Bridging the Gaps in Plant Health Advisory Services through Community-Based Plant Clinics: Lessons and Prospects

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Abstract

Increasing crop pests and diseases have become a global concern posing a serious threat to food security. Farmers are in dire need of timely, relevant and practical advisory services that can help them mitigate such challenges. There are apparent gaps and limitations in conventional extension services in delivering effective advisory service on plant health problems. Realizing such shortfalls, many have started advocating for a more responsive and demand-driven approach. Plant wise community-based plant clinics (CBPC) are one such innovative and complementary tool. Based on the results achieved in other countries, CBPCs were piloted in Ethiopia in 2013. Today, over 100 CBPCs operate and provide advice on plant health in Oromia, Tigray, Amhara and SNNP regions. The approach has demonstrated having notable potential to effectively and timely reach out to farmers with appropriate and practical advice on plant health problems. In Ethiopia unique opportunities and fertile ground prevail to effectively implement, scale up, institutionalize and sustain the initiative. These include presence of regional Plant Health Clinics, Farmer Training Centres, large number of frontline extension staff, decentralized structures, various agricultural development projects/programmes and pro-agriculture development policy. This paper presents experiences and lessons in implementing CBPCs in Ethiopia, the merits and contributions of the approach, prospects, challenges and future areas of focus.

Keywords: Plantwise, community-based plant clinic, Plant health advisory service, pests

Introduction

Plant pests (insects, diseases, weeds and vertebrates), adversely affecting the health of plants, are increasingly becoming a hurdle to efforts made to increase productivity in the agricultural sector. Increasing trade activities and movement of goods in this era of globalization, coupled with climate change, have aggravated the problem by accelerating the spread of plant pests. Ethiopia in this regard is no exception. Based on previous studies, Shiferaw *et al.* (2016) reported that in Ethiopia pre-and post-harvest

losses due to pests range between 30% and 50%. Likewise, Flood (2010) reported that globally an estimate of losses in annual crop production due to pests is about 30-40%. Addressing such challenges and enhancing productivity and food security among smallholders requires access to appropriate and effective advisory and other support services in a timely manner (Negussie *et al.* 2011). However, provision of advisory services for plant health problems has not been able to keep pace with the increasing pest problems. The successes of the popularly promoted integrated pest management projects were largely limited to dealing with individual pest problems (mainly insect pests of major crops), and their wider impact has been less impressive (Danielsen *et al.* 2011). Public extension services tend to heavily focus on promoting use of improved inputs and agronomic practices. There have been enormous limitations in the management of pests in Ethiopia largely due to the failure of the support service to respond to farmers' needs; provision of such services have only been carried out whenever there are large scale outbreak and commonly in the form of seasonal campaign works (MoANR 2016). In particular, there is an apparent lack of effective mechanisms to quickly identify and respond to newly emerging pest problems. National and regional diagnostic laboratories are not providing sufficient pest identification; some are non-existent and others are poorly equipped and inadequately staffed (MoANR 2016). Thus, farmers often rely on advices provided by agro-dealers in seeking solutions for pest problems. It was not uncommon to see farmers misusing pesticides, and applying them after the crops sustained significant damage (MoANR 2016). Such practices apparently have adverse economic, environmental and health impacts. The Plantwise community-based plant clinics offer a complementary approach to bridge the gaps in conventional extension services, helping to deliver effective plant health advice to farmers.

Plantwise is a global plant health initiative, led by CABI and implemented by national governments in 34 countries, including the Ministry of Agriculture and Natural Resources (MoANR) in Ethiopia. It aims to improve food security and the livelihoods of the rural poor by reducing crop losses. In addition, it has the potential to increase market access and farmer income by improving the quality and safety of their produce. Plantwise comprises of two main components: a network of village based Plant Clinics and the Knowledge Bank (KB). The former is a cornerstone of Plantwise and provides a facility where farmers can receive practical plant health advice. Community-based plant clinics (CBPCs) are run by field level extension staff, who work as Plant Doctors (PDs) in locations easily accessed and frequented by farmers. PDs and supporting experts receive several systematically designed, hands-on training courses that aim to build on their existing knowledge and experience. Farmers bring samples of 'sick' plants for diagnosis of the problem and often get on the spot advice on how to manage the problem. For problems that cannot be diagnosed immediately, PDs seek advice from local experts, while the most difficult problems can be sent to local diagnostic laboratories, research centres or to CABI's Plantwise Diagnostic Service in the UK.

During consultations at the clinic, data is recorded, including information on the farmer, crops presented, the diagnosis of the problem and the recommended

management advice. The captured data are then entered into a data-base, and provide valuable information to various plant health actors. The KB component (http://www.plantwise.org/KnowledgeBank/Home.aspx) is a comprehensive online resource that collates detailed, high-quality historical data and up-to-date plant health information from a wide range of sources (CABI 2014; Finegold *et al.* 2013/14). The KB also provides interactive diagnostic support and guidelines, mapping and analysis tools, pest news, as well as home page with country specific information. This paper presents experiences and lessons drawn from implementing CBPCs in Ethiopia, the merits and contributions of the approach, prospects and challenges, and recommends future areas of focus.

Methodology

The paper is largely based on information obtained from various reports related to Plantwise initiative (such as progress and annual reports) as well as on informal assessments through unstructured interviews/discussions held with key implementing partners, observations and experiences of the authors in implementing the initiative. The paper initially outlines the applications of this approach and then presents the results in terms of progresses made, lessons learnt and challenges encountered in implementing this innovative approach, as well as highlights future areas of focus. In addition, we analysed 1020 clinic query data from the Plantwise Online Data Management System (POMS) and demonstrated some of the key uses of clinic data.

Results and Discussion

Initiation and achievements of the Plantwise CBPCs in Ethiopia

Plantwise was introduced to Ethiopia in 2013 with the establishment of eight pilot CBPCs in four zones of Oromia region. The pilot focused on areas with serious pest problems, those with irrigation and year-round intensive farming activities. The initiative is nationally coordinated by the Plant Protection Directorate of MoANR, while its local implementation is vested on the Regional Bureaus of Agriculture and Natural Resources. CBPCs are run at farmer training centres (FTC), cooperative centre, local markets and other places frequented by farmers. Based on the encouraging results recorded during the first year, the initiative was expanded to Tigray and Amhara regions since 2014 and more recently to the SNNP region.

Currently, there are over 100 CBPCs operating in the four regions of Ethiopia (Table 1). Tigray region has attempted to scale out clinic operation by setting up an additional group of 50 CBPCs in different districts. Learning from this experience, Oromia has shown interest to expand clinic coverage in the region. In addition, some non-governmental agencies have expressed interest to support scaling-up of this initiative. Self Help Africa recently came on-board and launched ten new clinics in the SNNP region. An assessment shows that Ethiopia has completed the pilot phase and is in the consolidation phase in preparation for scaling up.

Table 1. Number and current distribution of CBPCs in Ethiopia

Region	Number of Zones	Number of districts	Number of plant clinics
Oromia	7	10	21
Amhara	5	7	17
Tigray	5	15	9 + 50*
SNNP	1	5	10
Total	18	37	107

*Tigray Regional Bureau of Agriculture and Rural Development launched 50 CBPCs using local resources

Assessments show that one of the areas where the initiative has performed well is in terms of capacity building of extension and crop protection personnel who have received various systematically designed and hands-on Plantwise training courses. In total, about 306 PDs and experts have been trained in nine rounds in Module 1: Field Diagnosis and How to Set-up and Run Plant Clinics and Module 2: Giving Safe and Practical Recommendations. Other training courses on production of Pest Management Decision Guides (PMDGs) and Fact Sheets[1], data management, and monitoring plant clinic performance also form an important part of this approach. National trainers were also recruited to take part in a Training of Trainers of Modules 1 and 2, which supports the country's effort in moving towards training PDs using its own experts to expand clinic operations. Clinic records show that so far over 10, 200 farmers visited the Plantwise initiated CBPCs[2] and received advice. According to the reports received from regional offices and PDs, over 47,000 farmers have been reached by PDs in various ways and received advice on plant health problems. Given the size of the country and the ever increasing demand for such services, there is still a need to further expand its coverage.

Assessment of opportunities, prospects and complementarity with existing services

Plantwise plant clinics are not an entirely stand-alone alternative extension approach. They serve as a complementary tool that runs in collaboration with existing extension services. The operation of plant clinics are based on existing capacities, organizational structures and social dynamics (Danielsen *et al.* 2011); by doing so they strengthen local capacity and service delivery systems. Experience gained in piloting the initiative and assessments of the national context reveal that there is fertile ground and unique opportunity in Ethiopia for fostering linkages and institutionalizing the initiative. These, among others, include the presence of a large number of frontline extension staff (to serve as PDs); availability of complementary structures such as FTCs, Regional Plant Health Clinics (PHCs), decentralized extension structures, large number of agricultural research centres and universities.

Linking CBPCs with FTCs and Regional PHCs has the potential to increase the effectiveness and sustainability of the approach. In fact most of the CBPCs are operated from FTCs by the development agents assigned to run these centres. Linkages with Regional PHCs can help CBPCs to receive technical, diagnostic and quality assurance supports from their experts as well as can serve as an interface between the later and higher level

[1] Whereby various reference materials such as 67 PMDGs and Fact Sheets (for use by PDs) were produced.

[2] This figure does not include those reached through the 50 additional plant clinics launched by Tigray region.

diagnostic facilities. CBPCs in turn can provide Regional PHCs with the opportunity to more regularly interact with the farming community. Information generated at the clinic can aid the later to plan surveillance activities as well as inform them on priority problems and farmers' needs. Oromia region has planned to scale out CBPCs in the mandated areas of the regional PHCs and to more formally link the two structures. However, for the Regional PHCs to effectively support the CBPCs, limitations in their institutional capacity (human resources, diagnostic facility and other logistics) need to be addressed.

Moreover, opportunities do exist to link CBPCs with agricultural research institutions and universities that provide diagnostic services, technical supports and capacity building for PDs. The information generated by CBPCs can also guide the research agenda of these institutions. Experiences documented in some other African countries show that plant clinics can be adopted and used as a practical training tool in higher learning institutions. According to Mur *et al* (2015), the School of Agricultural Sciences at Makerere University (Uganda) started seeing plant clinics as a means to support professional development of new and existing extension workers, as well as a way for the university to apply its technical expertise more widely through the connection with plant clinics. To this effect, different models have been developed for PDs training under the leadership of this university.

Another critical area of linkage is with agro-dealers, key actors in the plant health system, but who are sometimes blamed for giving incorrect/bad advices to farmers that can lead to the misuse of agro-chemicals. Experiences from other countries show that agro-dealers can improve their operations and contributions if they are effectively engaged and brought on-board. Danielsen *et al.* (2012) for example indicated that CABI/Plantwise had established a collaborative relationship with Uganda Agro-input Dealers Association to explore the possibilities of strengthening agro-input dealers' diagnostic and record keeping capacity, and --to reinforce the links between farmers, plant clinics and agro-input dealers. PDs are encouraged to closely interact with agro-dealers to help them supply the correct type of pesticides required by farmers at the right time. Such interaction and negotiation has started to bear fruits in some areas such as Raya Azebo district of Tigray region. According to Melese Mehari, PD of Wargiba village of Raya Azebo, being with large scale irrigation activities and year round intensive farming of high value horticultural crops, one of the key problems in the area was the heavy use and misuse of pesticides. These include: supply of counterfeit and unregistered products by some agro-dealers, re-packing and mixing of pesticides, exceeding the recommended application rates, lack of awareness and knowledge about the correct application time and pre-harvest intervals, spraying without personal protective equipment and lack of consideration for human health and the environment. Melese indicated that after launching the plant clinics, a number of actions have been taken to mitigate issues related to pesticide supply, handling and use. Discussions were held with agro-dealers and they were provided with the latest version of registered pesticides, reached consensus on modes of sale of pesticides and so forth. As a result, supply/sale of pesticides in the district at

present is taking place only based on the prescriptions provided by the PD. This helped them to supply registered pesticides of the correct type and quality with fair prices. In witnessing some of the recent changes in the area, Mr Hagos Bata, a clinic client farmer from Wargiba village, commented that "*after getting the advice of the PD, we are now aware of proper and safe use of pesticides, application time, frequency and PHI, as well as the critical importance of using proper PPE during spraying. We have started exercising safe practices, at least partly*". Mr Haile Hafitu, another clinic client farmer from Wargiba village, added that "*before the arrival of the plant clinics, we used to heavily rely on the best guess and suggestions of agro-dealers, some of whom often operate without integrity and sound business ethics. Now there is no conflict of interest; we get our problems diagnosed by the PD and then go to the agro-dealers with prescriptions. This has helped us to get the right type and amount of pesticide at the right time, and helped us to save both our money and our crops*".

There are also opportunities to link the initiative to existing agricultural development projects and regular programmes of the government. Assessments and observations show that there is a high level of commitment and interest at the ministry level and among some of the regions. As a result, CBPCs are now being considered as part of the regular crop protection activities of the ministry. Some regions/woredas also started integrating CBPCs into their regular work plans and reporting activities, although some still tend to show reluctance towards its full ownership.

Management and uses of clinic generated data

Plant Clinics data can be analyzed and used in numerous ways by different stakeholders – policy, extension, research, regulatory and agro-dealers (Finegold *et al.* 2013/14). For example, the data can be used by extension agencies to inform planning and to develop media messages, choose topics for extension materials, plant health rallies and to provide warnings on new pest incursions. It can also provide useful information for researchers that can inform their research agenda. Such data also plays an important role in informing policy makers (about new pest problems, pest outbreaks, farmers' priority needs, etc) and lobby for resource allocations. Clinic data is also an important tool in monitoring the quality of service and PDs performance and to identify knowledge gaps and training needs. Such data also provides agro-dealers with current information on major problems and demand on agro-inputs.

In order to be put into effective use, clinic data has to be properly managed and shared. The fundamental procedures and activities include: data capturing at plant clinics, data entry (digitisation), harmonization, validation, analysis and sharing. During the Data Management and National Stakeholders' Workshops, the following data flow process and responsibilities were agreed for clinic data management in Ethiopia (Figure 1). However, clinic data management, sharing and use are a major challenge in Ethiopia. Most of the information captured at CBPCs remained on paper forms due to time constraints in entering the data into the database hampering its use. Use of tablets has been recently introduced to some plant clinics to expedite clinic data entry, analysis and sharing. In countries

like Kenya data from all the districts running plant clinics were analyzed by the Ministry of Agriculture and used for various purposes. Experts and statisticians from universities, research institutions, pesticide regulating bodies and inspection agencies also played roles in the data analysis and quality assurance (Fingold *et al.*, 2013/14). The Kenyan experience reveals that it is also critical to demonstrate to stakeholders the benefits and various uses for the clinic data. Thus such practices of involving multi-stakeholders in the management and processing of data can be adopted in Ethiopia.

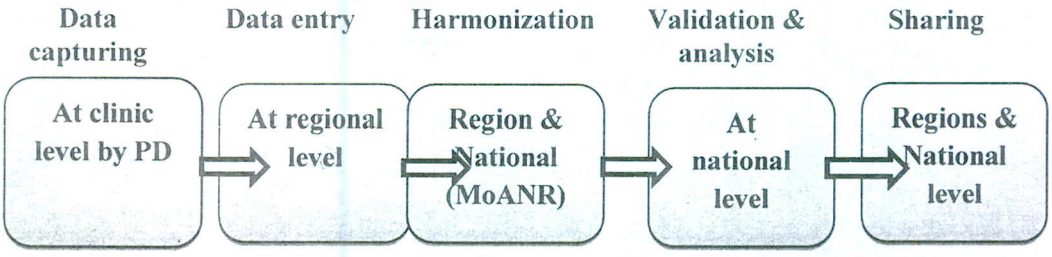

Figure 1: Clinic data flow process in Ethiopia

Analysis was performed on 1020 entries of clinic query data and general findings are presented below. It should be noted that the outputs are only a representative sample from a limited number of clinics at this stage.

Most common crops brought to the clinics by gender group

A diverse range of crops have been received at the CBPCs including cereals, vegetables and fruits. Figure 2, highlights the ten crops most commonly brought by farmers, accounting for nearly 90% of the total number of queries received. Maize is the most common crop brought closely followed by tomato then teff. The type of crops brought to the clinics is likely to be indicative of the farming systems and agro-ecology of the area where those particular clinics operate. In terms of its gender dimension, the overwhelming majority of the clinic visitors are male farmers. This underscores the need to find out why female farmers do not visit the clinics and to explore mechanisms that would enhance their participation in clinic services.

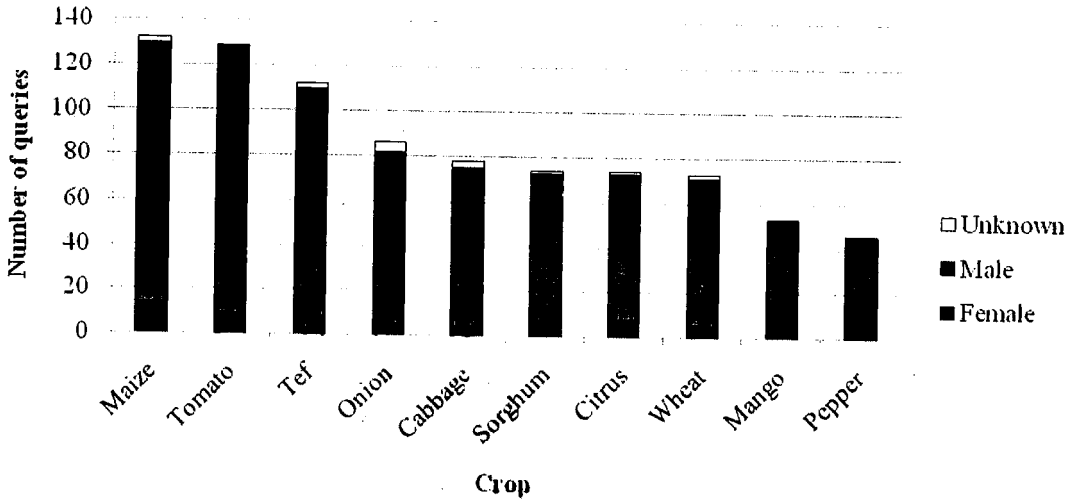

Figure 2. Top ten crops brought to the CBPC to date by gender (1020 queries)

Top plant health problems brought to plant clinics

Farmers brought different plant health problems to the clinics (Figure 3). These again differ by agro-ecology and farming systems of the areas, but generally followed the trends of the most common crops brought to the clinics. Analysis of the data shows that maize stalk borer was the most widely received problem followed by teff shoot fly, sorghum stalk borer and cabbage aphid. Analysis of a broader data set by region may provide a different priority list of plant health issues of the different regions, and could be a focus area for future analysis. This highlights the importance of and the critical need for transferring the data captured at CBPCs into an electronic format to improve its usefulness.

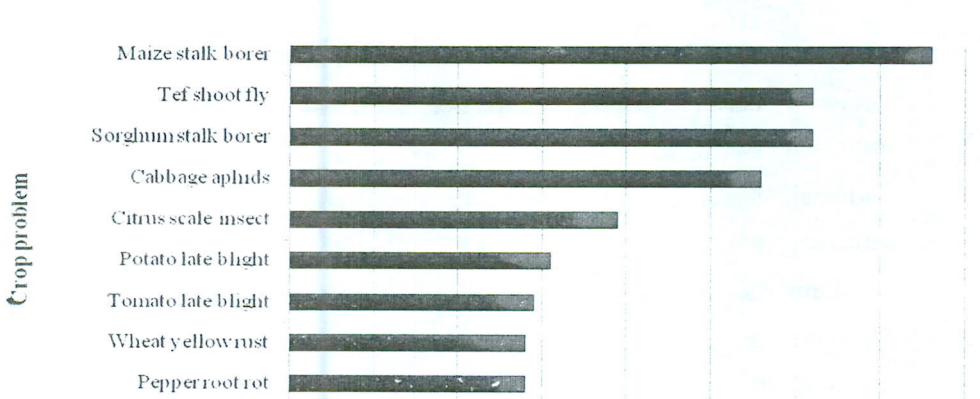

Figure 3: Top ten crop problems brought to the CBPCs

Causal agents of plant health problems at the CBPCs

The majority of plant health problems received at the CBPCs (Figure 4) are caused by insect pests (45%) followed by fungal diseases (35%). These two groups combined accounts for 80% of all the sampled pest problems brought to the CBPCs to date. Water moulds also seem to be a relatively common problem with the majority of instances attributed to late blight on tomato and Irish potato. Bacterial and viral diseases, mites and nematodes are the least common problems. This could be attributed to several reasons: their low prevalence in those parts of Ethiopia compared to insect pests and fungal diseases, farmers do not consider them as a critical problem and do not bring them to the clinics or they are more difficult to diagnose at the clinics. Nutrient deficiencies are the fifth most common causal group of plan health problem received by PDs. This has led to the provision of additional training and information to be provided to PDs for them to give better advice on such problems.

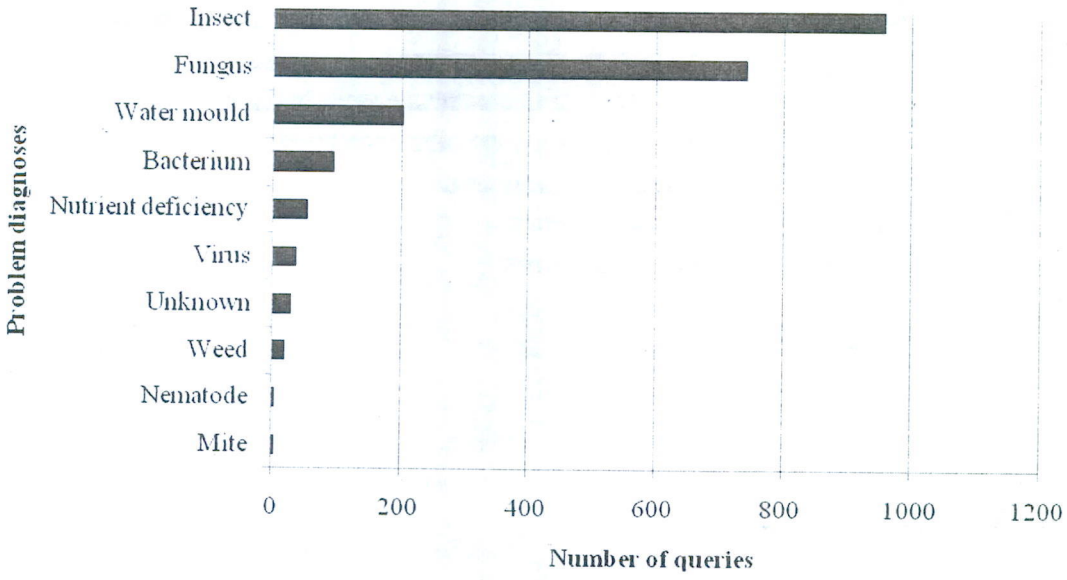

Figure 4: Diagnoses of plant health problems at the CBPCs

Types of recommendations given at the CBPCs

The CBPCs strive to promote the principles and practices of Integrated Pest Management (IPM). During the Plantwise trainings, the plant doctors are encouraged to consider a wide range of management strategies before giving recommendations. Plantwise advocates that recommendations should be effective, safe, economical, practical and locally available. Analysis (Figure 5) shows that the majority of the recommendations (36%) appear to be cultural practices, closely followed by insecticides and fungicides (34%). Feedback from PDs revealed that farmers often prefer chemical management option over cultural methods as these are often perceived as ineffective or labour intensive. This calls for the need to raise awareness with farmers on the consequences of over-reliance on chemicals as the first best option. Some PDs indicated that following the awareness creation provided through the clinics, use of various green options which are in line with IPM practices are on the rise. This has resulted in substantial reduction in the amounts of pesticides used in some of the areas such as Raya Azebo.

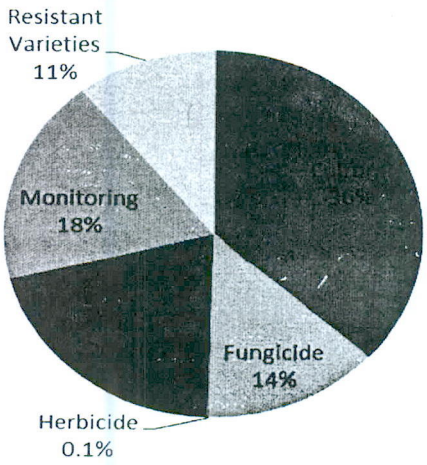

Figure 5: Most common type of pest management recommendations given at the CBPCs

Assessment of advantages of the Plantwise CBPCs approach in the Ethiopian context

Interviews and discussions held with different stakeholders and review of reports from the implementing regions have highlighted that the Plantwise initiative has demonstrated having several benefits. One of the key advantages is that it provides an opportunity to effectively reach out to farmers with appropriate advice on plant health problems. Extension staff, who work as plant doctors emphasized that the approach enhances their outreach, which would not have been possible through individual farm visits. Concurring with this view, Danielsen *et al* (2011) noted that PCs are simple and relatively cheap solution to the long standing outreach problem. Unlike other conventional extension approaches that push pre-packaged technologies to farmers (often using a blanket approach), CBPCs provide a demand-driven service that addresses farmers' priority problems. As Danielsen *et al* (2011) noted in plant clinics demand is defined by the queries farmers present and not by extension workers or researchers. It works through and builds on existing local structures and system which provides an opportunity to easily integrate into existing extension and crop protection services. Another prominent benefit of the approach in the views of PDs is that it has provided huge capacity building for extension/crop protection staff, which includes provision of systematically designed specialized training courses and access to relevant reference and diagnostic materials. Interviewed extension staff underlined that it has improved the attention given to and interest in crop protection at the community level. More importantly, the approach promotes safe, economical and practical recommendations as it is guided by IPM principles. By recommending IPM technologies plant clinics endeavour to reduce pesticide use (Danielsen *et al.* 2011). Provision of prescription-based advisory services minimizes the malpractices and risks associated with the use of pesticides. Implementation of this initiative also stimulates interaction and

linkages amongst key actors and creates synergies. However, observations and lessons so far gained reveal that there are evident gaps in terms of creating stronger linkages with such institutions as research, universities, Regional PHCs and agro-dealers.

The network of CBPCs has the potential to act as a community-based vigilance and early detection tool, helping to monitor plant pests. As an agricultural officer of Buikwe district in Uganda (Mur *et al.* 2015) noted extension workers are thin on the ground and can't be everywhere where they are needed. But when farmers come across something not familiar to them, they will bring it to the plant clinics. And that could be an opportunity for PDs to see whether this is a new disease which has come up, or it's an old disease that has resurfaced. The data generated by the networks of CBPCs can also help to obtain lists of plant health problems prevailing in specific areas. As highlighted above, CBPCs generate useful information which can be of great use to a variety of stakeholders in the plant health system.

What are the challenges?

Despite an increasing demand for services provided through this innovative approach, implementation of CBPCs in Ethiopia was not without its challenges. Whilst high commitment has been displayed at a national level, there is lack of adequate awareness and irregularity amongst regions and districts causing differences in the performance of clinics across districts. This is largely attributed to high turnover of officials at different levels, plant doctors and trained experts. At times performance of CBPCs tended to rely on the interest and commitment of individuals and nature of local leadership. This has limited its full institutionalization in terms of adopting and embedding CBPCs into government's regular activities and budget at all levels.

High extension staff workload due to other competing and overlapping seasonal agricultural activities often resulted in interruption of clinic operations. There is a tendency to prioritise attention to input supply, agronomic activities and other seasonal campaign works. Some PDs tend to view it as additional workload which is not properly recognized by their offices. Limited technical capacity among some of the PDs also adversely affects the quality of the clinic service. Low level of farmer attendance was observed at some plant clinics, which seems to be related to lack of adequate publicity and farmers' reluctance to visit experts when their crops get sick. Based on the experience in Uganda, Mur *et al* (2015) note that interruptions and lack of punctuality in clinic operations affect farmers' attendance and confidence in clinics. In addition, there are apparent gaps and limitations in data management and use. Entering the clinic data manually is time-consuming and there is shortage of manpower to complete this task on a timely basis, limiting its use.

Conclusion and Recommendations

This paper suggests that the Plantwise CBPCs offer an effective complementary approach that can bridge the gaps in the existing advisory services on plant health problems. Despite its limited coverage, it has proven to provide practical and timely advice to farmers. One of the advantages of this initiative is that it builds on and works through existing structures and

system. This can facilitate its integration into the regular programmes and services. Evidences suggest that there are great opportunities and fertile ground to institutionalize and sustain such an initiative in the Ethiopian context. However, there is a critical need to enhance awareness and secure better institutional commitment and buy-in at different levels. Incorporating plant clinics into the Plant Protection Directorate work plan and budget demonstrates commitment at the ministry level and is a positive move towards its institutionalization. However, the irregularities and gaps observed in its implementation at the local level need to be addressed.

Given the geographical size of the country, CBPCs are currently thinly spread in Ethiopia. It is thus imperative to devise mechanisms to scale up/out into other areas and increase its coverage. Effectively linking with existing structures and creating synergy with Regional PHCs, FTCs and other development programmes could ensure sustainability of the initiative. High turnover of PDs and trained experts is one of the formidable challenges. It is thus critical to closely engage regional/district officials and look into ways of minimizing ordinary transfer of trained PDs or how to cope with such challenges. Ensuring the quality of clinic service has to be a continuous process. Strengthening the support networks, backstopping and supervision by experts, quality assurance mechanisms and offering some targeted technical training should be given due attention in this regard. In order to effectively respond to emerging challenges and adapt to local context, some rooms for flexibility and adaptation should be allowed in running CBPCs, of course without compromising its basic features and quality of the service.

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