

Plantwise: an innovative approach to reduce crop losses by sharing plant health knowledge

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ABSTRACT: Strengthening plant health systems by building capacity to manage existing and emerging pests requires innovative approaches in agricultural advisory services. 'Plantwise', a global program led by CABI, delivers improved agricultural advice through networks of plant clinics supported by a knowledge bank (an open access gateway to online and offline plant health information). Plantwise is increasingly deploying ICT tools to ensure correct pest diagnoses and appropriate recommendations to farmers.

Together with partners, CABI is deploying SIM-equipped Android tablets to enable real-time capture of pest data and instant access to information that supports diagnosis and pest management advice. These tools enable 'plant doctors' to use the Factsheet Library app to access 10,000 factsheets on 4000 plants and 2500 pests. The tablets also allow 'plant doctors' to communicate via instant messaging services. At plant clinics, relevant data are logged online to enable CABI and partners to monitor the quality of recommendations, ensure that they are accurate and comply with best practice. Plant clinic data is instantly uploaded onto the Plantwise Online Management System where plant protection agencies can use it to track pest occurrences. Critical components of Plantwise include the use of ICT in training the 'plant doctors', the back-up from CABI's knowledge bases, the use of the evidence of impact of the interventions on crop losses as an indicator of potential to improve food security and farmer livelihoods, and the application of lessons learnt to improve the interventions. All of these are highly relevant to CABI's overall objectives that contribute to the UN's Sustainable Development Goals 2 and 17. This paper presents Plantwise as an innovation to reduce pre-harvest crop losses.

Keywords: ICT tools, knowledge bank, plant clinic, plant doctor, plant health systems

I am going to talk to you about a program called 'Plantwise', which is an innovative approach to reducing crop loss by sharing plant health knowledge. I work for CABI, based in Nairobi. CABI is best known to most people because of its publishing. Over time, however, CABI has had to evolve to remain relevant, and that is why we have gone into development work.

'Plantwise' is our response to the challenges of food loss and its negative impact on livelihoods. Information is important if these challenges are to be addressed, and the information provided needs to be relevant to all actors along whole value chains. Another justification for Plantwise is that it improves the capacity of small countries to deliver agricultural advice and thereby help in reducing crop losses.

This is an edited transcript of the presentation, with some of the powerpoint slides shown.



Figure 1. The three components of Plantwise.

Plantwise is implemented through government systems across three regions of the world – Africa, Asia, and Latin America and the Caribbean. Currently it has been piloted in 34 countries and is active in 32, meaning that the pilot phase did not succeed well in two.

Features and components

There are three components to Plantwise (Figure 1). First, the plant clinics. Plantwise operates through networks of plant clinics. A plant clinic is not a satellite lab; it is a simple structure in which extension officers, trained in visual diagnosis to become ‘plant doctors’, receive farmers who bring plant samples showing plant health problems. The plant doctors have support and relevant references to guide their work. Farmers can bring their problems to the clinic, where they are addressed, diagnosed and recommended solutions documented.

As an example, at a plant clinic the plant doctor talks with the farmer about the problem, and documents visual symptoms, the diagnosed problem and the recommendation given to solve the problem, in a prescription form. This can be paper-based or tablet computer-based.

The second component is the Plantwise Knowledge Bank, which is an online technical resource that the people serving the farmers can easily refer to for support. It provides them with fact sheets and pest-management decision guides, right on the spot. It helps them diagnose the cause of the plant health problem because they can use it as a readily accessible reference. Not all plant doctors will be able to diagnose all problems just from their own training; they often need to refer difficult or unfamiliar cases to other experts or laboratories. Here I am talking about diagnostics as opposed to identification. The latter regularly requires laboratory services.

An important feature of Plantwise is that the diagnosis is documented as part of data capture at the plant clinics; and the recommended solution for the problem is also documented. A farmer goes away with a prescription (Figure 2), and the information about the encounter remains with the plant doctor at the plant clinic and goes into the database for further validation and analyses for different uses.

The database, called Plantwise Knowledge Bank, supports the work of the plant doctors and also supports the diagnosis. The data collected from various farmers’ queries

Prescription form

- Paper version
- E-version
 - Use of tablets & SMS messaging
 - Link with other E-Systems in extension

Vision i.e. forward plan

- Scale up & sustainability
 - Country support & update
 - Justification: uses of pest data – surveillance, pest listing, pest reporting
 - Opportunity – EWS function of NPPOs

Figure 2. Data capture and use via the Plantwise prescription form

– about the farm, the crop, the pest, etcetera – is fed into the database within the Knowledge Bank, called Plantwise Online Management System (POMS), and is later validated and used to support the work of the plant doctors, besides informing decisions by stakeholders on management of plant health. Inbuilt in this is a monitoring and evaluation mechanism, because it is important always to use lessons learned to ensure there is continual improvement. This is the third component of Plantwise.

Monitoring and evaluation provide quality assurance used to give feedback to the plant doctors on their performance, and contribute to ensuring continual improvement of Plantwise activities.

Plant clinics are situated at locations easily accessed by farmers, their locations being determined by ease of accessibility but within rural locations. Plant clinics must be run on a regular basis: for instance, a particular location and a particular time at weekly, bi-weekly or monthly intervals.

Plant doctors are essentially extension officers trained in visual diagnosis and how to give good advice to farmers as pest management recommendations. The majority of them are government employees who have had basic training up to degree and diploma levels. Plantwise training gives them more focus on plant health, through short training on diagnosing common plant-health problems and their solutions. When farmers bring affected plants to the plant doctors, the latter should diagnose the problem and give satisfactory and practical advice. That advice is documented in a prescription form – an important feature. Those of you who are familiar with extension in developing countries will know that documentation and data capture are rare. Without data there is very little you can do to improve a situation or make informed decisions on plant health issues.

The Knowledge Bank is an information resource. It provides diagnostic support through factsheets and good recommendations, via what we call ‘pest management decision guides’ specific to crops and pests. These help the extension officers to give recommendations that are practical and do not promote any unwanted chemicals. Users of the Knowledge Bank include an array of people in the agricultural sector: extension services, farmers, plant health regulators, agricultural research organisations, academia, agro-input suppliers, and others. The Knowledge Bank is also a repository for plant clinic data, which is entered into the Plantwise Online Management System.

Plantwise e-version and benefits

Data capture using a paper form is one of the most unpopular tasks for plant doctors, so it is good that the e-version, using tablet computers, is working and moving forward. The e-version has contributed significant improvements in performance, and the information captured on tablets, including images, can be relayed very quickly – far away, such as from Kenya to Australia. Within a short time, you have a potential answer to the problem. This capability far outweighs what you can do with paper. As one plant doctor said: ‘It is not even comparable with the paper one ... wherever you go, this one is in the pocket’.

ICT tools therefore present an excellent opportunity to improve what can be done to manage plant health. Trials have been done in four countries – Kenya, Rwanda, Sri Lanka and India – and from those trials we have been able to make significant improvements in how data is collected and analysed, shared and used. Also, advice can be sent to a farmer as a short message using SMS, instead of being handed to them on paper. Training is required to enable that system to work, but once that is complete we find that the plant doctors themselves use the tablets to share a lot of information, and to support each other to improve how they work.

There are a number of ICT tools in Plantwise: for collecting, sharing and delivering agricultural data, and interlinking the range of actors in plant health. SIM-equipped Android tablet computers enable real-time capture of pest data, and instant access to diagnostic support and advice. The ICT tools also give plant doctors access to the Factsheet Library app, and let them communicate via SMS, and log relevant data online. This is important when there is a need to trigger prompt mitigation actions. The tablets are more efficient than working with paper, and they enable action to be triggered quickly whenever a new problem is detected. National Plant Protection Organizations (NPPOs) actually require that type of response.

In evaluations, 79% of farmers have reported improved production if they use the advice given from the plant clinics. That is 79% of farmers, not 79% reduction in crop loss. Also, 70% of farmers have reported better income after using the plant doctors’ advice.

An important final benefit is that Plantwise is combating a silent aspect of food loss. You may produce and place a visually very clean food on the market, but it is very heavily contaminated with pesticides and you eat it at your own peril. One of the things we have achieved by using integrated pest management via Plantwise is to minimise pesticide use (Figure 3).

Parameters	Pre-Plantwise: 2009 - 2012	Plantwise: 2013 - present
No. of pesticide sprays per crop	4-7x	2-3x
Total cost (in Baht) of insecticides per rai (6.25rai = 1ha) per season	฿650	฿350
Farmers using only pesticides (%)	80%	50%
Mean crop loss per crop per rai (%)	50%	10%
Income per crop per rai (Baht)	฿1,000	฿4,000

The results of a farmer survey conducted by the Thai national implementing partner undertaken in 2015 by plant doctors in 3 different regions. 6 plant doctors interviewed 90 farmers in total.

Figure 3. An important aspect of Plantwise is that it reduces reliance on pesticide sprays.



Figure 4. Acknowledgements.

Summary

In summary, Plantwise offers these opportunities: to take prompt action; to have instant access to pest-management information; to capture real-time data; and to link easily to other tools we have tried such as PestPoint and Plant Village. Through Plantwise there can be effective pest monitoring and active control to mitigate against loss.

Putting that to even better use is the next challenge we face, because most countries do not do that.

I want to finish by thanking the sponsors of Plantwise, as shown above (Figure 4).

Washington Otieno is the Plantwise Programme Executive at CABI. Prior to joining CABI, he was a consultant for phytosanitary capacity development at the International Plant Protection Convention (IPPC) (2011–2013), Agricultural Biotechnology Adviser with USAID-Kenya (2011), General Manager at Kenya Plant Health Inspectorate Service (KEPHIS) (2005–2010) and research scientist at the Tea Research Foundation of Kenya (1992–2005). At KEPHIS, he managed phytosanitary services and trade matters and was involved in sanitary and phytosanitary (SPS) capacity evaluation and development at national and regional levels. He represented Kenya at meetings of the WTO-SPS Committee and the IPPC between 2006 and 2010, and served as a developing country representative in working groups and policy committees of the STDF (2009–2011). Since March 2013, Washington has led coordination of Plantwise implementation in Africa. He holds Bachelor and Masters Degrees in Agriculture and Plant Pathology from the University of Nairobi, and a PhD from Wageningen University.