Rapid Responses to New Plant Diseases: the Use of Going Public to Monitor the Spread of *Xanthomonas* Wilt and Control Napier Grass Stunt in East Africa

E. Boa
Global Plant Clinic
CABI E-UK, Bakeham Lane
Egham, Surrey TW20 9TY
UK

Keywords: diagnostics, East Africa, Global Plant Clinic, going public, mass extension, plant health clinics

Abstract

Since 2002, the Global Plant Clinic (GPC), Surrey, UK, has strengthened plant health advisory services for smallholders through the initiation of plant health clinics. These started in Bolivia in 2003 and regular schemes now exist in ten countries in Latin America, Africa and Asia. The clinics aim to: improve diagnosis of plant health problems; provide regular and reliable advice on control; and strengthen community-based plant disease surveillance. In 2003 the GPC confirmed outbreaks of two new serious and spreading diseases: *Xanthomonas* wilt in banana (*Musa* spp.) in Uganda and Napier grass (*Pennisetum purpureum*) stunt in Kenya. However, plant health clinics were not established in Uganda until 2006 and only pilot clinics have been held in Kenya. Two one-week-long Going Public exercises, an extension method which helped give rise to plant clinics, were held to see if *Xanthomonas* wilt had reached the Southwest region of Uganda (2004) and to help farmers recognize and control Napier grass stunt in Kenya (2005). Over 1,500 people were reached by the two campaigns. Going Public was subsequently used in both countries to share and gather information on both diseases and promote good advice.

INTRODUCTION

The Global Plant Clinic (GPC), Surrey, UK, began as a diagnostic and advisory service in the 1980s, funded by the UK Overseas Development Administration, and providing free diagnoses and advice to scientists and researchers working in developing countries. The service was managed by scientists employed by the Commonwealth Agricultural Bureau (CABI), who also undertook project-based research on plant diseases. The Overseas Development Administration became the Department for International Development (DFID) in 1997. New priorities and policies were established which placed stronger emphasis on improvements to human welfare and livelihoods, part of a new consensus which gave rise to the Millennium Development Goals in 2000.

The response of the original diagnostic and advisory service was to place greater emphasis on working more consistently with organizations that served smallholders and who attempted to improve agriculture. Two new areas of work were identified: strengthening plant health advisory services and building plant health systems (Boa, 2009). The diagnostic and advisory service was replaced by the GPC which is still funded by DFID.

The early efforts of the GPC concentrated on identifying organizations to run plant health clinics and developing guidelines for operations. Clinics are run independently by organizations such as farmer groups, non-governmental organizations and extension services. The most effective clinic operators are organizations with close and regular links to farmers and with existing accountability for services rendered. Some scientific and academic institutes also run clinics, but their main role overall is in providing technical and scientific assistance. The GPC changed from being a UK-based diagnostic service to a broad alliance of plant health organizations (E. Boa, pers. commun.).

Clinics articulate grassroots demand for wider support in identifying new and unknown problems, and finding solutions for plant health problems. Clinics are the starting point for building public plant health systems and Nicaragua is the best example to date of how such systems can arise (Danielsen and Fernández, 2008). The first plant health clinics began in Bolivia (Boa, 2009), however, and provided stimulated other countries such as Nicaragua, Bangladesh and Uganda to start their own clinic schemes with GPC support. The Bolivia clinics established from 2004 onwards did not expand until 2009, when growing evidence of achievements and wider awareness of impacts (Bentley et al., 2009a, b) helped to convince more organizations to run clinics.

One of the purposes of this paper is to explain how the GPC responded to two serious plant diseases in East Africa originally diagnosed in the UK, and how these responses attempted to address the new imperatives of international development.

Diagnostic Services for Farmers

The original diagnostic service based in the UK still exists and is an important part of the GPC. Regular requests for assistance are received from countries, partly as a result of the wider engagement of the GPC with extension services and farmer organizations, and the expansion in number of clinics, but also because of a lack of diagnostic expertise in countries or the unavailability of tests for viruses and phytoplasmas, for example. Even the best-equipped laboratories have difficulty in maintaining stocks of molecular markers, reference material and chemicals needed for testing.

The International Plant Diagnostic Network, active in Central America, East and West Africa, is currently improving diagnostic capacity in national organizations and fostering better regional linkages (Miller et al., 2009). The need for close links between diagnostic laboratories and community-based plant clinics is self-evident yet these remain stubbornly weak in most parts of Africa. Strong demand from clinics (and hence farmers) provides the best possible evidence for securing financial support from governments for diagnostic laboratories. More support is needed to help diagnostic laboratories cope with the complete range of crops and types of plant health problems which concern farmers, as revealed through the regular operations of plant health clinics in Bolivia (Bentley et al., 2009a, b).

A well managed plant health system helps to ensure effective use of national diagnostic laboratories and hasten responses to new diseases. The Plant Healthcare and Diagnostic Network in Nicaragua (Danielsen and Fernández, 2008) aims to improve the support to the extensive network of clinics established since 2005 and to identify the need for international scientific assistance when additional expertise is needed.

There is still considerable scope for speedier community-based responses to new diseases, especially in East Africa, where coffee wilt disease (Rutherford, 2006) was one of a series of problems to have seriously affected livelihoods in the last two decades.

Going Public

In 2001 the GPC received banana samples from Uganda which were diagnosed as *Xanthomonas* wilt (Tushemereirwe et al., 2004). In 2003 samples of Napier grass (*Pennisetum purpureum*) in Kenya were sent which were diagnosed as a new phytoplasma disease, now known as Napier grass stunt (Jones et al., 2004).

The Uganda banana sample was the first of similar queries received in chronological sequence from the Democratic Republic of Congo, Rwanda, Tanzania, Kenya and Burundi. All were confirmed as *Xanthomonas* wilt by diagnosticians working for CABI and the Food and Environment Research Agency, both members of the GPC alliance. GPC staff worked closely with national staff to obtain suitable material for analysis. The Napier grass stunt phytoplasma was confirmed by Rothamsted Research, Hertfordshire, UK, part of the GPC alliance.

Xanthomonas wilt and Napier grass stunt were the first two major diseases that the newly named GPC encountered and were followed up directly in the countries where samples originated. A major frustration of the diagnostic and advisory service was: not

knowing how diagnostic results were used to help farmers affected by the disease in question. The development of the Going Public extension method in Bolivia (Bentley et al., 2003) provided the opportunity to link a diagnostic result with direct action.

Two one-week-long exercises were held in Uganda and Kenya, respectively, using the Going Public method for mass extension. Going Public had originally helped suggest plant health clinics in Bolivia in 2003 (Boa, 2009) and offered a rapid response mechanism to two serious diseases.

The *Xanthomonas* wilt Going Public campaign attempted to find out if the disease was present in the Southwest of Uganda (Fig. 1), though symptoms and control of the disease were also included. The Napier grass stunt campaign aimed to help farmers recognize symptoms, explain how the disease was transmitted and what could be done to control it. The Napier grass stunt campaign also reviewed the distribution of the disease in western Kenya (Fig. 2).

Plant clinics were not in operation in Uganda at the time of the *Xanthomonas* wilt Going Public campaign. The first pilot clinics were held in Kenya in Busia and Lubao (Fig. 2) at the same time as the Napier grass stunt Going Public campaign.

MATERIALS AND METHODS

***Xanthomonas* Wilt, Uganda**

The *Xanthomonas* wilt Going Public events were held in Southwestern Uganda (Fig. 1) at 17 sites in five districts (Table 1) and were held between 6–10 December, 2004. At this time, *Xanthomonas* wilt had not been reported from the Southwest of the country though there were fears that it was already present in the region. The Going Public events were for surveillance as well as having an advisory and teaching purpose.

The Going Public team consisted of O. Opolot from the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF), Kampala, Uganda, and P. Kelly and E. Boa from the GPC. MAAIF agricultural officers were co-opted on the day and after a short induction (observing one of the main team lead an event) the agricultural officers took over, giving short explanations of the disease and how to control it in the local language.

Each event had a similar format: locate a suitable place with enough people who might be interested in hearing more about *Xanthomonas* wilt; chose a vantage point where people could best see and hear the short talk of around five min; show photographs of the symptoms and compare them with Fusarium wilt (Fig. 3); and break out into small groups after the talk so that people could ask questions and other information could be imparted by the campaign team.

Each event lasted about 30 min, sometimes shorter if fewer people were present. The sites were chosen with the assistance of the co-opted agricultural officers, who were familiar with banana depots, trading places and markets. Sites between Kisoro and Bunagana, on the border between Uganda and the Democratic Republic of Congo attracted up to 130 people (Table 1), even though no banana trading occurred on the day of the visit.

A quick estimate was made of how many people attended each event (Table 1), excluding those who dropped in and out for a short time. The team did not ask questions about knowledge or awareness of *Xanthomonas* wilt before the event. Late in the week people were asked if they had heard radio broadcasts alerting farmers to this new threat. The team did not write down farmer questions.

Napier Grass Stunt, Kenya

The Napier grass stunt Going Public events were held in West Kenya (Fig. 2) at 13 sites in five districts (Table 2), and were held between 11–14 July, 2005. Napier grass stunt was already present throughout the region and the main purpose of the events was on advising farmers about the disease. The symptoms of Napier grass stunt are difficult to confirm visually in older plants and therefore photo sheets were used during the week to explain key symptoms (Fig. 4).

The Going Public team consisted of S. Ajanga and M. Mulaa from the Kenya Agricultural Research Institute (KARI), Nairobi, Kenya, and E. Boa and P. Jones from GPC. We did not co-opt local agricultural officers to hold the events since KARI staff were able to give the talks at the events and answer questions in the local language. The official driver, A. Shanzu, gave one of the talks after observing early events, and provided a clear description of the disease and how to control it.

The events followed a similar pattern to those for *Xanthomonas* wilt but with the major exception (and improvement) of recording farmer questions. This feedback helps to design better extension messages in the future as well as revealing misperceptions and gaps in knowledge which might affect adoption of control recommendations.

Although Napier grass is sold in towns and markets, the majority of fodder is grown for use on-farm. Banana depots are a natural meeting point for sellers and buyers; it was less obvious at first where to hold Going Public events for Napier grass stunt. Market places attracted the highest number of people (Table 2), but all locations attracted a sizeable audience with a majority interested in knowing more about Napier grass stunt.

Photo sheets were produced during the campaign to illustrate the key features of Napier grass stunt. The photo sheets were printed on good quality paper on a portable inkjet printer. People were eager to have copies. They were also eager to have printed information about Napier grass stunt and *Xanthomonas* wilt, but these were not available before the campaigns started and we hesitated to produce our own recommendations because a scientific consensus on control was still emerging.

RESULTS AND DISCUSSION

The Going Public method depends on effective team work. Both teams quickly learned how to assign individual roles and coordinate actions for each event, two essential actions if the method is to work in busy locations. Going Public depends on flexible responses and rapid adjustment to unknown circumstances. Each market place is different and crowds respond in different ways to the Going Public event. The Uganda team changed each day, with a new agricultural officer taking part, but all eventually coped with the unusual challenge of impromptu public speaking. A Going Public event is an exciting experience and team members were pleased to have the opportunity to listen and respond directly to farmers.

Going Public has been used regularly and successfully in Bangladesh to address particular plant health problems and complementing clinics organized by their agricultural advisory service (E. Boa, pers. commun.). However, it is also important to recognize that Going Public requires confidence in speaking in public, bravado in holding an event in an unfamiliar public place, and resilience in coping with unscripted questions and comments.

Those who took part in the campaigns later used or encouraged the use of Going Public in further campaigns to combat the two diseases. M. Mulaa of KARI used Going Public the following year to continue the Napier grass stunt campaign. Going Public was adopted by MAAIF in Uganda for the *Xanthomonas* wilt control program. Illustrated reports written after the campaigns were circulated widely to share results and advocate wider use of Going Public. However, Going Public has not, to my knowledge, been used for other plant diseases in Uganda or Kenya, suggesting that further action is needed to gain official approval and the small financial support necessary for travel costs. Going Public is not an expensive method.

The Uganda and Kenya campaigns both suggested improvements in how to hold events, notably in carefully documenting questions after the short talk has been given. Subsequently, Going Public has been used to create Public Plant Health Campaigns in Nicaragua.

The success of the campaigns in achieving their main aims (surveillance of *Xanthomonas* wilt and control of Napier grass stunt) are discussed in the following separate sections on each disease.

Xanthomonas Wilt

The agricultural officers in Uganda responded well to speaking and working with crowds. The main Going Public team learnt a lot about how the officers communicated with farmers, noting future needs for better knowledge and hence training, as well as under-estimated skills in responding to farmers' queries. The working practices of extensionists are often criticized for their poor effectiveness. The well-publicized failures of extension schemes (Davis, 2008) have encouraged a negative view of what extensionists are able to do. Yet first-hand experiences of extensionists' work are few; Richards (1984) is an honorable exception.

One of the unexpected benefits of the Going Public campaign on *Xanthomonas* wilt was that it helped show the main team how agriculturists respond to farmers. One officer was uneasy about standing up in a public place and talking. Once she had heard the talk on *Xanthomonas* wilt and had some of her own questions answered, she was then able to give the talk herself. She was reassured to learn that the unscripted questions after the event could be referred to other members of the Going Public team, and that it was also important to be honest about gaps in knowledge. Sometimes no advice is the best response.

Many farmers asked for a contact telephone number so that they could refer other questions direct to the agricultural officers later. Going Public events help to connect farmers to sources of support and advice. Some other observations include the following:

1. Control. Removing male buds was the most important procedure suggested to limit spread and each Going Public event encouraged its adoption. Better visual tools were needed to promote the use of a forked stick rather than knives. One forked stick collected at an event failed to break off the male bud. It was difficult to explain restrictions on moving infected suckers without publicity material. Merely showing the removal of the bud and talking about did not help the team understand who was going to adopt this method.

2. Surveillance. On three occasions we drove to nearby farms after the Going Public event, following up on potential new outbreaks of *Xanthomonas* wilt reported at the meeting: all examples were diagnosed as Fusarium wilt, a useful reminder of how symptoms are interpreted by farmers. One of the field visits close to the Rwanda border revealed the potential occurrence of banana bunchy top, though samples were negative when tested by the GPC. Talks with farmers did however reveal new information about movement of banana planting material into Uganda from the Democratic Republic of Congo. No examples of *Xanthomonas* wilt were identified in the one-week-long campaign.

3. Banana Trading Posts. Trading posts were good places to convey visual messages about *Xanthomonas* wilt. Publicity posters need to be protected from rain and fixed in place where they can be easily seen without being removed. One trading post had had posters removed (by someone keen to have their own copy) and the replacement was kept inside an office. The Going Public events worked well though many people who would otherwise have been interested in the talk were busy working.

4. Local Knowledge. A local name for *Xanthomonas* wilt was heard near Mbale during the first Going Public event held near Sironko in 2005 (Boa, 2005). Further studies of local names of other crops and their pests and diseases have been undertaken and published by the GPC (Bentley et al., 2009a, b). The Going Public events helped to raise awareness of banana management practices, though as previously noted these were not systematically noted at the time. The suggestion that male buds could be eaten was surprising to many people, a common practice in other countries, yet one person said they had done so and proceeded to explain how he had mixed the steamed bud with tomatoes. GPC events are full of such snippets which may well turn out to have a wider significance.

Napier Grass Stunt

The experiences with Going Public in Uganda helped to improve the design of

events in Kenya. Farmer questions and comments were systematically recorded and grouped into seven categories: cause of disease (symptoms, recognition); occurrence; control; replanting; sensitization (of farmers about the disease); other effects (e.g., does Napier grass stunt affect livestock who eat infected plants); and general.

A selection of farmer questions and comments are given in Tables 3 and 4, together with the answers given at the time. Recording comments allows other teams to prepare in advance for Going Public events and take publicity and other material to help explain answers. The Napier grass stunt and *Xanthomonas* wilt campaigns have helped to improve the Going Public method. The most important improvement is to collect baseline data before the event begins, and to return to communities later to find out how the information provided has been used and any benefits that have been gained.

More innovation is needed in extension and Going Public is one tool to consider. With regard to the GPC, Going Public was an excellent opportunity to take direct action. While the impact of the *Xanthomonas* wilt and Napier grass stunt on control of the diseases was small (as were the campaigns), the first-hand experience of working with agricultural officers and scientists in Uganda and Kenya helped to advance general ideas about how to combine an expert diagnostic service in the UK with practical attempts to improve livelihoods

ACKNOWLEDGEMENTS

The GPC is funded by the UK Department for International Development. The Xanthomonas wilt Going Public exercises were funded by CABI's Partnership Facility. In addition to the team members already mentioned in the text, the author thanks B. Byarugaba, J. Barigye, G. Kalikwisya, M. Sabiiti, J. Kasimasi, M. Betonde, T. Twomgyeimwe, J. Rwakare, and J. Tumushale of MAAIF in Uganda for their assistance with Going Public events.

Literature Cited

Bentley, J.W., Boa, E.R., Van Mele, P., Almanza, J., Vasques, D. and Eguino S. 2003. Going Public: A new extension method. Intl. J. of Agricultural Sustainability 1:108–123.

Bentley, J.W., Boa, E., Danielsen, S., Franco, P., Antezana, O., Villarroel, B., Rodríguez, H., Ferrrufino, J., Franco, J., Pereira, R., Herbas, J., Díaz, O., Lino, V., Villarroel, J., Almendras, F. and Colque, S. 2009a. Plant health clinics in Bolivia 2000–2009: operations and preliminary results. Food Security 1:371–386.

Bentley, J.W., Boa, E.R., Kelly, P., Harun-Ar-Rashid, M., Rahman, A.K.M., Kabeere, F. and Herbas, J. 2009b. Ethnopathology: local knowledge of plant health problems in Bangladesh, Uganda and Bolivia. Plant Pathology 58:773–781.

Boa, E.R. 2005. Going Public: extension in markets. Rural Development News 2:42–44.

Boa, E.R. 2009. How the Global Plant Clinic began. Outlooks on pest management 20:112–116.

Boa, E.R. 2010. Plant Healthcare for poor farmers around the world: gathering demand and innovative responses. In: N. Hardwick and M. Ludovica Gullino (eds.), Knowledge and Technology Transfer for Plant Pathology. In press. Springer, New York.

Danielsen, S. and Fernández, M. 2008. *Servicios Públicos de Salud de Plantas para Todos*. Clínica Global de Plantas, Managua.

Davis, K.E. 2008. Extension in Sub-Saharan Africa: overview and assessment of past and current models, and future prospects. J. of Intl. Agricultural and Extension Education 15:15–28.

Jones, P., Devonshire, B.J., Holman, T.J. and Ajanga, S. 2004. Napier grass stunt: a new disease associated with a 16SrXI Group phytoplasma in Kenya. Plant Pathology 53:519.

Miller, S.A., Beed, F.D. and Harmon, C.L. 2009. Plant disease diagnostic capabilities and networks. Annual Review of Phytopathology 47:15–38.

Richards, P. 1984. Indigenous Agricultural Revolution. Hutchinson, London.

Rutherford, M. 2006. Current knowledge of coffee wilt disease, a major constraint to coffee production in Africa. Phytopathology 96:663–666.

Tushemereirwe, W., Kangire, A., Ssekiwoko, F., Offord, L.C., Crozier, J., Boa, E., Rutherford, M. and Smith, J. 2004. First report of *Xanthomonas campestris* pv. *musacearum* on banana in Uganda. Plant Pathology 53:802.

Tables

Table 1. Location of 17 Going Public events *Xanthomonas* wilt in southwestern Uganda from 6–10 December 2004 and attended by 970 people.

Place[1]	District	Site	People
1. Ruti	Mbarara	Banana depot	100
2. Kisoro	Mbarara	Banana trading post	30
3. Kinoni	Mbarara	Banana trading post	30
4. Rutooma	Mbarara	Banana trading post	60
5. Bwizibwera	Mbarara	General market	20
6. Ruhama	Ntungamo	Outside shop	40
7. Mirami Hills (Rwanda border)	Ntungamo	Shopping area	40
8. Kasherere	Ntungamo	Banana market	60
9. Kabale market	Kabale	General market	60
10. Katuna (border crossing)	Kabale	General market	30
11. Kisoro market	Kisoro	General market	70
12. Natete	Kisoro	General market	70
13. Mubuga	Kisoro	Banana trading post	120
14. Bunagana	Kisoro	Outside shops	130
15. Kyambura SC Bunyaruguru	Bushenyi	Roadside	40
16. Kyambura SC Bunyaruguru	Bushenyi	Roadside	40
17. Kichwamba trading spot	Bushenyi	Banana depot area	30

[1]Place numbers refer to locations shown in Fig. 1.

Table 2. Location of 13 Going Public events on Napier grass (*Pennisetum purpureum*) stunt in western Kenya from 11–14 July 2005 attended by 795 people.

Place[1]	District	Site	People
1. Kiminini	Trans Nzoia	Dept of Agriculture	30
2. Luhna- Ndalu	Trans Nzoia	Road junction	45
3. Ndalu	Trans Nzoia	Market	80
4. Big Tree market	Trans Nzoia	Market	65
5. Wamuini	Trans Nzoia	Roadside	60
6. Shibale	Butere-Mumias	Crossroads	65
7. Harambe market	Butere-Mumia	Market	100
8. Kanduyi	Bungoma	Crossroads	50
9. Bukembe	Bungoma	Roadside	60
10. Emuhaya	Vihiga	Road junction by Bunyore Girls Secondary School	45
11. Luanda	Vihiga	Market	30
12. Busia market	Vihiga	Market	15
13. Lubao	Kakamega	Cattle market	150

[1]Place numbers refer to locations shown on Fig. 2.

Table 3. Selected questions and comments by farmers who attended Going Public events on Napier Grass (*Pennisetum purpureum*) stunt in Kenya: part 1.

Farmer question/comment	Replies and notes
Yellowing plants could be due to swamp near Napier grass and therefore water-logging.	If this were true, all the Napier would be yellow and not have patchy, stunted growth.
Is the disease airborne or soil borne?	No, though we believe the disease is transmitted by insects.
Where did the insect vector come from?	No information available.
Where did the disease come from before reaching Kenya?	Possibly introduced on sugarcane (*Saccharum* spp.), though still speculative.
We used to think the symptoms of the diseased plants were caused by male rodent damage.	Discussed rodent damage on other crops.
Such disease symptoms seem to appear on Napier grass which is not weeded or on old Napier grass.	Explained that symptoms were also found on young clumps.
When you look at Napier grass I am selling (in the roadside market), does it have any disease?	Made a field diagnosis and suggested it was healthy.
Is the yellowing not caused by nutrient deficiency?	Discussed symptoms and results of laboratory tests.
1. We have been observing such symptoms but didn't know it was a disease. 2. The disease seems to be increasing. What causes it?	Gave more information
I have seen such symptoms on maize, not on Napier grass.	Explained that the disease on Napier grass was unlikely to infect maize (*Zea mays*).
The plant is short because it has not been fertilized.	Discussed effects of nutrient deficiencies and distinct symptoms of Napier grass stunt.
What if I apply fertilizer to the diseased Napier grass? Will it not improve and later recover from the disease?	Possible that plants will improve, though the plants will not be cured.
What is the real name of the disease>	Napier grass stunt (no local name was detected at Going Public events)

Table 4. Selected questions and comments by farmers who attended Going Public events on Napier grass (*Pennisetum purpureum*) stunt in Kenya: part 2.

Farmer question/comment	Replies and notes
I heard over the radio about a method used to control witchweed (*Striga* spp.) and couch grass (*Cynodon dactylon*) using Napier grass and tick clover (*Desmodium* spp.). Can't the same method be used to control Napier grass stunting disease?	No.
Is there a cure for the disease?	No.
It is expensive and labor intensive to uproot the diseased Napier grass. Is there no insecticide to control the insects which transmit the disease?	No.
If the disease affects a large area, do you advise one to uproot the whole crop? Is uprooting the only remedy for the disease?	Explained that healthy Napier grass could be replanted in same spot.
How will uprooting prevent the insect from transmitting the disease?	Reduces the number of infected plants for insect feeding.
Up to now what have researchers done to prevent the spread of the disease?	Research is just starting.
Do you uproot all Napier grass once you observe disease?	No, only those with symptoms.
Can the uprooted and diseased Napier grass be disposed off in the same shamba[1]?	Yes.
What do you do about a mixture of diseased and healthy plants in the same hole? Do you uproot both?	No, but observe the healthy plants to see if they develop symptoms.
Is there any other control method apart from uprooting?	Uprooting is not a control measure; it only reduces sources of infection
If you uproot the diseased plant will it not have regrowth?	Not if you remove all the plant.
Where can we get clean planting material?	Various sources suggested.
Which cultivars are high yielding and tolerant to the disease?	Various suggestions for high yielding cultivars. There are no known tolerant cultivars at the moment.

[1]Food garden.

Figures

Fig. 1. Location of Going Public (GP) sites in Uganda for *Xanthomonas* wilt.

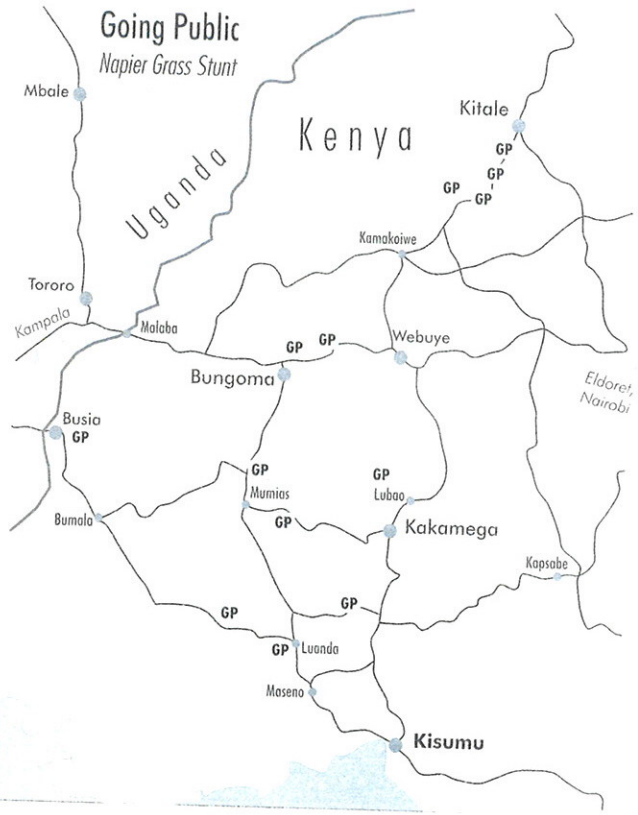

Fig. 2. Location of Going Public (GP) sites in Kenya for Napier grass (*Pennisetum purpureum*) stunt.

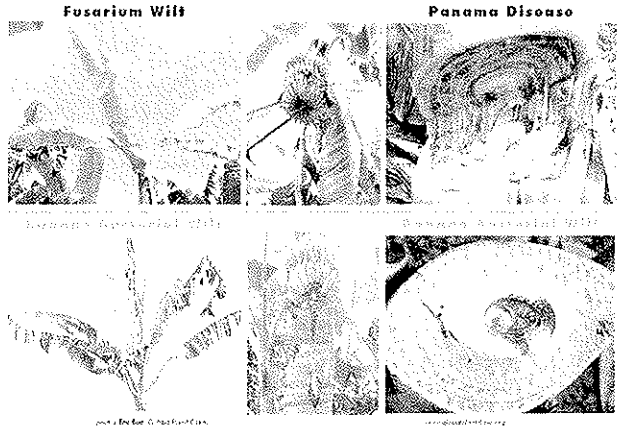

Fig. 3. Photo sheet comparing symptoms of *Xanthomonas* wilt and Fusarium wilt used at Going Public events in Uganda.

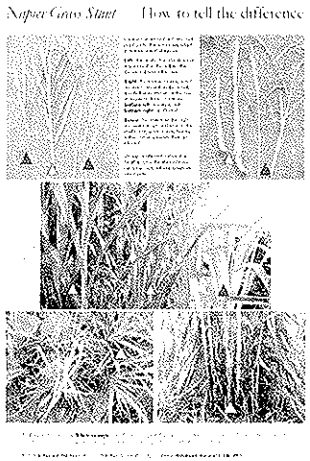

Fig. 4. Photo sheet of Napier grass (*Pennisetum purpureum*) stunt used at Going Public events in Kenya.

Innovation Systems: Tracking Adoption