-friendly mycoinsecticides for the management of fall armyworm (*Spodoptera frugiperda*) under in vitro condition. *Bulgarian Journal of Agricultural Science* 29(1), 124–130. <https://www.agrojournal.org/29/01-15.pdf> ✨
- Gurmessa, N.E. and Bundi, M. (2023) Use of plant clinic advice among farmers in Ethiopia: implications for sustainable pest management service. *International Journal of Pest Management* 69(2), 193–205. <https://doi.org/10.1080/09670874.2020.1869348> ✨
- Kadzamira, M.A.T.J., Ogunmodede, A., Duah, S., Romney, D., Clottey, V.A. and Williams, F. (2023) African agri-entrepreneurship in the face of the COVID-19 pandemic. *CABI Agriculture and Bioscience* 4, 16, 9 pp. <https://doi.org/10.1186/s43170-023-00157-3> ✨↑
- Kansiime, M.K., Rwomushana, I. and Mugambi, I. (2023) Fall armyworm invasion in Sub-Saharan Africa and impacts on community sustainability in the wake of Coronavirus Disease 2019: reviewing the evidence. *Current Opinion in Environmental Sustainability* 62, 101279, 6 pp. <https://doi.org/10.1016/j.cosust.2023.101279> ✨↑
- Kenis, M. (2023) Prospects for classical biological control of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) in invaded areas using parasitoids from the Americas. *Journal of Economic Entomology* 116(2), 331–341. <https://doi.org/10.1093/jee/toad029> ✨↑
- Kenis, M., Benelli, G., Biondi, A., Calatayud, P.-A., Day, R., Desneux, N., Harrison, R.D., Kriticos, D., Rwomushana, I., van den Berg, J., Verheggen, F., Zhang, Y.-J., Agboyi, L.K., Ahissou, R.B., Ba, M.N., Bernal, J., Bueno, A.F., Carrière, Y., Carvalho, G.A., Chen, X.-X., Cicero, L., du Plessis, H., Early, R., Fallet, P., Fiaboe, K.K.M., Firake, D.M., Goergen, G., Groot, A.T., Guedes, R.N.C., Gupta, A., Hu, G., Huang, F.N., Jaber, L.R., Malo, E.A., McCarthy, C.B., Meagher, R.L. Jr, Mohamed, S., Sanchez, D.M., Nagoshi, R.N., Nègre, N., Niassy, S., Ota, N., Nyamukondiwa, C., Omoto, C., Palli, S.R., Pavela, R., Ramirez-Romero, R., Rojas, J.C., Subramanian, S., Tabashnik, B.E., Tay, W.T., Virla, E.G., Wang, S., Williams, T., Zang, L.-S., Zhang, L. and Wu, K. (2023) Invasiveness, biology, ecology, and management of the fall armyworm, *Spodoptera frugiperda*. *Entomologia Generalis* 43(2), 187–241. <https://doi.org/10.1127/entomologia/2022/1659> ✨↑
- Mweke, A., Rwomushana, I., Okello, A., Chacha, D., Guo, J. and Luke, B. (2023) Management of *Spodoptera frugiperda* J.E. Smith using recycled virus inoculum from larvae treated with baculovirus under field conditions. *Insects* 14(8), 686, 10 pp. <https://doi.org/10.3390/insects14080686> ✨↑
- Tambo, J.A., Kansime, M.K., Mugambi, I., Agboyi, L.K., Bese, P.K. and Day, R. (2023) Economic impacts and management of fall armyworm (*Spodoptera frugiperda*) in smallholder agriculture: a panel data analysis for Ghana. *CABI Agriculture and Bioscience* 4, 38, 14 pp. <https://doi.org/10.1186/s43170-023-00181-3> ✨↑
- Tambo, J.A., Mbugua, F., Duah, S.A., Oppong-Mensah, B., Ocloo, C.Y. and Williams, F. (2023) Pest risk information, agricultural outcomes and food security: evidence from Ghana. *Food Security* 15(6), 1667–1683. <https://doi.org/10.1007/s12571-023-01398-w> ✨↑
- Tambo, J.A., Mugambi, I., Onyango, D.O., Uzayisenga, B. and Romney, D. (2023) Using mass media campaigns to change pesticide use behaviour among smallholder farmers in East Africa. *Journal of Rural Studies* 99, 79–91. <https://doi.org/10.1016/j.jrurstud.2023.03.001> ✨↑
- Tambo, J.A., Uzayisenga, B., Mugambi, I., Onyango, D.O. and Romney, D. (2023) Sustainable management of fall armyworm in smallholder farming: the role of a multi-channel information campaign in Rwanda. *Food and Energy Security* 12(2), e414, 14 pp. <https://doi.org/10.1002/fes3.414> ✨↑
- Terefe, B., Danish, M., Faisal, S., Holmes, K.A., Luke, B. and Williams, F. (2023) Gender analysis of uptake of *Trichogramma chilonis* to control *Helicoverpa armigera* on tomato crops in Pakistan. *Sustainability* 15(3), 2214, 19 pp. <https://doi.org/10.3390/su15032214> ✨↑
- Toepfer, S., Niyongere, C., Ndayanzamaso, P., Ndikumana, D., Irakoze, W., Cimpaye, E., Minani, D., Bindariye, P. and Ochilo, W. (2023) Sustainable improvements in diagnostic capabilities of plant health practitioners through short in-service training. *Sustainability* 15(17), 12956, 12 pp. <https://doi.org/10.3390/su151712956> ✨↑

Yaméogo, I.S., Ouattara, D., Dabiré, R., Ki, A., Bationo, D., Agboyi, L., Gnankiné, O., Kenis, M. and Nacro, S. (2023) Perception and management strategies of the fall armyworm, *Spodoptera frugiperda* J.E. Smith (1797) (Lepidoptera: Noctuidae) on maize, millet and sorghum by farmers in western Burkina Faso. *Advances in Entomology*, 11 (3), 204–222. <https://doi.org/10.4236/ae.2023.113015> ✨

Working papers, study briefs and publications that were not peer-reviewed

Danielsen, S. and Cartmell, S. (eds) (2023) Plantwise sustainability: two years on. Follow-up assessments in six countries. *CABI Working Paper* 32, 52 pp. <https://dx.doi.org/10.1079/CABICOMM-62-8173> ✨

Kothari, R., Khanna, K., Romney, D. and Koirala, P. (2023) Support for smallholders in Nepal – are community business facilitators the answer? *Rural* 21, 4 September 2023. <https://www.rural21.com/english/news/detail/article/support-for-smallholders-in-nepal-are-community-business-facilitators-the-answer.html> ✨

Mugambi, I., Danielsen, S., Kansime, M., Makale, F., Chacha, D., Rware, H. and Chege, F. (2023) Are integrated crop-livestock clinics an option for Kenyan smallholder farmers to address One Health issues? *CABI Study Brief* 44: *Learning*, 11 pp. <https://dx.doi.org/10.1079/CABICOMM-62-8171> ✨

Njenga, M.W., Hevi, W., Neave, S., Karanja, L., Bitange, N. and Kansime, M.K. (2023) Insights into farmer group effectiveness for promoting the adoption of food production standards. *CABI Study Brief* 46: *Learning*, 17 pp. <https://dx.doi.org/10.1079/CABICOMM-62-8176> ✨

Nyamekye, H., Terefe, B., Duah, S. and Davis, T. (2023) Assessing indicators of change in the delivery of gendered agricultural extension in Ghana. *CABI Study Brief* 45: *Learning*, 9 pp. <https://dx.doi.org/10.1079/CABICOMM-62-8175> ✨



A smiling woman with dark dreadlocks, wearing a white lab coat, is looking towards the camera in a laboratory setting. A microscope is visible on the right side of the frame. The background is slightly blurred, showing lab equipment and shelves.

Annex I: PlantwisePlus progress against Results Framework

Notes:

- The proof of concept results framework does not include targets at specific objective or impact levels, as the focus of the work during this phase was to test the approach and programme assumptions. There is no expectation that, within these first three years (2021–2023), PlantwisePlus will deliver against high-level objectives that are relevant for the 10-year programme. In the following table, the impact and specific objective indicators are given in grey to show that they are not reported against. A further three output-level indicators are greyed out in the table below as, based on lessons learned earlier in the proof of concept, CABI decided not to continue in those directions.
- The status of achievements for 2023 and the entire proof of concept against targets is indicated through the use of a traffic light system (green = on track; amber = minor delay; red = major delay).
- The results in this table include achievements only from programme countries supported by the four core donors (FCDO, DGIS, INTPA, SDC). Results from Burundi and China are excluded.

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
Overall objective (impact)								
Climate-resilient agricultural production supplying safer food	Proportion of farmers adopting sustainable/safer agricultural practices (disaggregated by age/gender)	M:		M:	M:	n/a during proof of concept stage		M:
		F:		F:	F:			F:
		<35		<35	<35			<35
	Income levels for farmers and agricultural service providers of different genders and age groups	M:		M:	M:	n/a during proof of concept stage		M:
		F:		F:	F:			F:
		<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 1								

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
Knowledgeable and professional agricultural service providers (including agro-input dealers) increasing uptake and promotion of climate-smart plant health practices and inputs	Number of agricultural service providers delivering actionable information					n/a during proof of concept stage		
	Proportion of recommendations provided in line with best agricultural practices					n/a during proof of concept stage		
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	0	6 tools	1 tool	0	A proof of concept was implemented for the inclusion of a third-party tool in one of the PlantwisePlus Toolkit tools but this needs further tweaks before being made available to users	7 tools	6 tools

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
	Upgraded Plantwise Knowledge Bank as digital platform to support offline and online access	0	2 significant upgrades	1 significant upgrade	1	Significant upgrade of the infrastructure, such as the sitemap, search engine indexing, and links, which has almost doubled traffic to the site	3 significant upgrades	3 significant upgrades
	Financing models assessed for the PlantwisePlus Toolkit	0	0	3 models assessed	3	Various financing models have been assessed for relevance to the digital tools, with a view to testing these in 2024. The models include licensing of content, developing specific collections or commodity-based packages, and subscriptions or freemium models of access for high-income countries	3 models assessed	3

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
1.2 Effective data collection systems developed and tested for quality assurance and market intelligence through PlantwisePlus Toolkit	Proposed mechanisms for quality assurance of Toolkit use and advice based on it	0	2 tools	4 tools	6 tools	Additional tools linked to CABI data collection system	6 tools	8 tools
	Feedback mechanisms being used for assessment of quality assurance processes	0	0	1 mechanism for alerts	1 mechanism for alerts	Insights dashboard developed, to demonstrate where usage has spiked for particular pest/country combinations	1 mechanism for alerts	1 mechanism for alerts
	Plantwise data management system upgraded	0	1 significant upgrade	1 significant upgrade	1 significant upgrade	New database approach being used for countries with larger datasets	2 significant upgrades	2 significant upgrades
1.3 Training and digital learning products created to support capacity building of agricultural service providers	Existing digital learning and other training products ready for roll-out in local languages to agricultural service providers	0	2 courses	0 courses	0		2 courses	2 courses
	Feasibility for digital learning and training approach appraised	0	1 assessment	0	0		1 assessment	1 assessment
	New digital learning products developed on the basis of existing course materials (e.g. use of natural enemies in sustainable agriculture)	0	5 courses	3 courses	2 courses		4 courses	7 courses
	Climate-smart pest management and other plant health techniques integrated into new and existing materials	0	52 factsheets	100 fact sheets	207		152 factsheets	259 factsheets

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
	Financing models assessed for digital learning products	0	5 models for CABI Academy components	1 model for CABI Academy	0	Various models were tested early on, with some success in generating revenue for minimum maintenance. No new ones were looked at in 2023. Approach to be refined in scale-out phase	6 models for CABI Academy	5 models
1.4 Agricultural service providers equipped with new digital learning products and decision-making tools	Number of male and female agricultural service providers using PlantwisePlus Toolkit and digital learning products online and offline, per pilot country	M: 0	M: 166,907	M: 60,000	M: 140,439		M: 300,000	M: 307,346
		F: 0	F: 117,094	F: 45,000	F: 103,928		F: 200,000	F: 221,022
		<35: 0	<35: 151,658	<35: 50,000	<35: 130,678		<35: 300,000	<35: 282,336
	Number of farmers supported with information about climate-smart agricultural techniques	Direct (systemic improvement): 0	Direct (systemic improvement): 540,031 Disaggregated: M: 194,141 F: 23,419 <35: 29,430 (plant clinics)	Direct (systemic improvement): 260,000 Disaggregated: M: 41,000 F: 3,000 <35: 12,500 (plant clinics)	Direct (systemic improvement): 113,927 Disaggregated: M: 86,326 F: 27,601 (plant clinics)		Direct (systemic improvement): 800,031 Disaggregated: M: 235,141 F: 26,419 <35: 41,930	Direct (systemic improvement): 653,958 Disaggregated: M: 280,517 F: 51,020 (plant clinics)

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
		Direct (partial improvement):0	Direct (partial improvement): 538,688 (digital decision support tools and plant health rallies)	Direct (partial improvement): 250,000 (digital decision support tools and plant health rallies)	Direct (partial improvement): Disaggregated: Digital tools: 205,589 Plant health rallies: 4,877		Direct (partial improvement): 720,000	Direct (partial improvement): 866,668
		Indirect: 0	Indirect: 1,971,700 (mass extension campaigns)	Indirect: 370,000 (mass extension campaigns)	Indirect: 1,352,227	Ghana TV campaign on pesticides, CBSD campaign in Zambia, apple snail campaign in Kenya	Indirect: 2,291,700	Indirect: 3,323,927
1.5 Improved provision of gender-sensitive agricultural extension services	Number of agriculture service providers adopting innovative approaches to reach women farmers	0	427 advisers trained (Ghana)	550 advisers trained (slightly more trained in 2023)	1069 advisers	Ghana and Pakistan gender training, based on needs identified in GRAST assessment	1,000 advisers	1496 advisers
	Number of women farmers accessing extension advice	0	230,000	150,000	231,107		380,000	461,107
Specific Objective 2								

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
Increased supply of and demand for safer, higher quality and locally produced food in domestic markets	Proportion of domestic consumers willing to buy safer and higher quality farm produce	0	0					
	Change in farmer knowledge and adoption of sustainable plant health practices disaggregated by sex and age	M: 0	M: 0	M:			M:	
		F: 0	F: 0	F:	F:		F:	
		<35	<35	<35	<35		<35	
	Quantity of produce on domestic market from targeted crops complying with agreed standards					n/a during proof of concept stage		
Outputs								
2.1 Domestic demand for safer produce increased	Proportion of stakeholders, including domestic consumers aware of risks of pesticide residues in food (disaggregated by gender, age, etc.)	M: 0	M:0	M: 20,000 consumers informed	M:416,751	Measured number, rather than proportion	M: 20,000 male consumers informed	M:416,751
		F: 0	F:0	F: 30,000 consumers informed	F:419,771	Social and behaviour change communication work in Kenya and Pakistan	F: 30,000 female consumers informed	F:419,771
		<35: 0	<35:0	<35: 10,000 consumers informed	<35:538,055		<35: 10,000 young consumers informed	<35:538,055
	Proportion of male and female consumers choosing and buying safer local produce	M: 0	M: 0	M: 30% of male consumers informed			M: 30% of male consumers informed	
		F: 0	F: 0	F: 30% of female consumers informed			F: 30% of female consumers informed	
		<35: 0	<35: 0	<35: 30% of young consumers informed			<35: 30% of young consumers informed	

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements	
				Target	Achieved	Progress narrative			
2.2 Farmers working to a voluntary crop production standard to deliver safer, environmentally friendly produce to higher value markets	Number of production standards identified, adapted and adopted for pilot agricultural value chains	0	2 production standards identified (Ghana Green Label standard GS 1054 and GS 1074); Kenya KS1758:	2 identified production standards adapted/adopted (Ghana Green Label; Kenya KS1758)	2		2	2	
	Number of male and female farmers producing standard-compliant food accessing new/higher value domestic markets	M: 0	M:0	M: 150			M: 150		
		F: 0	F:0	F: 100			F: 100		
		<35: 0	<35: 0	<35			<35: 0		
2.3 Job opportunities for young men and women in rural communities to provide agricultural services to local producers	Number of men and women (by age group) trained to become agricultural service providers, providing high quality and appropriate climate-smart agricultural techniques	M: 0	M: 274	M:300	M:611		M: 574	M: 885	
		F: 0	F:86	F:200	F:254		F: 286	F: 340	
		<35: 0	<35: 130	<35: 350	<35: 800		<35: 480	<35: 930	
	Business models for agricultural service provision identified and tested, with best fit highlighted for roll-out	0	3	2	5		5	8	
	Number of men and women (by age group) working in agricultural service provision (or self-employed)	M: 0	M: 0	M:400	M:300		M: 400	M:300	
		F: 0	F:0	F:150	F:165		F: 150	F:165	
		<35: 0	<35: 0	<35: 250	<35: 280		<35: 250	<35: 280	
	Specific Objective 3								

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
Improved management of plant production risks through targeted and cost-effective national pest prioritization, monitoring and management systems, using new digital technologies and processes	Number of targeted responses/interventions per country					n/a during proof of concept stage		
	Cost-effectiveness of assessed responses/interventions					n/a during proof of concept stage		
Outputs								
3.1 Decision support system established for national authorities to prioritize pests for monitoring and management	In-country decision support system designed, refined and updated regularly	0	HST used by 6 countries (BD, BF, GH, KE, PK, ZM). PRA Tool used by 5 countries (BF, GH, KE, PK, ZM).	HST and PRA Tool used by 3 economic blocs (EAC, SADC, ECOWAS). PRA Tool used by 1 more country (BD)	HST - 2 PRA – 4 countries, 3 RECs	HST used in Kenya and Rwanda PRA Tool used in 4 countries (BD, BF, KE, PK) and 3 RECs (EAC, Ecowas, SADC)	2 pest prioritization tools used by 6 countries and 3 economic blocs	HST used in 7 countries PRA Tool used in 6 countries PRA Tool used by 3 regional bodies

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
3.2 Co-ordinated pest preparedness, prevention and management through use of newly established decision support system	Number of pests prioritized by national systems	0	6 (citrus canker, CBSD, Diaphorina citri, Liriomyza trifolii and sativae, banana bunchy top virus (BBTV))	2 (TBD by Burkina Faso)	10	BBTV, CBSD, citrus canker, D. citri, fall armyworm invasive apple snail, papaya mealybug, Parthenium, mango mealybug, coconut hispine beetle in 3 countries (Kenya, Ghana, Bangladesh)	8 pests prioritized	12 pests prioritized
			3 species for mass extension campaigns (apple snail, CBSD, Parthenium)	1 species for mass extension campaign (papaya mealybug)	4	(1) CBSD in Zambia, (2) papaya mealybug, (3) invasive apple snail in Kenya, (4) invasive weed Parthenium in Pakistan	4 species targeted in mass extensions campaigns	4 species
	Number of pest prevention and management plans for high priority pests using decision support systems agreed, implemented and regularly updated based on lessons learned	0	4 evidence notes (CBSD, Papaya mealybug, Apple snail, Limnobia).	1 evidence note (BBTV)	1	Wheat rust in East Africa	5 evidence notes	5

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
		0	4 national prevention and management plans (Liriomyza trifolii and sativae, BBTv, CBSD)	1 national prevention and management plan (TBD by Burkina Faso)	2	<i>D. citri</i> , BBTv in Ghana	5 national prevention and management plans	6
	Number of biocontrol agent release applications submitted	0	2 (Kenya papaya mealybug and Pakistan Parthenium)	3 (Uganda, South Sudan and Burkina Faso (papaya mealybug))	2	Papaya mealybug in Uganda and Kenya	5 release applications submitted	4
Specific Objective 4								
Enhanced availability, accessibility and affordability of low-risk plant protection products	Number of trained agro-input dealers capable of delivering actionable information according to voluntary standard, disaggregated by age and sex	M:		M:	M:	n/a during proof of concept stage	M:	M:
		F:		F:	F:		F:	F:
		<35		<35	<35		<35	<35
	Sales of low-risk plant protection products	M: 0	M: 0	M: 0	M:	n/a during proof of concept stage	M:	M:
		F: 0	F: 0	F: 0	F:		F:	F:
		<35: 0	<35: 0	<35: 0	<35		<35:	<35
	Amount of agricultural land under application of low-risk plant protection products, disaggregated by farms managed by male and female farmers	0				n/a during proof of concept stage		
Outputs								

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
4.1 Enhanced capacity among agro-input dealers following voluntary standard on IPM and pesticide risk reduction	Number of agro-input dealers (disaggregated by gender, age, etc.) trained on low-risk plant protection advice/products and accessing related information through the PlantwisePlus Toolkit, digital learning course and other information sources	M: 0	M: 0	M: 50	13	Very successful training of agro-input dealers in Uganda in October 2023. The other training scheme had to be postponed until Q1 2024 due to staff availability issues. Uganda trainers from the ministry were very impressed with CABI's training material; they have asked for the main training material to be updated. Discussion for 2024	50	13
		F: 0	F: 0	F: 50	17		50	17
		<35: 0	<35: 0	<35: 10	23		10	23
	Number of male and female agro-input dealers compliant within voluntary standard	M: 0	M: 0	M: 0			M: 0	
		F: 0	F: 0	F: 0			F: 0	
		<35: 0	<35: 0	<35: 0			<35: 0	

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
	Business models for a voluntary standard for agro-input dealers developed and rolled out	0	0	1	0	Uganda, Bangladesh and Sri Lanka requested the training of agro-input dealers to be incorporated into the mandatory training scheme. In Bangladesh, a new mandatory agro-input dealers training scheme is being developed with CABI's support	1	0
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)	0	1 (Pakistan)	1 (Sri Lanka)	0	Working with Sri Lanka on this. However, Sri Lanka lacks the infrastructure and skills to test some of the potential products	2	1

PlantwisePlus description	PlantwisePlus indicators	Programme baseline	Achieved 2021–22	Progress made (2023)			Proof of concept target	Proof of concept achievements
				Target	Achieved	Progress narrative		
	One product registered through tested fast-tracked registration system (for biological based products)	0	0	1	0	The new regulations have not been ratified yet so it was not possible to put a product through the new registration system	1	0
	Policy briefs (crop-specific/nationally adapted) produced and distributed	0	2 (Pakistan x2)	3 Kenya, Ghana, Sri Lanka	0	Working with Sri Lanka but did not get as far as a completed policy brief	5	2
4.3 New agricultural businesses for low-risk plant protection products established	Functionality of newly established pilot production facilities assessed against agreed business plans	0	1 (Muguga, Kenya)	3 (Bangladesh, Pakistan x2)	2	A third TRF was built in Pakistan but was not functioning by the end of 2023. Bangladesh facility started to be built in early 2024	4	3
	Numbers of men and women (by age group) working (in the production of low-risk plant protection products)	M: 0	M: 3	M: 10	8		M: 13	11
		F: 0	F: 1	F: 2	1		F: 3	2
		<35: 0	<35: 2	<35: 2	4		<35: 4	6



Annex II: Towards scale-out: PlantwisePlus 2024–2030

The **PlantwisePlus** vision is to empower women and men smallholder farmers to manage evolving plant health threats, increase their incomes, improve food security and safety, and reduce biodiversity loss by promoting sustainable crop production practices

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