



KIT Royal
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End evaluation of CABI Plantwise Burundi (2020-2023)

KIT Royal Tropical Institute
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FINAL REPORT

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Cover photo: farmers with diseased crop samples waiting for a consultation with the plant doctor. Makebuko commune, Gitega province, 9 September 2023. Photo: B. van Schagen

Acronyms

BECEPTF	Office of Technical Education and Vocational Training
BIF	Burundi Francs (currency)
BPEAE	Provincial Bureau of Agriculture, Livestock and the Environment
BXW	Banana Xanthomonas Wilt disease
CABI	CAB International
CC	Community Conversations
CCF	Community Conversations Facilitator
CMU	Complete Mat Uprooting
DGA	Burundi Agriculture Department, Ministry of Agriculture
DPV	Department of Crop Protection
EKN	Embassy of the Kingdom of the Netherlands
FGD	Focus Group Discussion
IARC	International Agricultural Research Centre
IPM	Integrated Pest Management
ISABU	Institut des Sciences Agronomiques du Burundi
ISTEEBU	Institute of Statistics and Economic Studies of Burundi
ITAB	Technical Agricultural Institutes of Burundi
KII	Key Informant Interview
KIT	KIT Royal Tropical Institute
LQAS	Lot Quality Assessment Survey
MEC	Mass Extension Campaign
MFBPE	Ministry of Finance, Budget, and Economic Planning
MINEAGRIE	Ministry of the Environment, Agriculture and Livestock
NPPO	National Plant Protection Organization
NSC	National Steering Committee
NUFFIC	The Dutch organisation for internationalisation in education
ONCCS	National Seed Quality and Certification Authority
PC	Plant Clinic
PD	Plant Doctor
PHR	Plant Health Rallies
PHS	Plant Health System
POMS	Plantwise Online Management System
PMDG	Pest Management Decision Guides
SDSR	Single Diseased Stem Removal
SMS	Subject Matter Specialist
WEAI	Womens' Empowerment in Agriculture Index

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Executive summary

Plantwise aims to strengthen the plant health systems in Burundi using a unique Plant Clinic approach. The objectives are to decrease crop losses, to increase crop productivity and to improve livelihoods and food security through improving and strengthening research, extension, input supply, and regulation in the plant health system. This End Evaluation of the CABI Plantwise project in Burundi assesses the performance of the project regarding progress towards planned outcomes, outputs, and results. The evaluation also considers programme performance against the evaluation criteria of relevance, coherence, effectiveness, efficiency, and sustainability. Furthermore, the evaluation assesses to what extent the programme has been innovative, what the benefits have been to farmers and stakeholders, and identifies good practices and lessons learned. The evaluation was commissioned by CABI and the Royal Netherlands Embassy in Burundi.

The evaluation approach comprised a desk review of available literature and documentation, key informant interviews with institutional stakeholders, and a structured survey of beneficiaries using the LOAS technique. A validation workshop with National Steering Committee was organised at the end of the fieldwork period to validate key findings and identify priority areas for action.

Results and performance

The evaluation finds that Burundi Plantwise has made significant progress towards the envisaged outcomes, outputs, and results, some of which have already been met or exceeded or are on track to be achieved by project close. Both men and women farmers are positive about their Plant Clinic experiences. Most report that they are implementing the advice they were given and consider Plant Clinics as the best source of information on plant health. The Community Conversations aiming to change gendered norms are also generally evaluated positively. Women and men report much improved joint decision-making and collaboration in their household activities, which are clear indications of gender-transformative change.

Plant Doctors are proud of their new role and more confident in their plant health diagnoses and in issuing appropriate recommendations. They report that the Plantwise training was responsive to their needs and that the project also responds well to what farmers need. We do find some capacity challenges remaining to ensure technically correct and farmer-appropriate advice. Clinics are still few and too distant for many farmers to have easy access.

The evaluation validates the key project assumptions and finds that Plantwise is responsive to Burundi PHS needs by establishing buy-in of most of the key system actors and establishes a new modus operandi. However, international agricultural research institutions are not adequately represented, which may contribute to management recommendations which are not or no longer best-practice. To increase efficiency, a practical mechanism is needed to strengthen the engagement between ISABU and DPV. Further, rapid improvements in plant health extension because of Plantwise interventions are exposing weaknesses in input supply, notably the lack of farmer access to quality seed and appropriate plant protection products. For sustainability, the project needs to focus on consolidating its achievements and strengthening MINEAGRIE appropriation of the Plantwise model and associated policy reorientation.

Main recommendations

Consolidate gains first. Focus on ensuring the continuity of quality plant health advice, the availability of recommended seeds and chemicals, improving data management processes, and strengthening the engagement of DPV and BPEAE at provincial level.

Institutionalise Plantwise in the Burundi Plant Health System. Find better ways of working with institutional partners, civil society, and the private sector. Promote domestic ownership of the Plantwise agenda and seek complementary funding to develop it.

Strengthen input supply and regulation. A broadened Plantwise programme should prioritise the relatively neglected PHS components of input supply and sector regulation. Both have emerged as key weaknesses of the current programme.

Revisit the Community Conversations approach. We encourage continuing with a gender empowerment approach but with different implementation. The current process is relatively expensive and very difficult to scale up. The activity lies outside the Plantwise core business, a strong (scaling) partner is needed.

Continue to support plant doctor training by vocational training institutes. Agricultural training institutes will require ongoing capacity support, technical backstopping as well as financial support to mainstream the Plantwise curriculum and deliver qualified Plant Doctors.

1 Introduction and methodology overview

1.1 Introduction to the evaluation

The Royal Netherlands Embassy in Burundi has commissioned, through CAB International (CABI), an independent end evaluation of the Plantwise project in Burundi to review progress made since the start of project in 2020. The project is implemented by CABI and the Burundi national agricultural research institute (ISABU) with national stakeholders and partners. This evaluation is intended to support decision making on follow-up activities that address remaining challenges, and associated risks and opportunities for the mid-term future (1 January 2024 -31 December 2028).

The evaluation provides insights into the programme approaches used by CABI and ISABU in Burundi. The evaluation assesses the performance of the Plantwise project in Burundi regarding achievement of and progress towards project outcomes, outputs, and results. The evaluation also considers programme performance against the evaluation criteria of relevance, coherence, effectiveness, efficiency, and longer-term sustainability. Furthermore, the evaluation assesses to what extent the programmes have been innovative, what the benefits have been to farmers and stakeholders, and identifies good practices and lessons learned.

CABI Plantwise is a large, multi-country and multi-donor programme to strengthen national plant health systems (PHS) through improved stakeholder linkages in developing countries. Implemented since 2011 internationally and 2020 in Burundi, Plantwise aims to help farmers lose less of what they grow due to plant health problems by using a unique plant clinic approach. Plantwise objectives are to decrease crop losses, to increase crop productivity and to improve livelihoods and food security through improving and strengthening the four main components of the plant health system, namely extension, research, input supply and regulation (see figure 1, Plantwise theory of change). In the long term, Plantwise aims to increase the effectiveness of the overall plant health system in addressing crop problems through gradual systems change.

Plantwise Burundi commenced in late 2020 amidst the COVID-19 crisis and officially launched in 2021. Funding support for initial plant doctor training was provided by NUFFIC (July 2020 through March 2022) and currently the Royal Netherlands Embassy (EKN) in Burundi (November 2020 through 31 December 2023).

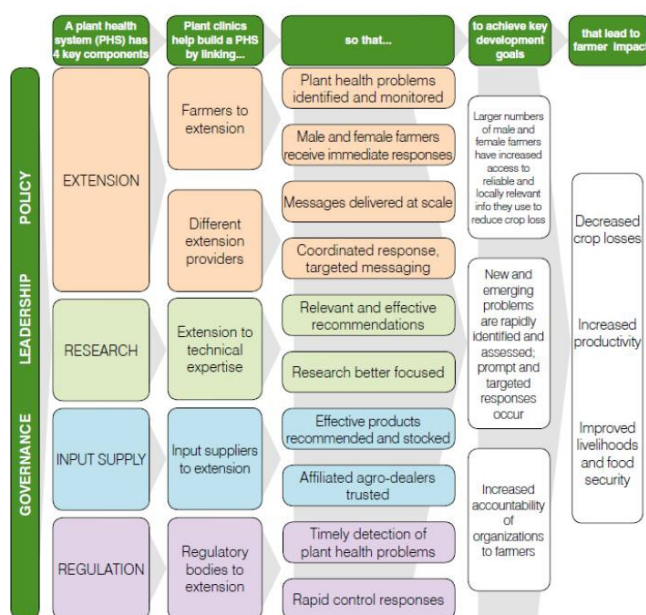


Figure 1. The Plantwise theory of change

1.2 Evaluation objectives

The purpose of this End Evaluation is to make an overall assessment of the Plantwise project in Burundi, paying particular attention to the achievements thus far, and the feasibility for future activities that address remaining challenges, and associated risks and opportunities for the mid-term future (until end 2028). The End Evaluation is intended to:

- **Provide information that allows the incorporation of lessons learned into decision-making processes of CABI.** Findings will be used to identify implementation challenges and reasons in case the project may not have evolved as planned; and develop project adjustments to address the evaluation learning.
- **Inform the development of follow-up activities** from January 2024 onward. This includes useful information for current and other donors to base their future funding decisions upon.

The following main questions will be answered by this evaluation:

1. What is the performance of Plantwise Burundi regarding the programme outcomes against the main objectives, its relevance for target groups and stakeholders, effectiveness, efficiency, coherence, sustainability, and programme management and risks and potentials.
2. To what extent is Plantwise Burundi innovative?
3. What are the benefits as compared to alternative interventions/results (opportunity costs)?
4. What are the good practices and key lessons learned, and how has Plantwise responded to challenges in implementation?
5. What are the expected benefits of rolling out follow-up activities that are included in CABI's PlantwisePlus programme?

The evaluation will also examine the two Burundi-specific programme assumptions to confirm whether they hold true:

1. Demonstrated benefits of Plantwise in other countries can be replicated in Burundi.
2. The Plantwise model can be adapted to address farmers' needs more holistically if linked to interventions by other organisations working in the areas of agro-input supply, market access for certain agricultural products, provision of financial services to farmers.

In answering the evaluation questions, KIT will assess the validity of the change pathways and implementation approaches adopted by Plantwise Burundi. The evaluation is predominantly qualitative in nature and does not provide quantitative impact estimates. Programme impact will be established by the endline survey which will be implemented in late 2023.

1.3 Evaluation approach and methodology

The end evaluation is formative, with an emphasis on learning rather than accountability. It is qualitative in nature, where the principles of contribution analysis will be applied. This means that have looked for evidence that the change pathways are plausible and that the two Burundi-specific underlying assumptions hold true. This means that triangulation of evidence from different sources, using different methods, is required. The evaluation approach includes three main methods:

1. **Desk study**, based on secondary information on the Burundi implementation of Plantwise specifically, but with reference to relevant documentation and learning from other national Plantwise programmes. The list of documents consulted in provided in Annex 2.
2. **Semi-structured Key Informant Interviews (KIIs)** with CABI staff and EKN Burundi, Plantwise implementers including Plant Doctors and Community Conversation Facilitators (CCF) and Plantwise

partners, National Steering Committee members and other stakeholders. The persons interviewed and their affiliation is provided in Annex 1.

3. **Structured interviews with Plantwise beneficiaries**, specifically farmers that attended Plant Clinics and Community Conversations participants. The structured interview was implemented via a simple oral questionnaire and used Lot Quality Assured (LQAS) sampling.

LQAS is used to assess the quality of services coverage in geographic zones and cohorts (known as 'lots'). The key strength of the methodology is that it can identify priority areas requiring only small sample sizes. Per question or indicator, it tests whether a goal is achieved or not, comparing the total amount of positive responses to the predetermined threshold value, in this case 50 percent. Indicators that do not reach the threshold value are flagged as priority areas where it may be necessary to adapt the delivery of the programme. LQAS questions were a checklist composed of a number of yes/no and quantity questions to assess delivery and quality of the service, such as plant clinic advice or changes resulting from Community Conversations. Questions were asked both at individual level (Plant Doctors), and to groups (CC participants, with women and men asked to respond separately by raising their hands).

Fieldwork took place over a 3-week period in September 2023. Key informant interviews were convened in Bujumbura. Field visits were timed to coincide with Plant Clinics and Community Conversation meetings in 5 communes. These communes were selected from the original 8 PC pilot sites, as these had been operating for the longest period (since August 2021, approximately) and would thus be the most mature. The 5 communes were selected to ensure coverage of the key agroecologies in Burundi, and will reflect different farmer priorities, crops cultivated, and pest and disease pressures.

2 Plantwise Burundi innovations, achievements, and outcomes

2.1 Plantwise Burundi innovations

Many elements of the Plantwise programme are considered innovative, including the demand-driven plant clinic model itself, the POMS database, the Knowledge Bank, the Community Conversations gender transformative approach, and the WhatsApp social media platform for rapid PD support and exchange, and the efforts to institutionalise PD training in appropriate university and agricultural technical and vocational institutions (ITABs) in Burundi. According to CABI, much was learned from Plantwise experience in other countries, and this supported a context specific and adaptive Plantwise response in Burundi.

The plant clinic and plant doctor approach: demand-driven extension.

The plant clinic approach is seen as an innovative and promising way by stakeholders to establish demand-driven extension by 'bringing farmers to the doctors'. In a practical sense, this is supplementing the usual visit to local farmers' fields by zonal and colline-level agronomists with an on-demand service at the commune level for those farmers who wish to seek specific diagnostic and management advice on PH issues. The new approach has imparted a new-found confidence and pride in the valuable work of the BPEAE agronomists, and increases (theoretical) efficiency in the systems by ensuring that only those that have need and interest for finding solutions attend the PCs.

A linked innovation, still in development, is the concept of "mobile clinics" where Plant Clinics regularly move to different locales within the commune to bring services closer to clients. In practice this has not been realised to due lack of financing for plant doctor transport.

Knowledge Bank, POMS and data-driven monitoring and decision making.

In Burundi it is difficult to get a rapid understanding of location-based pest and disease pressures and appropriate mitigating approaches in a specific location. The CABI POMS system and the online Knowledge Bank provides a systematic way of collecting and analysing data and contributing appropriate plant health practices. However, these digital solutions have yet to be fully exploited and integrated into the PHS in Burundi, with significant scope for better coordination amongst institutions such as ISABU, DPV and DGA and agreeing collaborative processes for reporting and decision making.

Social Media.

The WhatsApp group established amongst Plant Doctors, ISABU and CABI subject matter specialists has gained significant traction. The rapid peer-to-peer support, knowledge sharing, and capacity building is used frequently and greatly valued by Plant Doctors. WhatsApp has a broad adoption rate, uses mobile phones most PDs and extension agents already have, is easy and inexpensive to use.

Community conversations.

Most farmers are women, but women traditionally have the least access to agricultural information and services. A Plantwise gender analysis carried out in the agriculture sector in Burundi has identified gender-based constraints that can affect women's participation and benefit from the program and strategies to

address those constraints. One of these strategies was shifting social norms on gender related to women’s participation in agriculture extension and decision making in agriculture production and income. Community Conversation (CC), a social and behavioral change communication approach was selected to facilitate discussion and change in social norms related to gender in agriculture. CC is a socially transformative approach that brings together communities to address underlying causes of development problems. It involves bringing together a cross section of the community members (local admin, religious leaders, men, women, young and old) to reflect on specific identified challenges; after reflection, identify steps to take to resolve the challenges and draw action plans; eventually leading to change in attitudes, values, beliefs, and practices. The CC dialogues are conducted with guidance of trained facilitators, holding a series of bi-weekly meetings that can run up to 9 months or a year.

Through July 2023, 31% percent of all farmers that visited PCs in Burundi were women, which is a respectable figure. The PW endline study will be able to demonstrate whether there has been an increase in women’s participation over time. The data extracted from POMs does seem to show a positive correlation for women’s participation in PCs in locations where CCs are convened and in nearby communes where they are not (see figure 1)

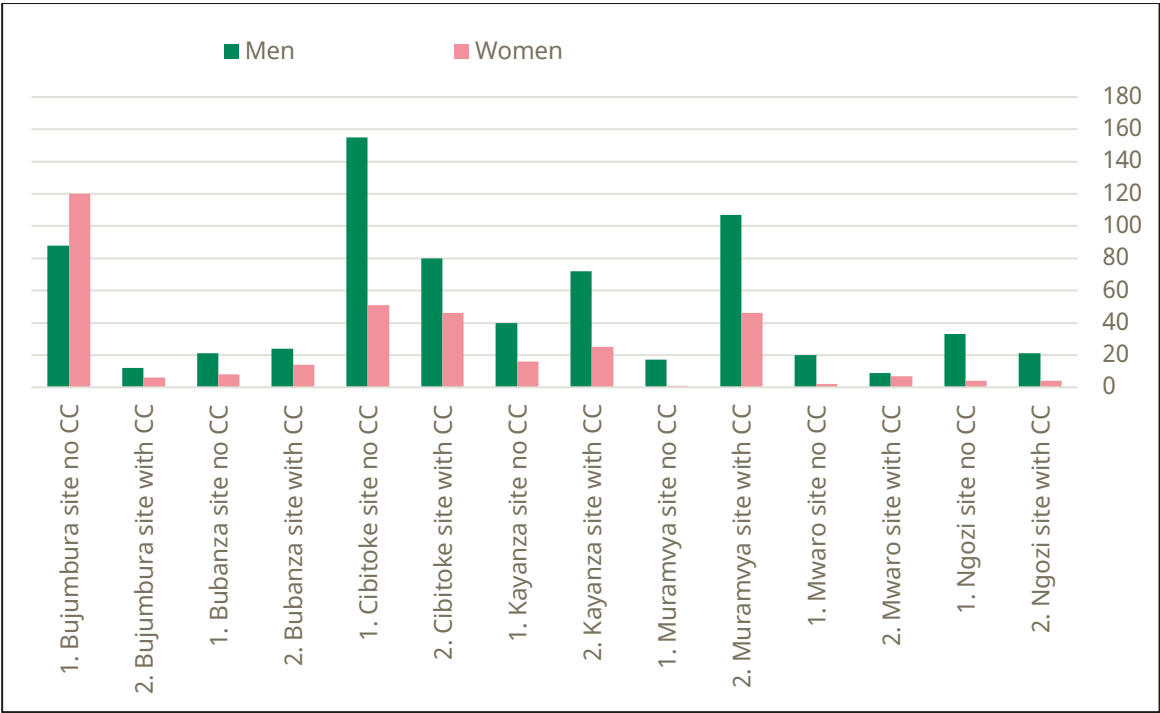


Figure 1. Cumulative number of men and women farmers attending PC in areas where there is or is not a CC group. A key objective of the CC groups is to achieve a higher proportion of female PC participants, and that appears to be the case in 5 of the 7 provinces (Source: ISABU)

Plant doctor training: incorporating PW curricula in technical training of agronomy students.

Key in any national PHS is ensuring the steady availability of qualified field extension and agronomy staff. In Burundi, Plant Doctors are being trained by a cadre of ‘trainers of trainers’ who are backstopped by ISABU as well as CABI subject matter specialists. To ensure long-term viability of training programmes, Plantwise took the step towards institutionalisation of plant doctor training within the Institut Technique Agricole du Burundi (ITAB), which are a series of over 50 professional vocational schools which are responsible for training most of Burundi’s field agronomists and extension staff (those trained to A2 level – meaning a post-secondary level of

education of 3 or 4 years). Pedagogy staff from Bureau d'Etudes et des Curricula de l'Enseignement Post Fondamental Technique et de la Formation Professionnelle (BECEPTF), which is the umbrella organisation for the ITABs, have been introduced to key plant doctor modules and are working initially with a small number of ITABs to integrate this into the second- and third-year agronomy curriculum. If successful, the programme will mainstream the process of delivering a large number of qualified Plant Doctors to replace older generations of public extension staff. At the time of writing, the curriculum integration process was making good progress but was not yet complete in the pilot institutions. The modules are expected to be taught in the 2024 academic year onwards (for second year students), meaning the first graduates will complete their training in mid-2026.

2.2 Plantwise outputs and results

Plantwise Burundi experienced a difficult start due to the COVID-19 epidemic in 2020 and 2021. Despite this, remarkable progress has been made training Plant Doctors and establishing Plant Clinics countrywide. The Plantwise logframe identifies 4 levels of change: impact, outcomes, outputs, and results. Impacts are ultimate change ambitions related to increased crop productivity, higher crop income, and better resilience to agricultural stresses and shocks. Other than reporting anecdotal statements, impact assessment is the purview of the end-line planned for the fourth quarter of 2023 and is beyond the scope of this assignment.

Table 1. Traffic-light progress against logframe outcomes, outputs and selected results (evaluated status green = target achieved, orange = target on track, red = target at risk).

Outcomes	Indicator	2022 total	Project target	Evaluated status	Observations and comments
1. Plant Doctors reach more farmers with better quality advice	1.1. Number of farmers reporting satisfaction with plant doctor services	1600	8000	Orange	<ul style="list-style-type: none"> Target of 8000 is feasible given exponential growth of PCs and PDs. The term 'satisfaction' requires qualification when not all advice is correct or appropriate for the farmer.
2. Plantwise contributing to prompt identification and action on plant health problems	2.1. Number of new and emerging plant health problems identified or solved through PW intervention	3	2	Green	<ul style="list-style-type: none"> Target exceeded. To what extent did PW network signal this from the bottom up? The PD WhatsApp group plays a strong complementary role to official POMS system.
3. Farmers adopt practices according to advice given by Plant Doctors	3.1. Number of farmers adopting Plantwise advice	152,000	180,000	Orange	<ul style="list-style-type: none"> Target on track The concept of farmer adoption requires further qualification and complementary approaches to recall-based surveys and interviews. 152,000 farmers adopting PD recommendations should be reviewed given issues around access to clean/disease resistant seed and plant protection products, as well as known problems with the banana BXW recommendation, upon which some of these results are based.
Outputs	Indicator	2022 total	Project target	Evaluated status	Observations and comments
1. PC networks established and complemented by other extension methods to enhance access to information on	1. Number of PC operating in Burundi	50	100	Green	<ul style="list-style-type: none"> Target achieved, already 119 PC operating in Burundi. One in each commune
	2. Number of farmers accessing advice from	245,000	600,000	Green	<ul style="list-style-type: none"> A target of 600,000 is high but achievable by end 2023. A high proportion of this number relies on

sustainable management of crop health	PC and PW-led extension approaches				data provided through Auxfin's digital farmer outreach programme.
2.Plant Doctors deliver advice at Plant Clinics	1.Number of Plant Doctors offering advice to farmers at Plant Clinics	100	200		<ul style="list-style-type: none"> Number significantly exceeded
3.Plantwise information resources used by Plant Doctors and other plant health stakeholders	1. Number of stakeholders using Plantwise Knowledge Bank (data and other information resources)	31 ⁰	35 ⁰		<ul style="list-style-type: none"> On track to reach target Most are PDs and stakeholders in Burundi, which can be tracked by IP address validation and the unique identifiers of PD tablets.
	2.Number of extension materials developed/adapted by local experts and stored in the Knowledge Bank for use in Burundi	31	30		<ul style="list-style-type: none"> Target surpassed 16 factsheets are available on the Plantwise Knowledge Bank. 15 others have been completed but are awaiting validation by MINEAGRIE
4. Data-driven ICT based processes adopted in systems for plant health management at smallholder farmer level	1.Number of Plant Doctors and other stakeholders using the Plantwise ICT toolkit (DCA, Factsheet App etc)	299	250		<ul style="list-style-type: none"> Target surpassed PDs are using tablets to record and upload consultations, and have access to (offline) factsheets and diagnosis and decision-support materials
	2.Number of PC records stored in Burundi site of POMs	1776	10000		<ul style="list-style-type: none"> Below target, although the number had increased to about 6000 in October 2023. Reflects challenges PDs have in entering the data on the tablets (double work), and not actual data transmission issues.
Results (relevant selection only)	Indicator	2022 total	Project target	Evaluated status	Observations and comments
1.Content of Plantwise training modules included into curricula of agricultural colleges and universities	1.Number of college and university curricula with PW training materials/content	1	1 or more		<ul style="list-style-type: none"> Agreements and MoUs have been signed and many discussions and plans have taken place. However, unclear if this will be concluded in 2023. Regardless, ITABs will almost certainly not implement programme content until 2024-25 academic year
1.Additional Plant Doctors trained to run expanded networks of Plant Clinics in Burundi	1.Number of new Plant Clinics successfully established and operational	34	84		<ul style="list-style-type: none"> Plantwise had targeted a total of 84 Plant Clinics by the end of 2023, but this has already been significantly exceeded. Plant Clinics are now operative in all 119 communes of Burundi.

Plant Clinics and Plant Doctors

By late 2023, the ambition was to have 100 operational PCs in Burundi. At the close of 2021 there were 16, increasing to 50 in 2022. At the time of this evaluation, PCs had expanded to all 119 communes in Burundi. This is an impressive achievement. In each commune, the PD-trained BPEAE communal agronomist is assisted by a zone-level (lower administrative level) to operate weekly Plant Clinics. The agronomists are all equipped with a tablet with cellular internet connection, magnifying loupe, disease factsheets/identification guides and, case registration forms and prescription (plant health management) forms to issue to the farmers when needed.

General highlights and achievements, by late 2022:

- One plant clinic operates every week in each of Burundi's 119 communes.
- 215 persons (138 of whom will operate Plant Clinics; for a cumulative total of 238 Plant Doctors) completed the plant doctor training.
- Nearly 5000 plant clinic queries reported by July 2023 in the Plantwise Online Management System (POMS).
- 2,414 sessions on the Plantwise Factsheet app made in 2022.
- 671 visits to the online Plantwise Knowledge Bank made in 2022 (1,130 cumulative)
- Eight Pest Management Decision Guides (PMDGs) and four Factsheets for Farmers produced by local partners in 2022 (31 cumulative, of which 16 published in the Plantwise Knowledge Bank)
- Positive outcomes from result monitoring, namely the majority of farmers (89%) satisfied with the advice from Plant Doctors, with most of them (63%) fully implementing the advice.
- 20 persons (five female) trained as trainers on gender-sensitive agriculture extension service provision.
- 405 persons (48% female) participated in CC meetings.
- The country's laboratory infrastructure for diagnostic support assessed with technical gaps in terms of facilities and human resources identified.
- Deliberate steps taken towards the institutionalisation of plant doctor training, namely exposure of personnel from prospective institutions to Plantwise modules and signing of a partnership and training material license agreements with two institutions.

3 Farmers' appreciation of Plant Clinics and Community Conversations

For the assessment of the relevance of Plantwise for farmers and the effectiveness of the plant clinic approach we have used a Lot Quality Assurance Sampling (LQAS) approach. More details on this approach are provided in the methodology annexes. Five communes were selected from the initial eight pilot communes as these have been running for the longest time. These sites are also in the same areas where Community Conversations have been implemented. The selected sites are: Bukeye (Muramvya) at the convergence of Mugamba and Kirimiro, Makebuko (Gitega), Mugongo-Manga (Bujumbura) in Mugamba, Rugombo (Cibitoke) in Imbo, and Kiremba (Ngozi) in Buyenzi. However, data collected from Bukeye have not been included in the LQAS. In Bukeye, farmers attended the PC at random and in small numbers. They were not mobilised for FGD.

The LQAS analysis is applied to beneficiaries of (i) Plant Clinics and (ii) community conversations. Plant Clinics are organised once per week in the morning when plant samples are fresh to make plant disease identification easier. In some communes, community conversations to discuss gender issues are organised in the afternoon, usually twice per month. In the study sites reported here, both Plant Clinics and community conversations were organised consecutively.

3.1 Plant clinic performance and services

Table 2. Farmer perceptions on plant clinic services.

	The farmer has:	Plant clinic							
		1		2		3		4	
		M (%)	W (%)	M (%)	W (%)	M (%)	W (%)	M (%)	W (%)
1	overall positive experience with the PC	100	100	100	100	100	100	100	100
2	received advice on the same day he or she presented the sample	79	100	38	42	77	63	93	50
3	received advice in time to treat the problem	74	65	44	37	100	88	100	50
4	has implemented the advice	84	82	44	37	100	88	100	100
5	stated the advice solved the problem	47	29	44	37	100	88	100	100
6	used pesticide when the Plant Doctors advised it	26	0	38	21	85	100	78	50
7	stated that the advice implied use of less chemical pesticides	100	100	38	32	85	81	0	0
8	shared the knowledge in the community	95	88	56	37	92	100	100	100
9	stated that plant clinic is the best source of information for plant health issues	100	100	100	100	100	100	100	100
10	encouraged others to visit the PC	100	100	100	100	100	100	100	100

Note: M: Men; W: Women; Pilot Plant Clinics are implemented at the Communal level. Communes involved in the study are 1: Makebuko (Gitega); 2: Mugongo-Manga (Bujumbura); 3: Rugombo (Cibitoke), and 4: Kiremba (Ngozi). Orange-shaded area indicates areas where attention is still required, in green-shaded areas the threshold (50%) has been met.

Farmers were first informed on the existence of plants clinics through an array of channels: (i) agronomists and local meetings; (ii) information distributed after church service; (iii) other farmers; (iv) the serendipitous discovery of the colourful PC umbrella and PC banner. These information channels do not significantly vary across Plant Clinics or men/women. The waiting line at the plant clinic is on average 2-3 persons, the waiting time is around 20 minutes given that the consultation duration is on average 7-10 minute per crop sample.

Even though there are some constraints limiting the adoption of advice provide by Plant Doctors (lack of improved seeds and pesticides in many locations), the overall experience with plants clinics is positive for farmers. Furthermore, farmers are aware that Plant Clinics are the best source of information for crop health issues when compared to other options (radios, local cooperatives, or other extension activities). In Mugongo-Manga, due to the poor attendance of farmers, Plant Doctors have enough time to provide additional recommendations on good agricultural practices. Hence, farmers' testimony on Plant Clinics is often related to the increase of production due to integrated land management they learned.

Except for Mugongo-Manga, where farmers are less motivated to visit Plant Clinics and to share their acquired knowledge, knowledge dissemination to the wider community scores highly. The number of farmers with which the information is shared varies between 2 and about 300 farmers due to the existence of several farmers organizations (cooperatives and other farmers associations). The number of farmers reached by a single farmer visiting the plant clinic is the highest in Kiremba (Ngozi) who shared knowledge with member of a large rice growers association in the marshland of Nyamuswaga.

When all indicators are taken into account, the Mugongo-Manga Commune has the lowest scores, sometimes below the 50% 'acceptable' lower threshold. At the other extreme, Rugombo is green on all indicators. In Makebukoko, the key issue is the lack of an authorised phytosanitary pharmacies, hence farmers struggle to find a pesticide when the plant doctor advised it. An issue in Rugombo is unfair practices by some agrodealers who farmers claim mix pesticides with other (non-active) products to increase their sales volume. In Mugongo-Manga and Kiremba, farmers believe that using very large volumes of pesticides is best practice. This is an area that demands more attention in the Plantwise training sessions on integrated pest management.

Besides the lack of improved seed and pesticide outlets, the common issue for all the Plant Clinics visited is their scarcity and remoteness from farmers. Due to lack of funds, the PCs are unable to relocate to reach more farmers. Farmers who need to pay large amounts for transport to a PC, or to spend more than two hours walking to reach a plant clinic without any guarantee of securing the recommended plant protection product would prefer to call Plant Doctors for an *in-situ* crop inspection.

In Burundi, despite trainings to reduce gender inequalities, men have the latitude to travel long distances, a privilege many women do not have. Hence, men are more likely to be able to buy pesticides from distant agrodealer than women. In Makebukoko and Mugongo-Manga, where there are huge constraints to get pesticides, scores are the poorest for women. In Rugombo, plant clinic attendance is a significant gender issue. Men are normally involved in the production and marketing of several crops (cash-crops and food crops), while women frequently manage food crops only. Farmers visited PCs an average of 6 times since the Plant Clinics opened, compared to only 2 times per year for female farmers. Plantwise Burundi aims to address gender disparities around participation in farming operations and access to agricultural services through Community Conversations (CC), the results of which are presented further below.

Even at Plant Clinics where farmers indicate they are using less pesticides than before (Makebukoko and Cibitoke), this does not necessarily result in lower costs due to the price of pesticides increasing over time. Nimenya (2020) found that due to COVID-19, the price of pesticides increased by 30%. The higher price of pesticides may be deterring some farmers to visit Plant Clinics. The Plant Doctors of Mugongo-Manga

complained that farmers are very angry when they were informed about Plant Clinics. *“How relevant is it to visit a plant clinic to get an advice which you cannot afford?”*

3.2 Community conversations performance

Community conversations are a key component of the Plantwise project in Burundi. CC is a structured training program with 18 modules for the benefit of 40 persons (20 men and 20 women) randomly selected in the neighbouring community. Each CC is facilitated by one man and one woman assisted by the two Plant Doctors providing services at the plant clinic. Participants to CC are intended to graduate the programme with the completion of all training modules in around 6-7 months. The CC are organised two times per month, during the first and last week. The relevance of community conversation justified by the key role of women in the farming system in Burundi and the social norms that limit their freedom and to attend extension services. The rationale of the CC process is to dismantle gender inequalities and hence increase female attendance to Plant Clinics. Table 3 displays for CC performance indicators from five of the nine CC locations.

Table 3. Participants perceptions on Community Conversations.

	The male/female farmer has:	Pilot site community conversations							
		1		2		3		4	
		M	W	M	W	M	W	M	W
1	attended a plant clinic two or more times	71	26	45	25	93	94	94	94
2	a positive overall experience with CC	100	100	100	100	93	94	100	100
3	stated that men and women now jointly decide which crops to grow	100	100	91	100	100	70	100	68
4	stated that men and women now jointly decide how to use the income generated from the crops sales	100	68	91	94	100	65	94	87
5	shared what he has learned with others in the community	100	100	91	100	100	100	100	56
6	stated that CC is the best opportunity to discuss issues around gender	100	95	100	100	100	100	100	100
7	stated that women are able to access Plant Clinics as easily as men	14	63	91	62	86	94	94	37
8	stated that women are able to decide to implement the recommendation from Plant Doctors as easily as men	86	95	100	56	86	88	94	31

Note: 1: Bukeye (Muramvya); 2: Mugongo-Manga (Bujumbura); 3: Rugombo (Cibitoke); 4: Kirembe (Ngozi).

Orange-shaded area indicates areas where attention is still required, in green-shaded areas the threshold (50%) has been met.

Participants consider Community Conversations as the best place and opportunity to discuss issues around gender. Some churches and the Familial and Community Development Centre (CDFC) occasionally organise debates on gender issues with varying content. The CDFC are more involved in the monitoring and evaluation of social improvements rather than training. Hence, Community Conversations seems to be the only option where meetings are held regularly and content is clearly structured.

In Bukeye, both female and male participants believe that women are still unable to access Plant Clinics as easily as men. Mugongo-Manga is characterised by poor attendance rates to Plant Clinics, but Rugombo is performing well on the various indicators.

However, CC is already having an impact in some key areas. All CC participants in some communes fully agree that men and women now jointly decide which crops to grow, a level which was only around 20% before the CC, according to participants. The most significant changes in the community are improved collaboration between husbands and their wives in the household decision-making processes. Participants ranked the most important training module to date as that which discusses how to value women in the household. Participants were guided on how to attribute a financial value to the work accomplished by both men and women. When examining the time spent on various tasks, including farming, food preparation, and taking care of children (washing, clothing and feeding them), and keeping domestic animals, the financial contribution of women to the household was 6 times higher than that of her husband.¹ Based on these results, some men claimed to have increased their participation in the various household tasks.

We find that in order to accelerate the achievement of results, married couples should be trained; when only a woman is trained she struggles much to convince her husband on the relevance of the modules she has been trained on. Indeed, indicator responses are the highest for male respondents. In Kiremba, CCF highlighted this fact and ranked the social change with respect to the status of trained beneficiaries. Significant change in households is achieved when both husband and wife are trained; intermediate results are got when only husbands are trained and the poorest results are registered when only wives are trained.

¹ By accounting and valuing all the tasks carried out by women, participants of the Mugongo-Manga CC found that females were creating 4,400,00 BIF of labour income per year while males were creating only about 650,000 BIF over the same period of time.

4 Plant Doctor perspectives on Plant Clinics

All 10 Plant Doctors visited during their farmer consultations at the five Plant Clinics visited accepted to participate in our interview. Plant Doctors have run these Plant Clinics coupled with community conversations since August 2021. Except for Mugongo-Manga, where the plant clinic is open two times a week, other communes organise Plant Clinics once per week. The PD perspectives are addressed in four sections: (i) relevance of Plant Clinics; (ii) relevance of the plant doctor training programme; (iii) logistic constraints to run the Plant Clinics and (iv) the exercise of the profession of Plant Doctors and unsolved issues.

4.1 Programme performance according to Plant Doctors

All ten Plant Doctors interviewed mentioned an overall positive experience with Plant Clinics despite several shortcomings still prevailing. Positive experiences are the following:

- The most widely reported positive experience is related to the capacity building they received; Plant Doctors are now well-trained and can perform their work more effectively and efficiently. They are now more confident in their plant disease diagnoses and in issuing appropriate management advice.
- The trust relationship between Plant Doctors and farmers has significantly improved; farmers far from the Plant Clinics who cannot attend them easily have increased their contacts with Plant Doctors through phone calls.
- Farmers report being more active on farm than before, they are bringing crop sample to Plant Clinics due to regular inspections of their farms. By visiting Plant Clinics, farmers are acquiring technical knowledge on plant diseases which they are able to share in their community.
- The information and advice provided by Plant Doctors appears to be helping to increase crop productivity.
- There are positive spillovers on the environment: farmers are becoming aware of the need to only spray pesticides when required, and understand the preference for non-chemical, integrated pest management practices when possible.
- By virtue of the fact that farmers are inspecting for plant diseases more regularly, Plant Clinics are playing a role in early warning.

Negative experience with Plant Clinics includes:

- There is only one plant clinic per commune and it is not mobile due to lack of funds. Only few farmers are benefiting from Plant Clinics, and only around one-quarter of collines in each commune are partaking in or have reasonable access to Plant Clinics.
- Farmers distant from the Plant Clinics sometimes bring wilted crop samples due to the long travel times. This sometimes makes plant health diagnoses difficult or impossible.
- Plant Clinics are unable to address or solve all plant health issues. For example, for some soil-borne pests and plant diseases Plant Doctors will need to make *in-situ* field site inspection for a good diagnosis.
- Farmers attending Plant Clinics often still request for an additional *in situ* plant inspection.
- Plant Doctors are uncomfortable recommending disease tolerant or resistant seeds and/or pesticides when they are aware that these inputs are not available to be procured locally.

4.2 Relevance of plant doctor training programme

Table 4 shows the Plant Doctors ratings of the relevance of the Plantwise programme. This relevance is proxied by the extent to which PW is responding to PD and farmers' needs. The note reported is an average value of the rating provided by the 2 PDs in each commune; where 5 is the best or maximum note. The extent to which this note goes below 5 is due to the perceptions of Plant Doctors on the negative experience highlighted above.

Table 4. Rating of Plantwise relevance by Plant Doctors

Indicator	Plant clinic				
	Bukeye	Makebuko	Mugongo-Manga	Rugombo	Kiremba
The extent to which Plantwise is responsive to Plant Doctors' needs	3.5	4	3.5	4	3.25
The extent to which Plantwise is responsive to farmers' needs	3	4	3	3.25	2.5

Note: Score from 0 to 5, 5 is best. Average score for both PDs per PC. Scores of 3 or higher are assessed as green (good), 2.1 to 2.9 as orange (requires attention), and 0-2 as red (poor).

- Plant Doctors much appreciate the training programme (Table 5). They are aware of the Knowledge Bank (KB) and sometimes use the offline version on their tablets when they require diagnosis or decision support, although this was not observed during the field visit. They also have a set of paper-based factsheets to refer to. The factsheets and the KB are essential aide-memoirs and reference documents for Plant Doctors
- Some Plant Doctors were unaware that they could access the offline KB.
- The WhatsApp PD group is useful as a tool for peer support and to request help with diagnoses or plant health recommendations.
- Plant Doctors populate the POMS database without any validation at the province level. The provincial phytosanitary inspectors are also trained as Plant Doctors but they do not convene or support Plant Clinics, but do report independently on the phytosanitary situation. Similarly, the BPEAE plant doctor supervisor cannot access or view the data collected from his province. These actors should work more closely together around the plant clinic approach and validate provincial-level POMS data before forwarding to ISABU.

Table 5. Rating of Plant Doctor training programme and the Knowledge Bank by Plant Doctors

Indicator	Plant clinic				
	Bukeye	Makebuko	Mugongo-Manga	Rugombo	Kiremba
Plantwise Knowledge Bank	3	4.5	3	3.75	4
Training by ISABU and CABI	3.5	4	4.5	3	4.5

Note: Score from 0 to 5, 5 is best. Average score for both PDs per PC. Scores of 3 or higher are assessed as green (good), 2.1 to 2.9 as orange (requires attention), and 0-2 as red (poor).

4.3 Constraints with logistics

In some areas, the lack of a good internet connection makes it challenging to upload data to the Plantwise Online Management System (POMS). In each plant clinic there are 2 PDs: one consults with the farmer directly whilst the other completes the consultation/registration form. Double work is done when the consultation needs to be transposed to the tablet for uploading to POMS. Plant Doctors face a number of logistical constraints among which the most challenging are:

- A lack of means of transport and/or fuel for transport.
- Poor road infrastructure and quality limiting mobility.
- An insufficient monthly data bundle to connect to POMS. Some Plant Doctors think they need to be online to connect to the KB, others use the bundle to call farmers by telephone.
- The absence of a facilitation allowance (no per diem).
- Insufficient weather protection: farmers attending Plant Clinics are only protected from extreme weather conditions, either extreme heat or rain, by only a small umbrella.

However, Plant Doctors appreciate the IT equipment provided by the project as well as the equipment under the umbrellas (chairs, tables, magnifying loupe, factsheets, etc.). The fact that farmers ask other questions to Plant Doctors not related to plant disease (e.g. other technical advice, financial advice) is not really an issue for some Plant Doctors. They are very aware that there are not enough sources of information in rural areas. When there are not many farmers waiting in the PC queue, Plant Doctors often take the time to provide additional technical advice on agricultural practices. For example, in Mugongo-Manga, farmers frequently mentioned an increase in agricultural production attributed to the adoption of good agricultural practices recommended by the Plant Doctors.

4.4 Effectiveness of Plant Clinics according to Plant Doctors

The number of Plant Doctors that were able to be interviewed (10) is not sufficient to employ an LQAS approach. Instead, we simply rate the plant clinic effectiveness against the various criteria (see Table 4). It is very difficult for Plant Doctors to follow up and monitor how farmers are implementing the advice they received from Plant Clinics. One approach is to provide a transport allowance by which Plant Doctors could visit farmers at home and confirm if and how they are applying the recommendations. A practical alternative is for colline-level extension agents to follow up on the instruction of the plant doctor. Finally, the ambition is to strengthen agri-input service provision (phytosanitary products and quality seeds shops, etc.) closer to the Plant Clinics. These agrodealers could record who is purchasing what and feed this back to the plant doctor for validation. In Rugombo, Plant Doctors have tried themselves to assess the implementation rate of PD recommendations as they do not have access to the Plantwise monitoring database.

Table 4. Plant Doctors' ratings of plant clinic effectiveness

Indicator	Makebuko	Mugongo-Manga	Rugombo	Kiremba
Out of 10 farmer queries, how many are from women farmers?	1	7	6	3
Out of 10 farmer queries, how many times where you able to give recommendations immediately	8	9	10	6
Out of 10 farmer queries, how many times were you not able to give a satisfactory response by the next plant clinic meeting?	0	1	0	0
Out of 10 farmers that you have given a recommendation, how many implemented that?	N/A	N/A	10	N/A
Out of 10 farmers that implemented the recommendation, how many had some form of benefit?	N/A	N/A	10	N/A
Out of 10 farmers, how many shared their knowledge with other farmers?	N/A	N/A	7	N/A

Plant Doctors claim they are reducing the (limited) cases in which they were not able to give a satisfactory response by the next plant clinic meeting. During the fieldwork we observed diagnoses accompanied with incorrect advice. For example, some plants doctors were advising insecticides to combat a situation of abiotic stress. PDs do recognise this challenge and have requested additional refresher training. In future, in addition to a possible expansion of Plant Clinics, there is a real need to consolidate what has been learned in the previous three years. Continued refresher trainings – whether remote or in-person – are likely to be needed in light of emerging diseases and evolving prevention and treatment strategies.

5 Plantwise programme performance

In this section, a synthesis is provided based on the information obtained from key informant interviews, CABI publications and other literature. In addition, these information sources are triangulated with the information obtained from the LQAS surveys, and discussions with Plant Doctors survey to draw conclusions for each of the evaluation questions.

5.1 Relevance

This review finds a need for a significant improvement of the plant health system in Burundi. We consider that Plantwise has established the foundations of a more responsive and effective PHS framework, where previous approaches have often been ad-hoc and failed to fully leverage the complementarity of sector stakeholders. By consolidating the project buy-in of all key actors and establishing a new *modus operandi*, Plantwise is indeed helping to develop a plant health *system*.

A study by Ochilo et al. (2022) which used a literature review as well as a broad stakeholder consultation input in Burundi identified key PHS challenges related to poor input supply and availability (mainly fertiliser), limited in-field extension worker access and who possess limited technical skills and knowledge, lack of a 'data science' approach with regard to PH information management at the national level, lack of capacity to detect and respond to emerging pests and diseases, inadequate regulation of the inputs sector, PHS system bureaucracy and poor central planning and management. In all of these areas, Plantwise has either made efforts to mitigate the challenges, or recognises the remaining challenges for future redress.

5.2 Coherence

At the commencement of the Plantwise project, a stakeholder consultation and engagement process and study of the policy and institutional environment in 2021 (Ochilo et al., 2022) executed a mapping process of the PHS and the stakeholder interactions. This revealed a 'core' set of 20 stakeholders – some two-thirds of which are government or public sector actors. The second largest group (civil society and NGO actors) constitute only 3 actors and the remainder represent the private sector, academia, and farmer representative bodies. A national steering committee was established at project outset with relatively diverse stakeholder representation and this meets twice per year to discuss progress and future actions. We do see a notable omission in the composition, in that the international agricultural research centres (IARC) active in Burundi are not represented. The International Institute for Tropical Agriculture, the Alliance of Bioversity and CIAT, and the International Rice Research Institute all make significant investments in Burundi and have a strong interest in research-for-development solutions related to agricultural challenges, including pests and diseases. This omission in steering committee representation – or at least a clear engagement with – has already led to a Plantwise banana disease IPM recommendation which, whilst technically correct, is highly unlikely to be adopted by farmers. This is despite the availability and previous dissemination in Burundi of a simple, effective and farmer-friendly alternative (see box 1).

The government body responsible for Burundi plant health is MINEAGRIE. Other ministries also have agencies with PH responsibilities, including the Institute of Statistics and Economic Studies of Burundi (ISTEEBU) in the Ministry of Finance, Budget, and Economic Planning (MFBPE); technical colleges and universities in the Ministry of Education and Vocational and Professional Training; and the Ministry of National Solidarity,

Human Rights, and Gender. Within MINEAGRIE, there are three General Directorates which embody a PH responsibility, some with relevant sub-directorates. There are also separate institutional entities including ISABU and ONCCS, the national seed certification and quality authority. In short, there are a plethora of governmental PHS 'owners' that need to discuss, agree, finance and execute in coherent fashion. The process is understandably imperfect and rather bureaucratic. However, an important point of attention is the division of labour between ISABU and DPV, the Burundi directorate of crop protection.

In most other Plantwise countries, the local implementing organization is the National Plant Protection Organisation (NPPO). DPV assumes this mandate in Burundi, yet the project is implemented by ISABU, the national agricultural research institute. This decision was taken for pragmatic financial and staffing related reasons which are understood by the authors. However, the result is overlapping agendas, poor coordination, and ultimately a duplication of activities and PH recommendations. These are frictions that require resolution going forward. DPV has one province-level phytosanitary inspector plus a number of inspectors stationed at the country's borders and international airport.

Box 1. Are Plantwise recommendations best-practice? The case of banana wilt.

Banana *Xanthomonas* wilt (BXW) is a devastating bacterial disease causing large yield losses in Burundi. The Plantwise management recommendation involves the complete uprooting of diseased banana mats (CMU). This is effective but extremely labour intensive. BXW management using CMU was a major component of the Plantwise MECs held in Burundi and was targeted at 400,000 farmers¹. A much simpler and less burdensome BXW control approach is Single Diseased Stem Removal (SDSR). SDSR has been scientifically validated^{2,3}, tested with farmers and scaled out in the African Great Lakes region⁴ including to extension officers and 86,000 farmers in Muyinga Province, Burundi⁵. Why is Plantwise not recommending SDSR as best practice?

One female farmer who visited the Makebuko plant clinic reporting 50 infected banana mats said she was advised to uproot and bury the infected bananas *"I can do about 5 mats per day, so this will take me 10 days"*. This labour investment is unnecessary when using SDSR. SDSR is highly effective and maintains some productivity (because only the symptomatic plants are removed). *"I know about removing only the individual sick plants, I learned this from my local agronomist previously. I found that often the remaining plants stayed healthy"* the female farmer added. She had wanted a consultation with the plant doctor because more than half her banana mats were showing BXW symptoms. However, she admitted this was a consequence of infrequent field inspection. She confirmed the plant doctor had told her to (among others) use resistant banana varieties (which do not exist) and to practice crop rotation (which is irrelevant for the control of BXW). It is noted that the printed Plantwise factsheet booklet contains four different factsheets on BXW management (sheet #2, sheet #22, sheet #42 and sheet #43). This could be confusing for Plant Doctors. Factsheets on BXW management using SDSR have already been produced and a very good extension video is available⁶.

¹ Auxfin and CABI, September 2023

² <https://link.springer.com/article/10.1007/s10658-017-1189-6>

³ <https://d-nb.info/1272309533/34>

⁴ https://link.springer.com/chapter/10.1007/978-3-030-92022-7_10

⁵ https://t.ly/pA_bl

⁶ <https://www.youtube.com/watch?v=k4mGpmooVDo>

5.3 Effectiveness

Plant health services to farmers in Burundi have significantly improved with the introduction of Plant Clinics. Farmers now have on-demand access to better quality diagnoses and crop management advice. Farmers are highly appreciative and broadly content with the recommendations and prescriptions. Key findings are that:

- Taking a plant health system perspective, extension has improved dramatically. This now exposes weaknesses in input supply, notably the lack of access to quality, improved seed and appropriate plant protection.
- Plant Clinics in every Commune is an impressive achievement in a short period of time. PD advice is now available countrywide.
- The performance of Plantwise in the four communes is uneven. For example, both farmers and Plant Doctors are less satisfied with PC services in Mugongo-Manga than in Rugombo (see Table 2 and Table 4).
- Plant Doctors are proud of their role and motivated to give good advice to farmers.
- About one-third of plant clinic attendants are female, which suggests a respectable level of access for women.
- Plant clinics are relatively well equipped for (pests and diseases) identification, which improves diagnosis accuracy.
- Plant Doctors are occasionally giving incorrect or unsuitable advice, including recommendations to use 'tolerant' seeds or for unavailable chemical products.
- The Whatsapp PD group is very popular and supports 'crowdsourced' diagnoses and recommendations.
- Plant Clinics are still very distant from most farmers. Service reach is limited to a minority of farming households. The extent of farmer awareness about Plant Clinics is unknown but we expect there is much more potential for sensitization and awareness raising.
- Community conversations seem to be resulting in some gender transformative changes and improved gender attitudes.
- The CABI knowledge bank is a useful resource but may need updating with more Burundi specific resources (currently 16 factsheets). The CABI factsheet guides used by PDs are also largely sourced outside Burundi and contain duplications and not always the most up-to-date advice.
- A key institutional innovation is the institutionalisation process of Plant Doctor training modules in ITAB plant protection courses. All going well, this will ensure a consistent supply of PD-ready agronomists from 2026.
- Partnerships with quality seed outlets and agrodealers selling plant protection products are missing, and this could reduce access to inputs for many farmers. This is also a system inefficiency, with high transaction costs for farmers who seek to source appropriate seed and agrochemicals.

5.4 Efficiency

Plantwise Burundi is still in its formative years and naturally there are processes and arrangements where efficiency gains can be made.

- The plant clinic approach is responsive to needs and to date nearly 5000 plant health advisories have been made. Training and material expenses notwithstanding, the variable costs of running fixed-location Plant Clinics is rather low. Training costs should reduce further over time as ITABs incorporate the Plantwise curriculum.
- Plant Clinics use existing BPEAE staff capacity. They are essentially doing the job they are employed to do, but they are doing it better.

- The case of the provincial DPV phytosanitary inspector and BPEAE supervisor is less evident. Both are trained PDs but do not practice. DPV inspectors contribute weekly plant health reports to DPV and BPEAE does the same to POMs. This is a duplication of both effort and reporting systems and does not support effective national phytosanitary decision support in case of plant health emergencies.
- The Plantwise implementing organization ISABU has highly skilled and dedicated staff and administrative support active working on the Plantwise project full-time, or nearly full-time. The national coordinator and the national POMS data manager hold other fulltime positions at ISABU. Each wears two hats. This is not efficient, nor effective, nor sustainable. The data manager is responsible for POMs entry validation, analysis, and system administration. This is tiring and complex work. Support from a more junior colleague for some aspects of the reporting is being organised.
- POMs data is a valuable national data resource. Disaggregated provincial data should be available for both DPV and BPEAE. DPV should also be able to use the system for their own reporting needs, although ideally this would be streamlined in a single system and process.

5.5 Sustainability

CABI has developed a sustainability roadmap that charts a country's progress towards sustainable Plantwise operations. The key stages are piloting > consolidation > scaling up > sustainability. Here, sustainability is defined in terms of independent planning, policy, partnerships and ownership, communication and feedback, limited CABI backstopping, and human and financial resourcing. Plantwise Burundi meets many but not all the 'consolidation' criteria (which supports the key conclusion of this evaluation).

With regard to institutionalisation, we consider it important to distinguish between operational investments and policy investments. For the former, MINEAGRIE financially supported the recruitment of an administrative assistant to the project and nominated the Plantwise national coordinator, deputy national coordinator and national data manager, although each still hold their official titles as head of the crop production programme and senior data management expert, respectively. MINEAGRIE also supports CABI by way of its country membership dues. According to our discussions with the Minister of Agriculture, investments are being made to pilot 'agro-sylvo-pastoral' communal level structures to manage plant and animal health issues. These locations reportedly will host permanent Plant Clinics, phytosanitary outlets, veterinary facilities and training centers for all the agronomists at the commune level. There will be one fixed plant clinic per commune and several mobile plant clinics to reach as many farmers as possible. Essentially, the actions described above are operational plans and investments. The policy and regulations that underpin these decisions, as well as the implications for Plantwise, are unclear. MINEAGRIE further expressed 'awareness of the challenges around transport to enable mobile Plant Clinics and the lack of a budgetary line item dedicated to Plant Clinics and pesticide subsidies', and that 'over time' these issues would be addressed.

The long-term sustainability of the Plantwise approach ultimately hinges on increasing MINEAGRIE appropriation of the Plantwise model (or elements thereof) and associated policy reorientation. In our view, there is no clear public commitment to the policy institutionalisation of Plantwise by MINAGRIE. This position was mostly supported by stakeholders during the evaluation results validation workshop. MINEAGRIE needs to deliver a costed sustainability and appropriation plan. In the absence of a plant health policy framework, a first step could be a (financial) commitment expressed in the National Agriculture Investment Plan (NAIP), which is currently being updated for the 2023 – 2027 period. This would be followed by a MINEAGRIE decree or ordinance which legitimises and formalises the Plant Clinic approach and identifies the key institutions and their roles and functional criteria. Similar ministerial ordinances were issued in 2015 and 2016 to support structural reform of the seed sector in Burundi. A costed commitment in the NAIP does not necessarily mean that it needs to be (fully) funded by government resources. Having validated Plantwise in Burundi, other

bilateral or multilateral donors may be interested to provide complementary funding for Plantwise. For example, IFAD and the World Bank were mentioned as possible donors during the evaluation validation workshop by members of the NSC.

6 Conclusions and Recommendations

Plantwise Burundi has made impressive inroads in developing an integrated plant health system which acknowledges the four plant health system components in the Plantwise theory of change – extension, research, input supply and regulation. In practice, the emphasis has clearly – and correctly - been on extension through a rapid roll-out of the plant doctor / plant clinic model. This puts farmers front and centre, catering to household needs so that farming families, both women and men, are in a better-informed position to *grow more and lose less*. Those farmers who are aware of the service and can make their way to the clinics are enthusiastic, and the Plant Doctors themselves – government extension agents – have a renewed sense of purpose and pride. The extension aspect of the programme is, given the scope of the current project, a resounding success. Insofar that the Plant Clinics are a plant health system ‘revolution’, taking the long view now demands that diverse and incremental investments are made in incremental plant health system *evolution*. To disregard this is to undermine the foundation of the plant clinic approach and its future utility to farmers. Consequently, the overarching recommendation of this evaluation is to:

R1. Concentrate on the consolidation of gains. A large number of Plant Doctors have been trained, and these are running weekly Plant Clinics in every commune in Burundi. Farmers appear to be broadly content with the new approach to service provision. We assert that that the most important function of Plant Doctors at this early stage is to establish a rapport of trust with their clients. That trust means being able to give accurate and above all meaningful advice to farmers. Factually incorrect prescriptions (eg. ‘*use resistant varieties of banana to avoid BXW disease*’) or advice to apply a commercial insecticide which is not available to be purchased locally is not only useless to a farmer, but can damage the evolving trust relationship between farmers and Plant Doctors. Ensuring *accurate* and *actionable* recommendations is paramount. This can be done by:

R1a. Ensuring Plant Doctors use the correct ‘aide-memoirs’ and have appropriate technical backstopping. The WhatsApp group is extremely pragmatic and useful and its use should be encouraged for specific diagnostic support. In the field, Plant Doctors have access to the offline version of the CABI knowledge bank but not to other online resources. Updating the CABI factsheet guide would avoid duplication and provide pragmatic recommendations on best-practice.

R1b. Ensuring Plant Doctors are aware of which seed and which (safe) chemical control products are available locally. They should advise farmers appropriately and be able to link farmers to agrodealers and seed sellers. If this is not possible, farmers should be informed appropriately or provided alternative recommendations.

R1c. Strengthen farmer follow-up using zonal agronomists and colline-level agronomists. A negative aspect of the plant clinic approach is that extension advisors do not see the disease context in the farmers field and immediate environment and only a sample of a leaf, stem, or root. By networking appropriately with lower level extension agents, Plant Doctors would be able to better confirm actions were taken and yielded results, with farmers also receiving additional good cultural practice advice from the extension agents at the colline level. This will also help engage zonal/colline-level agronomists in the Plantwise approach and will likely improve impact.

R1d. Bringing clinics closer to farmers. One PC per commune is insufficient to be able to reach a greater proportion of farmers. Worse, the intended ‘movement’ of the clinic to different locations within the commune does not happen due to lack of transport and funds. Many farmers live too far away to be appropriately served. Initiatives to host a permanent clinic at the commune headquarters

are noteworthy but do not address the problem. More PCs are needed at a lower level. How this can be done to balance effectiveness, access and efficiency needs to be explored. Discussions with connected partners on the ground, particularly Auxfin, might provide useful insights or complementary approaches. For example, Auxfin's network exceeds 500,000 farmer households that are connected to digital solutions. Local agrodealers selling seed and plant protection products can be mapped and orders can be aggregated to increase supply efficiency. Basic plant health information can be disseminated via the platform (in the manner of the BXW mass-extension campaign). For common plant health challenges in a community, the local Plant Doctor may be consulted by lead-farmers who pass on key messages to their Auxfin groups, again increasing PC reach and efficiency.

R1e. Review methodology of data-entry in POMs. Plant Doctors in the field need to conduct three administrative steps: Issue a written prescription to farmers, register the consultation details on a paper-based form, and then transcribe the registration onto the tablet for uploading to POMs. The latter two processes are duplications, and are the primary reason there is a huge backlog of POMs entries. It is also a great limitation on the number of consultations that are possible per day, as completing the form takes quite some time. PDs need to be empowered to enter data directly into the tablet, and this process may need to be simplified or made faster.

R1f. Improve utilization of the BPEAE supervisor and DPV phytosanitary inspector. Both persons, present in each province, have been fully trained in the Plantwise modules. However, neither use this learning to the full. The supervisor's role is to check on PD performance, but this is difficult in practice and can most often be done by POMs validation. The DPV inspector is tasked with weekly field inspections and reporting on notable crop disease indicators. This redundant capacity should be put to better use, for example by supporting and implementing a permanent PC at the Provincial offices and allowing the current PC to move to various locations to provide easier access to more farmers.

R1g. Implement regular monitoring of PC performance. Plant Clinic performance is not the same everywhere. Regular PD and farmer feedback should be sought to ensure that PCs are responsive to local needs and function adequately. A clear communication and reporting system should be established between PDs and the lower-level zonal agronomists / colline-level extension agents to help validate PD diagnoses, support farmer implementation of PD recommendations and communicate the results and remaining challenges.

R2. Institutionalise Plantwise in the Burundi Plant Health system. A consolidation of gains also implies a commitment to embed the approach in the responsible public institutions. Financing is a key aspect, but more fundamental is finding better ways of working with institutional partners, civil society, and the private sector. Collaboration between ISABU, BPEAE and DPV must be significantly strengthened. Complementary roles should be set out and full and equal access to Plantwise platforms, such as POMs, should be granted. Organisations such as Auxfin and IFDC have proven platforms and initiatives which are not yet being leveraged to help reach farmers, provide data-driven services or to support farmer access to quality seed. These organisations are both members of the national steering committee, which suggests that this platform and process may need to be reviewed and made more accountable.

A key component of institutionalisation is domestic ownership of the Plantwise agenda, with the gradual withdrawal of CABI towards a backstopping role only. Institutionalisation is a progressive process, but we expected to see stronger indications of progress. For example, the Plantwise coordinator at ISABU dedicates most of his time to Plantwise duties. However, his official responsibility is Head of the Plant Production Programme. In short, a dedicated Plantwise programme management unit needs to be established with the creation of one or more staff positions (or reallocation of appropriate BPEAE or DPV staff to such positions).

With regard to the financing of Plantwise institutionalisation and expansion (more Plant Clinics), additional development financing will be required from institutional donors. Now with a clear proof-of-concept, alternative donors could also be approached to funding complementary funding. A donor strategy scan is recommended to identify potential candidates.

A further pragmatic suggestion is to consider the temporary 'embedding' on an international PHS expert within the MINEAGRIE structure for a number of months. This expert would provide hands-on, pragmatic help to advance and support key policy agendas, whilst simultaneously strengthening Ministry technical capacity. Such an approach has been piloted by AGRA in Kenya (KIT, 2020).

R3. Continue to raise farmer awareness of Plant Clinics. A substantial proportion of farmers may still be unaware of Plant Clinics and the possibility for disease diagnostics and advice. At this point, we would suggest complementary MEC investments in radio and messaging to larger farmer cooperatives and associations.

R4. Strengthen input supply and regulation. With due respect for the recommendation to first focus on the consolidation of Plantwise efforts, a broadened Plantwise or PlantwisePlus programme should prioritise the relatively neglected PHS components of input supply and sector regulation. Both have emerged as key weaknesses of the current programme.

R4a. Increase local availability of appropriate plant protection products. Suitable pesticides, insecticides, and fungicides are simply not available from local outlets. Agrodealers require practical and capacity building support to provide appropriate products and advice, with preference for less harmful (bio)products where possible. Efforts can also be made to produce bio-control products locally, such as those using neem oil or *Tithonia diversifolia*. Explore working with INADES for developing recommendations and guidelines. Explore collaboration with SOBUPRODIA to evaluate efficacy, enhance availability and farmer update of their *Bacillus thuringiensis* product against caterpillars and possibly Fall Armyworm.

R4b. Plant protection product regulation and enforcement. Many local agrodealers are not licenced to sell chemical plant protection products. There is need to support the development of a simplified agrodealer registration procedure with appropriate capacity building initiatives. Better training will reduce the risk of inappropriate advice (such as combining two products with the same active ingredient), reduce the availability of illegally imported and unregistered products, and help promote the use of safer (bio) plant protection products. Existing seed suppliers (eg. those of IFDC) could possibly also be trained and recruited as sales agents. Agrodealers can also be better linked to wholesale suppliers, such as SOBUPRODIA.

R5b. Strengthen laboratory facilities and related DPV staff capacity. Expert study visits to Burundi examining PHS-related laboratory facilities have suggested a number of recommendations. Among them, laboratory infrastructure and maintenance as well as improved analytical capacity of DPV staff for diagnostics and pesticide residue analyses are important considerations.

R5. Revisit the Community Conversations approach. The Community Conversations are intended as a gender-transformative process to encourage more equitable agricultural decision making between men and women and to encourage women's participation in the Plant Clinics. Although early data, and reports from participants, are positive, we would recommend waiting for a thorough impact analysis using the Womens' Empowerment in Agriculture Index (WEAI) approach to be applied in the project impact assessment. Assuming the results are positive, we would encourage continuing with an empowerment approach but with different implementation. The current process is relatively expensive and very difficult to scale up, because each CC participant is paid a travel allowance and a total of four CC trainers (including Plant Doctors) are

needed for each group of 30 or 40 participants. Plantwise will need to find a suitable partner to provide this service. We strongly support the initiative in principle, but we also understand it to lie beyond the Plantwise core business. A strong partner organisation can likely perform the role better and with a broader (beyond agriculture) impact.

R6. Continue to support the integration of Plantwise module curricula into the agronomy training programmes of the ITABs. The integration of Plantwise training modules in selected pilot ITABs is expected to be completed this year. ITABs will however require ongoing capacity support, technical backstopping as well as financial support to assure effective implementation. This support should be limited to the pilot ITABs initially, with a rigorous monitoring system established to evaluate training performance and adapt quickly to identified opportunities and challenges. The learnings will help effectively scale the Plantwise curricula to other ITABs in future.

Annex 1. List of key informants and field site visits

Name	Institution/affiliation
Arakiza , Blaise	SOBUPRODIA agrodealer, Bujumbura
Bindariye , Pascal	Consultant Plantwise integration, BECEPTFP Bujumbura
Bizimungu , Epitace	Advisor DPV, Bujumbura
Chocola , Yannick	Territory Manager, Auxfin Burundi
Dushime , Arlette	Communication assistant, ISABU
Havyarimana , Richard	Head of Advocacy and Communications, INADES Formation
Masabarakiza , Lucien	Advisor DPV, Bujumbura
Mudasumbwa , Julie	Technical advisor, Auxfin Burundi
Ndayihanzamaso , Privat	National POMS data manager, ISABU
Ndikumana , Nicodeme	MAPVET agrodealer, Bujumbura
Ndirayidige , Pascal	Plant Health Consultant, FAO Burundi
Ndishimiyimana , Emmerence	Plantwise Administrative assistant, ISABU
Ndoricimpa , Marie-Reine	Project Manager, INADES Formation
Nduwimana , Jean-Bosco	BPEAE Plant Doctor Supervisor, Bujumbura Rurale
Nibbering , Jan Willem	Food and Nutrition Security Advisor, Royal Netherlands Embassy
Niragira , Sanctus	Minister of Agriculture, Livestock and the Environment, Burundi.
Niyokwishimira , Alfred	Director, ISABU
Niyongere , Célestin	Plantwise Coordinator, ISABU
Niyomwungere , Désiré	Agricoach facilitator, Auxfin Burundi
Niyonzima , Eddy	Food and Nutrition Security Advisor, Royal Netherlands Embassy
Nkunzimana , Francois	Director, BECEPTFP Bujumbura
Ntirampeba , Léonidas	Independent Expert Consultant on Gender
Nzubahimana , Simon	Agrodealer, Rugombo, Cibitoke Province
Ochilo , Willis	Project Scientist and Plantwise regional coordinator, CABI Kenya
Sakayoya , Eliachim	Advisor DPV, Bujumbura
Simbashizubwoba , Cyriaque	Project Coordinator PSSD, IFDC Burundi
Toepfer , Stefan	Plant Health advisor, CABI Europe
Uwobikundiye , Edmond	BPEAE Plant Doctor Supervisor, Cibitoke
Vos , Janny	Partnerships Development Director, CABI Netherlands
Vyizigiro , Francois	Executive Secretary, FOPABU farmers organization

Field site visits				
Date	Province/Commune	Plant Doctors (KII)	Farmers (FGD)	CC participants (FGD)
8 September 2023	Muramvya/Bukeye	x	x	x
9 September 2023	Gitega/Makebuko	x	x	x
13 September 2023	Bujumbura/Mugongo-Manga	x	x	x
14-15 September 2023	Ngozi/Kirembe	x	x	x
18 September 2023	Cibitoke/Rugombo	x	x	x

Validation workshop participants: Members of the Plantwise National Steering Committee attended the validation workshop at ISABU on 12 September 2023.

Annex 2. References

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