

ICT4BXW

Citizen science and ICT for advancing the prevention and control of Banana Xanthomonas Wilt

NEWSLETTER #2 JANUARY 2019

Controlling BXW in Rwanda *A new approach*

The ICT4BXW project uses digital information and communication technologies to enhance the fight against one of the most serious banana diseases in Rwanda: Xanthomonas Wilt of banana, better known as BXW. An effective management approach has been available for a number of years, yet BXW continues to be the scourge of banana farmers across the country. Why?

BXW is a bacterial disease commonly spread from plantation to plantation by insects and infected cutting tools. When nothing is done, up to 100% of banana production can be lost (Figure 1). Complete mat uprooting (CMU) is generally practiced in Rwanda to manage BXW outbreaks. It is based on the premise of complete disease eradication, meaning no BXW should be present after CMU is practiced. Unfortunately, CMU is highly labour-

intensive and results in a loss of banana productivity for up to 2 years (i.e. time required for re-establishment). There are no compelling incentives for farmers to voluntarily practice this method because their livelihoods depend on the banana stands, and the associated wait time for recovery after CMU is unaffordable for many banana farmers. However, CMU can be enforced by collective action at community level such as during umuganda community work or 'Army Week' interventions.

Since first appearing in Rwanda in 2005, there have been frequent recurrent outbreaks of BXW in all banana producing regions. In some of these places, the disease has been 'eradicated', only to return at a later point in time. This experience, along with an understanding of the long-distance, trans-frontier vectors of BXW (birds, bats and insects), has led to the understanding that the eradication of BXW at national level is complicated and requires permanent and consistently coordinated efforts. This suggests that the current practice of mobilizing collective action in Rwanda to practice CMU for BXW control, at significant public cost, may be unsustainable,



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Combatting Banana Disease Through
Digital Innovation



Figure 1. BXW causes the banana fruit to rot and become inedible.

and indicates that farmers should be empowered to voluntarily control BXW by adopting proven alternative cost-effective approaches.

Empowering banana farmers in Rwanda

Single-Diseased Stem Removal (SDSR) was developed in 2013 as an alternative to CMU. SDSR practice is aligned to the reality of smallholder farmers where banana growing is mainly geared toward subsistence and where the allocation of labour to other crops or activities is high. SDSR is a BXW management practice that involves cutting a plant that shows BXW symptoms at soil level, sterilizing cutting tools by heating in fire or by disinfecting with household bleach, and removal of early male bud by using a forked stick (Figure 2). Infected mats of banana plants can recover under the combined effects of 'incomplete systemicity' (not all banana suckers become symptomatic) and latent infections (bacterial density low enough not to cause any symptoms). By initially cutting down all symptomatic stems regularly, BXW incidence drops rapidly. A residual plant incidence of around 2% is achievable within 3 months, regardless of initial plant disease incidence. Longer term studies from farmer groups in Burundi and in DR Congo showed average residual disease of only 0.4% and 0.7% after 1 year (Figure 3)

Establishing SDSR demonstration sites in Rwanda

The ICT4BXW project expects great benefits for Rwandan farmers and public agricultural administration if SDSR becomes an accepted option for the management of BXW.

Four on-farm demonstration sites located in different agroecologies across Rwanda were recently commissioned and will be monitored for a period of 12 months. Each site comprises three interventions – one using SDSR, one using CMU, and one where BXW will not be controlled at all. The objective of these sites is to collect create support amongst farmers and Government officials for SDSR technology by visually demonstrating the effectiveness of the approach. The project will also collect empirical data for technical analysis.

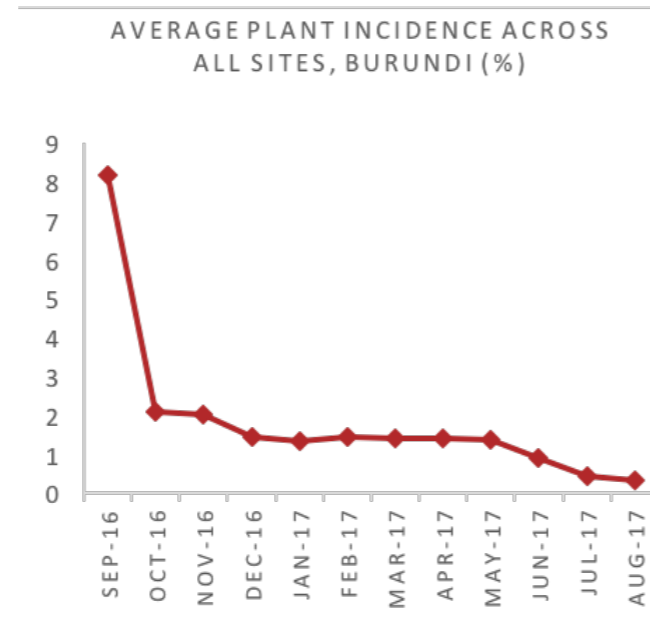
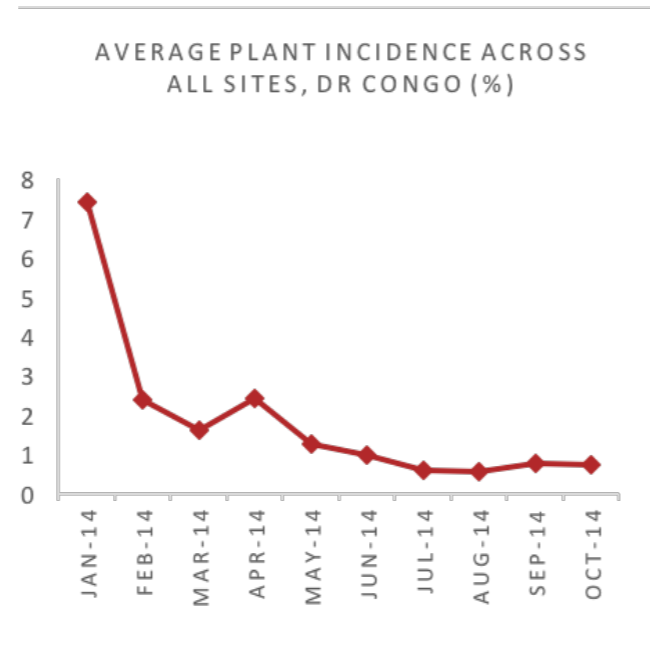


Figure 3. Average BXW reductions amongst farmers participating in facilitated farmer learning groups in DR Congo (left) and Burundi (right).

WHAT TO DO IF PLANTS ARE SICK

AFTER CUTTING, ALWAYS KILL THE PLANT BY REMOVING THE MERISTEM. DO THIS BY DIGGING A HOLE WITH THE MACHETE IN THE MIDDLE PORTION OF THE STUMP.

BECAUSE BANANA WILT DOESN'T SPREAD TO ALL PLANTS IN A BANANA MAT, CUT DOWN ONLY THE PLANTS THAT SHOW SYMPTOMS. CUT DOWN AT GROUND LEVEL. BE CAREFUL NOT TO CONTAMINATE THE SURROUNDING HEALTHY PLANTS WITH THE MACHETE. REMOVE THE MERISTEM, THEN COVER THE EXPOSED STUMP WITH SOIL. LEAVE THE CUT STEM INTACT. CUT STEMS CAN ALSO BE ADDED TO A COMPOSTING HEAP.

1 YOU CAN AVOID DAMAGE TO BEANS FROM FALLING PLANTS BY CUTTING IN TWO OR MORE STAGES.

2

STOP INFECTIONS FROM SPREADING

AFTER CUTTING DOWN ALL SICK PLANTS, DISINFECT THE MACHETE IN FIRE.

DO NOT REMOVE ANY LEAVES OR HEALTHY SUCKERS FOR 4 MONTHS.

DO NOT LET GOATS, SHEEP OR COWS BROWSE AMONGST THE BANANAS.

HOW TO PREVENT BANANA WILT

REMEMBER TO INSPECT YOUR BANANA PLANTS WEEKLY FOR BANANA WILT SYMPTOMS! CUT DOWN ALL VISIBLY DISEASED PLANTS, INCLUDING DISEASED SUCKERS.

IMMEDIATELY AFTER THE LAST HAND OF BANANAS HAS FORMED, BREAK OFF THE FLOWER USING A FORKED STICK.

Figure 2. An image from an information factsheet for farmers showing how to apply SDSR to control BXW.





Figure 4. Group deliberations during the PITD workshop in Kigali, November 2018.



Co-development of surveillance tool

In the last quarter of 2018, we planned and implemented a Rapid Appraisal of Agricultural Innovation System (RAAIS) workshop and the first Participatory and Inclusive Technology Design (PITD) session for the co-development of BXW surveillance and control tool. The RAAIS workshop was convened in Kigali on the 13th of November, 2018, with participation of stakeholders from Government, NGO's, research institutions, farmers, and the private sector. It was considered as 'ultra-rapid' or 'u-RAAIS' because the conventional RAAIS process was distilled and successfully implemented within a half-day, instead of 2 days. The outcomes of the u-RAAIS exercise provided the desired entry point for the PITD, which was held on 14th and 15th December (Figure 4). The PITD process was facilitated by the ICT Developer, Mangotree (Kampala, Uganda), whose Team has garnered 20-years' experience in co-developing and deploying ICT-based tools with users. Fifteen (15) Farmer Promoters (FPs) were enlisted in the initial co-creation process (including the mapping of farmers' persona and sketching of the users' journey, Figure 5). This first PITD provided the required elements for prototyping (the key structure and initial content) of the BXW tool and platform. The next PITD is tentatively scheduled for Feb. 6th – 7th, 2019 and it will be focused on testing the mock-up version of the tool with the FPs.

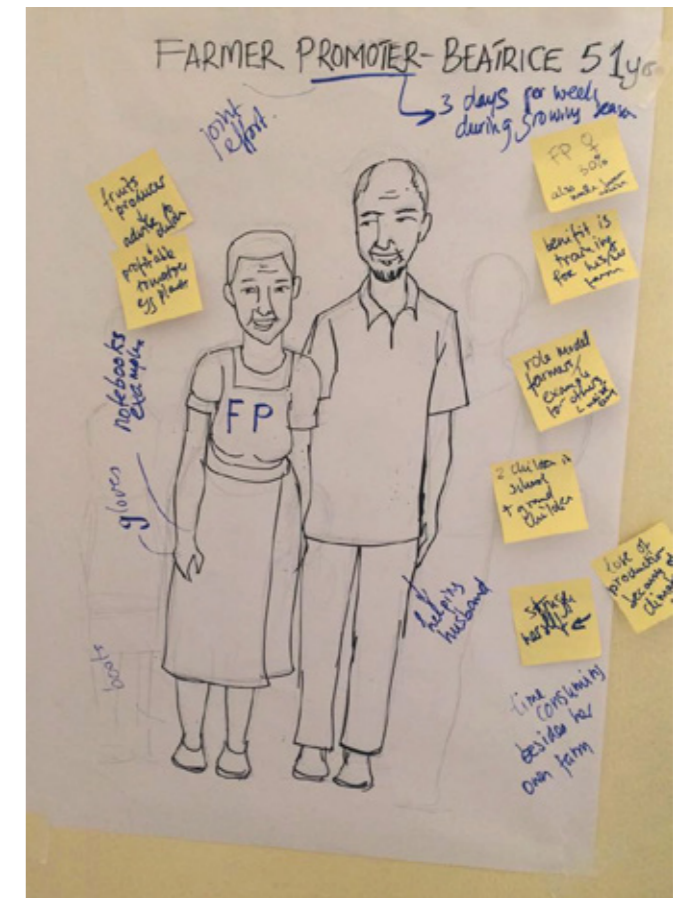


Figure 5. Mapping farmers' personas was used during the PITD workshop to better understand the audiences to be targeted by ICT4BXW. The characters used in this drawing are fictitious and only sketched for illustration purposes.



Creating digital communication contents

Effective communication is hinged on clarity and context-richness of the messaging content. Since ICT4BXW s focused on promoting methods for control and surveillance of BXW in Rwanda, we commenced a pilot videography to generate context-rich content that can be used for training, illustration, and engagement of tool users and stakeholders. To date, several video clips have been created and they are currently being processed by German Development Cooperation (BMZ) into a short documentary that highlights the potential impact of the proposed tool and control methods under the auspices of the project. A final documentary that captures the entire co-creation, testing, and validation stages with Farmer Promoters is expected to be released by the end of 2019.

Our Team of Experts

The ICT4BXW project is being implemented through collaboration of many experts and institutions and we showcase some of the researchers in each edition of our newsletter. In this edition, we present Dr Svetlana Gaidashova (Head of National Banana Programme, RAB) and Dr. Zhanli 'Jerry' Sun (Senior Researcher, IAMO).

Dr. Svetlana Gaidashova



Svetlana Gaidashova is the RAB focal point for the ICT4BXW project. RAB is a key partner in the project baseline survey, GIS field diagnostic activities, coordination of the SDR demonstration sites, and liaison with Government

policy actors. Svetlana is also engaged in participatory gender research throughout the project to ensure the ICT application and its feedback system will be gender-sensitive with regard to decision-making on BXW control. Svetlana has a strong research background in crop variety selection and banana pests and diseases. She holds a PhD in Crop Science from the Catholic University of Louvain-la-Neuve, Belgium, and a MSc and BSc in Biological Sciences from the Moscow Lomonosov State University, Russia. She has subsequently published well over 25 research papers, many as first author.

Svetlana's email: svetlana.gaidashova@rab.gov.rw

Dr. Zhanli 'Jerry' Sun



Zhanli 'Jerry' Sun a senior researcher at Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Germany. He received PhD in Cartography and GIS from the Chinese Academy of Sciences

in 1999. His research focuses on human-environmental systems (mainly land systems) with complex system theories and concepts (resilience, regime shifts, tipping points) and various analytical as well as simulation models such as cellular automata, agent-based models, system dynamics, spatial econometrics, and Bayesian networks. He uses a multidisciplinary approach in examining land system changes and land users' decision making by combining qualitative and quantitative methods. He published over 50 academic publications (with over 2000 citations) in renowned journals including *Nature*, *Global Environmental Change*, *Land Use Policy*, *Environmental Modelling & Software*, *Earth's Future*. Under the ICT4BXW project, he co-supervises Michel Kabirigi and provides support for GIS and spatial analysis work.

Jerry's email: sun@iamo.de

ICT4BXW Timeline for the coming months

For the coming months the most important activities under the ICT4BXW project.

JANUARY 2019

- Establishment of SDR demonstration sites in four sites across Rwanda
- Showcasing of ICT4BXW Project at the International Green Week in Germany (Largest Agricultural Festival in the world)

FEBRUARY 2019

- Second iteration of PITD development
- Technical reporting project activities for 2018

MARCH 2019

- Refinement of user interface of surveillance tool based on PITD outcomes

APRIL 2019

- Initial drafting of scientific publications focused on BXW status and lessons from baseline survey



ICT4BXW Essentials

Timeline

2018-2020

Country

Rwanda

Lead organisations

International Institute of Tropical Agriculture (IITA - overall lead)
Bioversity International
Leibniz Institute of Agricultural Development in Transition Economies (IAMO)

Main partner in Rwanda

Rwanda Agricultural and Animal Resources Development Board (RAB)

Implemented under

CGIAR Research Program on Roots Tubers and Bananas (RTB)
www.rtb.cgiar.org

Total Budget

€ 1,200,000

Donor

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