



**An Innovation Platform Approach for Up-scaling Banana Xanthomonas Wilt
(*Xanthomonas campestris* p.v. *musacearum*) Control Technologies in Western Kenya**

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Abstract

The Innovation Platform (InP) has become an attractive approach for supporting agricultural development. An InP is generally established to foster interaction amongst a wide range of stakeholders including producers, researchers, development practitioners and policy-makers, around a shared interest. The stakeholders interact to jointly identify problems and opportunities, seek and apply solutions and learn to stimulate continuous innovation. However, establishment and management are complicated given the multiplicity of actors with diverse objectives and expectations. This article describes how an InP in western Kenya contributed to increased control of banana Xanthomonas wilt (BXW). Several demonstrations were set up to show farmers how the control technologies worked. After couple of months, they told their neighbours about it and this helped in the scaling up of the programme. To enhance access to knowledge and information on BXW control best practices and technologies, additional InPs were formed and used to reach over 6,000 banana farmers.

Introduction

In Kenya, banana is a major fruit crop grown by both subsistence and commercial farmers on more than 77,000 hectares with an estimated annual production of more than one million tonnes, valued at US\$139 million (Kenyan MoA report, 2007). Banana is an environmentally friendly perennial crop with a broad root and leaf network, which maintains the soil structure, protecting against erosion, and provides soil cover throughout the year. They are recommended for use on contours for soil conservation. However, the crop is threatened by BXW disease, caused by

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Xanthomonas campestris p.v. *musacearum*. The disease was first reported in East and Central Africa in 2001 and in Uganda and in western Kenya in 2006 (Mgenzi et al., 2006, Mbaka et al. 2009). The destruction of large areas of banana plantations left land susceptible to soil erosion.

Effective management requires knowledge of how the disease spreads. The BXW inoculum in the soil and plant debris remains viable for up to 3 months (Kubiriba et al., 2012). During this period, infection can be spread from the asymptomatic plant to other plants using pruning tools. Because of limited knowledge on spread mechanisms and control options, very few farmers applied the various control measures to eradicate BXW from their fields. Farmers who used clean cutting tools in the same field for at least 3 months and who removed all infected plants gradually reduced infection to zero. A combination of all these practices in Uganda effectively controlled BXW from below 5% to over 60% within 15 months. In addition, it was also important to introduce structures that would enforce farmers to apply these control techniques. InPs appear the appropriate tools/mechanisms/places to support agricultural development as they offer the forum for people to discuss common problems and exchange solutions, in this case BXW control technologies.

The success of the various combinations of control practices in Uganda formed the basis of this study in western Kenya using InP approach.

The following BXW control technologies and practices were offered: (1) removal of BXW-affected banana stems or banana mats as instructed; (2) disinfection of farm tools using fire or a (sodium hypochlorite) disinfectant 1:5 water ratio; (3) removal of male buds using a forked stick or hand; (4) use of clean planting material when establishing an orchard establishment; and, (5) rehabilitation of fields that were previously affected by BXW.

Box 1. Establishment phase

- Extension staff, farmers, community leaders and innovation platform members trained in BXW control
- Innovation platform members trained in partnership management and gender integration
- InP mobilised affected surrounding communities and villages for BXW control campaigns conducted monthly in each district by platform members
- Capacity building for TOTs in all the 6 BXW control innovation platforms in various important BXW control options i.e. symptoms, spread and control
- 6 TC hardening nurseries were established

The ways in which BXW technologies should be promoted were incorporated in the project's processes from the start and included: the use of InP, campaigns, market rallies, schools, meetings with local leaders, churches, agricultural shows, funerals and field days.

Box 2. Initiation Phase

- National banana stakeholders planning meeting
- Identification and establishment of platform teams at each of the six sub-counties
- Development of the data collection tool, training of the enumerators, data collection on status of BXW in the six sub-counties and data analysed
- Identified, validated TC hardening nursery sites at the six sub-counties.

Box 3. Management Phase

- Capacity building for the 6 hardening nursery operators on management of nurseries, quality seed production and handling, and business management, at TC lab in Nairobi
- Acquisition of starter 800 TC plantlets for the hardening nurseries in Emuhaya, Ugunja and Gem for easy access to control of BXW
- BXW control and management demonstration fields where established in each of the 6 sub-counties
- Establishment of by-laws and operationalization at the sub-county platform level, in Siaya and Emuhaya Counties for BXW control
- Training of farmers on various aspects of banana agronomic, pests and disease management and more on BXW management
- 3 farmer exchange visits conducted (within and between sub-counties)
- Monitoring of BXW management progress by the InP members

Six InPs were established in Gem, Ugunja, Ugenya, Emuhaya, Busia and Teso sub-counties. The Kenya Agricultural and Livestock Research Organisation (KALRO) had an effective collaboration with other partners including National Agricultural Research Organisation (NARO) of Uganda, and Rural Energy and Food Security Organisation (REFSO) non-governmental organisation (NGO) in Busia, Kenya. Farmer involvement in the implementation of this project was described as participatory and hands-on. Demonstration/mother gardens were prepared by farmers on their own farms by clearing, digging holes and contributing manure. Farmers who were affected by > 80% BXW cleared their farms and only replanted with clean suckers after ≥ 3 months. To ensure continuous supply of planting materials, nursery operators were linked to the tissue culture (TC) banana laboratories. Participating farmers identified BXW-affected farmers, planned monthly campaigns and got involved in training banana farmers on BXW management. Farmers with few mats affected with BXW removed the affected banana stems, disinfected farm tools using fire and Jik 1:5 water, and removed male buds.



Figure 1. Farm with >90% banana Xanthomonas wilt infection destroyed and used for training on the disease management.

To enhance availability of knowledge and information on BXW control best practices, and technologies, InPs were formed and used to disseminate BXW control technologies to over 6,000 banana farmers in the project area. With an InP guide booklet (Makini et al., 2013) and a curriculum that covered key aspects in the banana value chain, facilitators visited all these banana farmers. In monthly meetings the facilitators of the six InPs met to discuss and exchange experiences, for example, their campaigns on BXW management in which they visit affected farmers.



Figure 2. A training session on the banana Xanthamonas wilt disease management on one of the farms in Western Kenya.

The BXW management platform members are men and women who believe in the technologies they promote. They convince farmers to give the recommended control practices a try, allowing the capacity building of platform members to become immediately effective. Sometimes, facilitators met resistance because people wanted a quick fix, a chemical, for instance, to spray and cure the diseased crop. Over time, however, the BXW management platforms succeeded in building solid relationships with banana farmers and were therefore able to persuade farmers that the technologies worked. The adoption of BXW management technologies started slowly, but momentum increased as farmers saw the impact (Table 1). The one-year project achieved capacity building for > 7,000 stakeholders, 3 new partnerships, and establishment of 10 demonstration plots. Six functional hardening nurseries were established for ensuring that clean planting material was accessible by farmers and 5 policy options, laws and regulations that enhanced access and utilisation of BXW control technologies and innovations were analysed.

Table 1. Major milestones in Banana Xanthomonas Wilt management in Western Kenya

	Emuhaya	Gem	Ugunja	Ugenya	Busia	Teso
Number of BXW InP formed	1	1	1	1	1	1
Number of people reached with BXW management information	1500	4,000	2,500	2,000	5,000	2,000
Number of Hardening nurseries	1	2	5	1	1	1
Number of new banana farms established	2	3	8	2	3	4
% reduction in BXW	20	60	10	10	30	40
% increase in yield	10	30	10	10	15	20



Figure 3. A rehabilitated farm in Butula, that initially had >80% banana Xanthamonas wilt infection.

Farmer groups established the following by-laws for effective management of the disease:

1. Quarantine for banana planting materials from BXW-affected areas
2. Clearing and destruction of the abandoned/neglected fields of bananas which are ‘hosts of the disease’ – enforced by local administrator.
3. Seed inspection by the Kenya Plant Health Inspectorate Services (KEPHIS) and certification by the Horticulture Crops Development Agency (HCDA) of all mother gardens and hardening nurseries.
4. Removal of male buds at correct stage using forked stick must be done by all.
5. BXW control and management must be addressed in all chiefs’ barazas (public meetings) at least once a month.
6. Imposition of fines of 200 Kenya shillings per month on farmers refusing to remove BXW-affected banana plants.

Box 4. Sustainability Phase

- Three farmer exchange visits were conducted to learn from success stories of BXW control
- The 6 established demonstration plots were used for farmer training
- Distribute information material to stakeholders for use in training and management of BXW
- T-shirts made for InP members to use during campaigns
- Signposts made for nursery operators’ visibility

Conclusion

The adoption of BXW management technologies started slowly, but the uptake increased as more farmers observed the benefits. The InP approach, as an extension tool, is effective especially when the technologies are well packaged and they are considered relevant by the community involved. It is an appropriate approach to support agricultural development as it offers a forum for stakeholders to discuss common problems, identify and implement solutions collectively and evaluate the impact.

References

- Kenya Ministry of Agriculture (MOA). 2007. Annual Report 2007. Ministry of Agriculture, Nairobi, Kenya.
- Kubiriba, J., Bagamba, F., Rockfeller, E. and Tushemereirwe, W.K. 2012. The changing spread dynamics of banana Xanthomonas wilt (BXW) in Uganda. Uganda Journal of Agricultural Science 13, 53–60.

Makini, F.W., Kamau, G.M., Makelo, M.N., Adekunle, W., Mburathi, G.K., Misiko, M. et al. 2013. Operational guide for developing and managing local agricultural innovation platforms. Kenya Agricultural Research Institute, Nairobi, Kenya.

Mbaka, J.N., Nakato, V.G., Auma, J. and Odero, B. 2009. Status of banana Xanthomonas wilt in Western Kenya and factors enhancing its spread. African Crop Science Conference Proceedings, 9, 673–676.

Mgenzi , S.R.B, Muchunguzi, J., Mutagwaba, T., Mkondo, F., Mohamed, R. and Aritua, V. 2006. An out-break of banana bacteria wilt disease in Muleba district, Kagera region, Tanzania. AfricanCropsNet. <http://www.Africancrops.net/news/april06> [Accessed 19 August, 2015]

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