



Supporting Plantwise with digital technologies

Report on the piloting of e-plant clinics in Kenya
March 2014 – March 2015

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Executive summary

The use of tablets and SMS messaging is being piloted in Kenya as 'e-plant clinics' to test if and how these digital technologies support the current Plantwise model. Plant doctors working in e-plant clinics use tablets to fill an electronic version of the prescription form, send recommendations via SMS to farmers, and have access to a wealth of electronic plant health materials.

The Kenyan pilot has been conducted in three incremental stages of increasing size. To date 60 plant doctors from 30 clinics are now involved in the pilot and have collectively submitted 4,000 prescription forms over the last 12 months.

The initial findings suggest that there are substantial advantages to integrating tablets into plant clinics. Most notable are the improvements of data speed, quality and value, the wealth of resources available for decision making and the opportunities plant doctors have to support each other through chat groups.

Key findings

- Stakeholders receive the data far more quickly, allowing them to rapidly respond to threats.
- Plant doctors give higher quality recommendations, using updatable reference materials installed on their tablets.
- Chat groups enable plant doctors to ask each other for advice.
- Plant doctors collect more data on plant pests and diseases.
- More advice is given to farmers per clinic session.
- Plant doctors are coming up with innovative new uses for the tablets.
- Plant doctors use the tablets in all aspects of their extension work.
- Collaboration with government e-extension programme and participatory design approach has created strong local ownership.
- Tablets streamline the data collection and resource delivery process.
- E-plant clinics have the potential to be 21% cheaper than paper.

Pilot design

Learning from the pilot

A set of hypotheses was developed prior to the start of the pilot, and our monitoring and evaluation has used a variety of methods to assess the pilot results:

Surveys

- Plant doctor interviews during clinic visits
- Video interviews with plant doctors and farmers
- A log of e-mails, stories and communications

Review workshop

- Participatory review after 2 months and planning of further stages

Clinic data

- Statistical analysis of clinic data

Local ownership

- Plantwise worked closely with plant doctors and other stakeholders to develop and refine the tools.
- Plant doctors shaped the design of the data entry form to best support their workflows, defined which apps and information resources they wanted installed, and explored new ways of using the tablets in all areas of their extension work.
- Plant doctors are now integral to the training. The first cohort of plant doctors revised the training package during the review workshop, and some are now trained trainers.

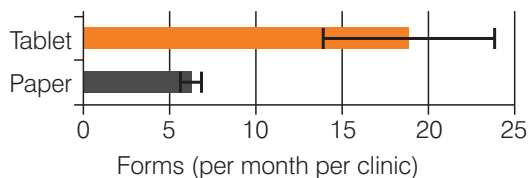


Beatrice Njeru (left) from Embu Market clinic was one of the first plant doctors to test tablets in her clinic

Results for farmers

More farmers are helped

- Clinics with tablets submit significantly more forms on average than clinics using paper forms which means more farmers are receiving advice.



Average number of forms submitted ($p < 0.01$)

Promoting clinics increases attendance

- Some plant doctors have been using SMS on the tablets to invite farmers to clinics. Plant doctors that sent invitations reported that an average of 4 more farmers came to the advertised clinic sessions.

Better advice to farmers

- Recommendations given to farmers via the tablets are, on average, 56 characters longer than recommendations given to farmers on paper forms ($p < 0.01$).
- These longer recommendations include a broader range of control options and more detailed instructions. This results in 16% more recommendations written on tablets ($p < 0.01$) achieving the highest quality score in validation.

Results for plant doctors

John's story – rapid uptake

John Mutisya, a plant doctor from Katoloni CBO clinic in Machakos, is an excellent example of the initiative and innovation of the plant doctors.

John very quickly mastered his tablet and has been integral in the design of the pilot. He is now a trainer and teaches other plant doctors how to use their tablets when they join the pilot.

John discovered that he could copy advice from the Plantwise Factsheets Library app and paste it into his recommendation for the farmer. This ensures that farmers get advice that is consistent with agreed best practice and saves time.



John Mutisya advising a farmer at his clinic in Machakos

At their request, he has taught this method to other plant doctors and it has now been integrated into the training materials. The ability to copy and paste recommendations without needing to switch between apps ranks highly on the list of new features requested by the plant doctors. John takes the tablet in his pocket wherever he goes and uses it at every opportunity to give plant health advice.

Mary's story – overcoming initial struggles

Mary Bunyasi is a plant doctor at Kiminini plant clinic in Western Kenya. The technology was very new to Mary and initially she struggled to pick it up. She was determined to learn how to use the tablet, however, and continued practicing. Through calls to the support phone and the visits we made to her early clinic sessions, she is now fully competent with her tablet and submitting as many forms as her peers. When we visited her later in the pilot we found Mary using her tablet as a tool to teach farmers about plant health problems. She had taken a series of photographs of various pests and diseases and was using them to show farmers how to recognise these problems and explaining how to manage them.



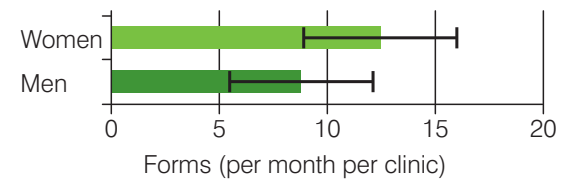
Mary Bunyasi advising a farmer

“Before I never used to share data and information, but now with the devices, if there is a new pest I can tell the others what is happening and even I can know what pests are in their areas too.”

Mary Bunyasi, Kiminini clinic

Enabling communication and knowledge sharing

- At the plant doctors' request, we installed an instant messaging app on the tablets. They use this to communicate with each other most days.
- They post photos of problems; ask each other for diagnostic support or treatment recommendations; forward resources on new or challenging problems; update each other on their activities.



Average number of electronic forms submitted ($P < 0.05$)

Female plant doctors are excelling

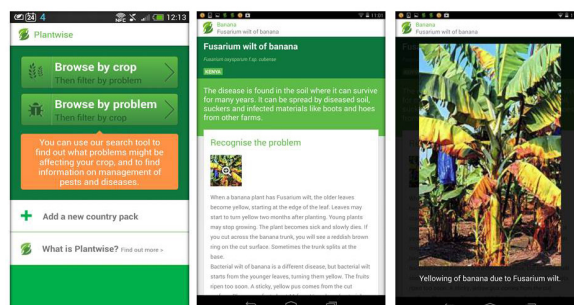
- Of the 60 plant doctors trained on the tablets 31 are male and 29 female.
- The female plant doctors have taken to the tablets exceptionally well and on average submit 4 more forms per month than their male counterparts.
- It was hypothesised that age and education may impact tablet uptake but no significant results have been found. However the group was not highly diverse - most plant doctors being between 50 and 60 and of a similar education level.

“It’s not even comparable with the paper ones... this one you go with it, wherever you go it’s in the pocket.”

Daniel Kamaru, Mbogoni clinic

Access to reference materials helps plant doctors give better advice

- The plant doctors are using their tablets to access a wealth of Plantwise and non-Plantwise resources such as the Plantwise Factsheets Library, the Plantwise Knowledge Bank, Infonet Biovision, e-books, internet searches and weather apps.
- Plant doctors also use a wider variety of reference sources wherever they need them. As one plant doctor states “everywhere the need arises” and “it goes with me everywhere in my pocket”.
- Automatic updates ensure that when plant doctors refer to Plantwise materials, like factsheets, they are looking at the latest version. If pesticide restriction or best practice changes, updates can be made immediately and distribution is no barrier.



Screenshots of the Plantwise Factsheets Library App

Results for government and other stakeholders

Supporting government priorities

- Using and promoting ICT tools is an important priority for the Kenyan government, which aims to be a “digital government.”
- This pilot has been run in close collaboration with the Ministry of Agriculture, Livestock and Fisheries (MoALF), and supports their e-extension initiatives.

“I am very happy that this innovation comes up and supplements what the government is doing in terms of ensuring that the quality of service that we are giving our farmers is the best. It will change the type of livelihood that the farmers have by increasing their productivity.”

James Wanjohi, Head of Extension Administration, MoALF

Improving data speed, accuracy and value

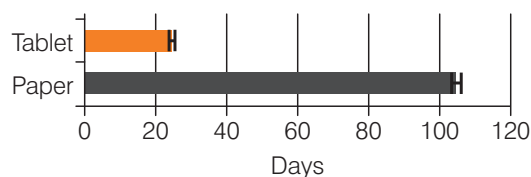
Data gathered at plant clinics can assist all stakeholders in the plant health system, from agro-input supply and extension to research and policy-making providing a wealth of information for evidence-based decision making.

Data is of better quality and requires less processing

- Data collection on tablets allows pick lists to be used instead of free text.
- As a result, data submitted is much cleaner and requires half the processing prior to analysis, contributing to improvements on how quickly it becomes available.

Data is available more quickly

- For the data to be most relevant and useful, it needs to be made available as soon as possible.
- Clinic data collected on tablets is transmitted in near-real time and requires far less processing, it is available to stakeholders via the Plantwise Online Management System (POMS) within an average of 24 days, a dramatic improvement on the current average of approximately 3 months.
- As we are starting to update the POMS more frequently this average will decrease further.



Average time from data collection to when data is available in POMS ($p < 0.01$)

Photos enrich the data

- The tablets allow plant doctors to submit a photo of the farmer's sample with the prescription forms.
- So far over 2,500 photos have been submitted.
- These photos assist data validators in quality checking the diagnoses the plant doctors have made.
- The photos also provide a source of images for use in future extension materials.



David Gitshuki using a tablet to advise farmers

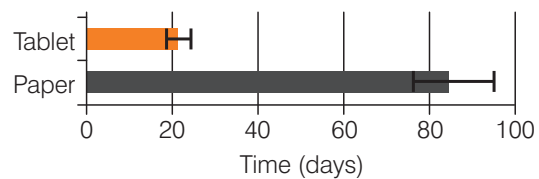
“It’s the matter of a tap of a button and you can relay the same information to the farmer straight away.”

Daniel Kamaru, Mbogoni clinic

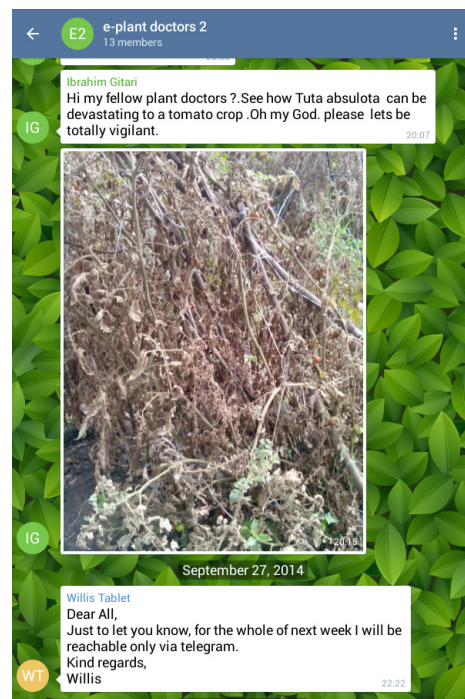
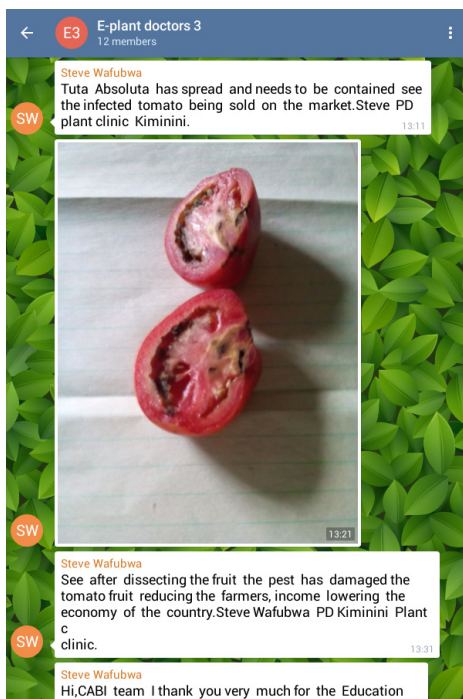
Case study - response to new pests

Tomato leaf miner (*Tuta absoluta*) is a new pest in Kenya that can decimate tomato crops and has major trade implications. For new pests like this, comprehensive monitoring and rapid communication are key to an effective government response. The tablets have helped in this battle against *Tuta absoluta* in a number of ways:

- Plant doctors used the chat groups to request management information and share photos and advice about the problem.
- Plant doctors can show farmers pictures of the devastation the pest is causing.
- As the government developed information materials on the pest, they were circulated quickly and easily to the plant doctors.
- Records of *Tuta absoluta* collected on tablets are available on the POMS with minimal delay, allowing the government to identify, monitor and respond to the threat more quickly.



Average time from collection of data on *Tuta absoluta* to when that data is available in POMS ($P < 0.001$)



Screenshots of the Telegram group chat app where plant doctors share photos and advice on *Tuta absoluta* and other plant health problems

“This has made us proud. When the farmers see us, they give us much respect because they know we are doing the right thing and have the right information.”

George Muembe, Kamukuywa clinic

Sustainability and next steps

Value for money

- E-plant clinics currently cost 35% more than paper clinics. E-plant clinics will, however, be 21% cheaper than paper when the current commercial data collection app, which is subscription based, is replaced with the newly built in house data collection app, currently under development.
- Savings result from eliminating print and transport costs and reductions in staff data processing times.
- Introducing tablets streamlines the Plantwise model in the following key ways: removing manual data transfer and data entry; reducing manual harmonisation and facilitating information distribution.

	Paper	Tablets	
		Current commercial data collection app	Future in-house data collection app
Start up	£0	£1,076	1,076
Running	£2,766	£3,168	1,104
Total	£2,766	£4,244	£2,180

Annual costs estimated for 10 clinics assuming a tablet lasts for 3 years

Clinics in India

- Working with the MS Swaminathan Research Foundation (MSSRF) in 6 clinics in Tamil Nadu, we are testing whether the tablets will have similar benefits in the Indian context.
- We are working with the coordinators and plant doctors to user test and refine the tools prior to beginning a pilot. Everything from the apps to the SMS that farmers receive will be in the Tamil language.

Challenges and lessons learned

- For many of the plant doctors using tablets is a completely new skill and some struggled initially. Giving the plant doctors the space to explore the tablets together without the supervision of trainers is key, though we expect that this may vary in different cultural contexts. It is important to train all of the plant doctors from any given clinic, as they work together very closely and help each other learn. Despite this, however, 5 out of the 60 plant doctors still struggle and have submitted fewer than 10 forms.
- For this initial stage, we've used a commercial data collection app as a low-investment way of testing the tablet concept. While it has served that purpose, it is missing key functionality the plant doctors need (e.g. ability to handle farmers with multiple problems, or to send the recommendation SMS without switching apps), and its pay-per-user subscription model will prevent us from using this app as and when we increase the scale of tablet use in Plantwise.
- Our monitoring and close contact with the plant doctors have yielded important insights into what plant doctors are using the tablets for, but we will need further qualitative work to understand how and why, and how this might vary in different contexts.

Next steps

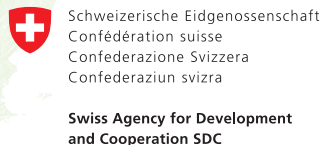
- Initial results are generating enthusiasm and strong demand from plant doctors and coordinators across Plantwise. It will be important during this pilot stage to manage expectations.
- In 2015, we will be undertaking a carefully managed expansion. The pilot in Kenya will continue, incorporating more plant clinics, and full pilots will begin in India, Rwanda and Sri Lanka. Expansion in Kenya has been supplemented through additional third party funding.
- We are in discussion with some additional countries which have expressed an interest in joining the pilot using their own (non-Plantwise) funds.
- The focus in 2015 remains on learning how tablets are used in different contexts and the effect this has on plant clinic operations.
- Investigation is underway into building a custom app which will better meet the plant doctors' user requirements and allow us to improve the long term cost effectiveness of e-plant clinics.

Plantwise is a global programme, led by CABI, working to increase food security and improve rural livelihoods by reducing crop losses

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