Full Length Research Paper

Knowledge on cassava disease management: The case of cassava brown streak disease awareness in Northern Uganda

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The cassava brown streak disease (CBSD) has spread rapidly in Northern Uganda since its emergence in Uganda in 2005. Field surveys conducted in 2010 and 2011 by Ngetta Zonal Agricultural Research and Development Institute (Ngetta ZARDI) revealed high CBSD prevalence in the zone. CBSD epidemic has severely affected livelihood of smallholder farmers in the region. Lack of knowledge on disease recognition and management contributed significantly to rapid spread of CBSD in the zone. Addressing this aspect to increase and improve the knowledge base of cassava farmers was an important component in integrated disease management. Ngetta ZARDI through the Agricultural Technology Agribusiness and Advisory Services (ATAAS) project developed a multi-disciplinary effort to reduce the spread and impact of CBSD, partly through promotion of adoption of tolerant cassava varieties, and educating and training of smallholder farmers and other stakeholders. Participants were carefully selected from farmer groups, extension and political leadership. Training involved lectures and field visits for practical demonstration of CBSD symptoms. The training increased the number of people with knowledge on CBSD management up to farmer level. Overall, the training program significantly strengthened the human resource base employed against CBSD in the zone.

Key words: Cassava brown streak disease, Northern Uganda.

INTRODUCTION

Cassava is a major staple food for more than 200 million people in Eastern and Central Africa, most of which are living in rural areas. The crop has been prioritized by NEPAD as a “poverty fighter” (NEPAD, 2004). Cassava plays a key role as food security and income generating crop for majority of the farming communities in Northern Uganda (UBOS, 2010). Despite the importance of cassava in Northern Uganda, farm yields are about 12 t/ha in comparison to 40-50 t/ha achievable in good growth conditions (UBOS, 2012). These low yields are due to constraints that challenge the production and utilization of the crop: pests and diseases; the use of inferior and low yielding varieties; lack of good quality planting materials; poor farm management and husbandry practices and variability in weather patterns. Among the major diseases, viral disease; CBSD and cassava mosaic disease (CMD) are the most important in the zone. CBSD is the most damaging disease causing over 60% yield loss and threatening the livelihoods of small holder farmers. Cassava brown streak disease (CBSD) is caused by cassava brown streak virus (CBSV) (Moner et al., 2001) and Ugandan cassava brown streak virus (UCBSV)

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which affects all parts of the plant, causing characteristic above and below ground symptoms (Alicai et al., 2007; Hillocks and Jennings, 2003). The disease affects the yield and quality of the tuberous roots of cassava (Manihot esculenta Crantz). The economically damaging symptoms occur on the tuberous roots in the form of yellow/brown, corky necrosis in the starch bearing tissues (Figure 3), and radial root constriction in very severe infections (Figure 4). The necrosis begins as discrete areas, but in fully susceptible cultivars, it may affect most of the root, rendering the roots unfit for human consumption (Hillocks and Jennings, 2003; Hillocks et al., 2001, Nichols, 1950). Foliar symptoms of the disease are expressed on leaves (Figure 1) and stems (Figure 2).

It has been known for some time that CBSD symptoms can be expressed at altitudes greater than 1,000 m above sea level when infected cuttings have been planted. This occurred in Uganda when infected material was taken from Tanzania in 1934, but the disease was eradicated by destroying all plants showing symptoms (Jameson, 1964). From that time until 2004, CBSD has not been prevalent in Uganda, although CBSD-like symptoms were observed on a few cassava plants at one site in central Uganda in 1994 (Thresh et al., 1994). CBSD re-emerged in Uganda in 2005 (Alicai et al., 2007). The re-emergence of CBSD in Northern Uganda raises concern for food production and household income for farmers in the Northern agro-ecological zone of Uganda who regard cassava as their major staple food. Most farmers in the zone grow CBSD susceptible varieties, resulting in high loss in yield (personal communication). Thus if not controlled, CBSD is likely to bring cassava production in the zone to a halt. CBSD has been considered one of the most dangerous diseases in the world (Donald, 2010). The overall effect of CBSD is reduction of root yield by up to 74% (Muhana et al., 2004) and quality (Hillocks et al., 2001). When combined with cassava mosaic disease,
100% yield loss can result. In terms of control, the most economically viable method for cassava brown streak disease management is the host-plant resistance (Munga, 2008). To date no CBSD resistant cassava has been developed.

At the time of planning for the CBSD awareness campaign there was inadequate information with regard to the disease. Farmers, extension staff, NGOs and policy makers in northern Uganda did not know how CBSD expresses itself, its effects and how it spreads. It was therefore, very important to create awareness on the severity and effects of the disease and how to manage it, while researchers continue their efforts in discovering more effective means of overcoming the CBSD pandemic. Resource materials on CBSD that can be used in CBSD awareness campaigns were developed and used to train trainers within northern Uganda to help carry out the campaigns in the different sub-counties in the northern agro-ecological zone of Uganda.

MATERIALS AND METHODS

A training program was executed in a cascade model that progressed through three levels (sub-county, parish and village levels). The training started from sub-county level (level 1) through parish level (level 2) to community/farmer level (level 3). Level 1 was initiated with a training workshop for extension workers and representatives of farmer groups in the worst hit district of Amolatar in 2011. From Amolatar, the training workshops were rolled over to other affected districts in Lango and Acholi sub regions of Uganda (Figure 5). A total of 40 sub counties from 8 districts benefited from the training. Seventy one participants were targeted per Sub County (total of 355 for each district). Among the seventy one trainees, the criteria required representation of at least extension, farmer groups and political leadership. After the training, those trained at level 1 organized and conducted further training (level 2) to increase the number of people (trainers) available within each sub county, who then took the training further down to the community/farmer level (level 3).

Training at level 2 and 3 were based on needs and resources available in each sub county. Training modules involved lectures and visits to selected field locations for practical demonstrations and it ensured that participants appreciated both foliar and root tuber symptoms of CBSD on cassava varieties widely adopted in the zone. Additional training materials were provided during the training sessions. These included printed handouts and CBSD fact sheets. Progress in implementation of the training program was monitored regularly and adjustments were done as necessary. Follow up visits were made to sub counties to document level of adoption of available management options including CBSD tolerant variety MM 98/4271.

RESULTS

Progress achieved

At the time of planning the zonal training program (2011) CBSD had already been confirmed to be present in all the 15 districts of the northern agro-ecological zone of Uganda. None of these districts had the necessary manpower to support rapid response to the disease. A critical gap was noted especially regarding the involvement of extension and policy makers. By careful selection of participants for the CBSD training workshop, the CBSD initiative managed to increase the number of trained manpower in each sub county and importantly, also expanded the diversity of trained stakeholders to include extension leaders and policy makers. Farmer group representatives selected from parish level conducted further training for their group members thereby significantly increasing the number of knowledgeable stakeholders across the zone (Table 1), a more than 10 fold increase as compared to the number trained at sub county level (level 1). At the community level, where more emphasis is needed for effective CBSD management, over 3,000 stakeholders were sensitized on CBSD across the zone within one year. Considering that an estimated 2.7 people are affected or threatened by the CBSD pandemic within the 40 target sub counties, the over 3,000 stakeholders trained at grass root level was considerable. Although this ratio did not match the required critical mass for effective disease management, it was expected that gains on containing disease spread would be achieved if the knowledge acquired was put to use. There were, however, concerns on whether those trained would effectively
apply the knowledge gained.

As a result of the training, 60% of the sub counties in Lango and 40% in Acholi sub regions who benefited from the training adopted CBSD tolerant variety MM96/4271 as a variety of choice for their farmers under food security program. Foundation seeds of MM96/4271 were obtained from Ngetta Zonal Agricultural Research and Development Institute and multiplied in farmer’s locations with a pathological focus. This helped to increase access to CBSD tolerant varieties by smallholder farmers in the northern agro-ecological zone of Uganda, hence the decline in the spread of CBSD through movement of diseased planting materials.

**Some challenges and lessons learnt**

**Absentee trainers**

In numerous instances training at level 2 (parish level) was affected by loss of training capacity since some of those trained at level 1 (sub county level) were not available to conduct training at level 2. Notably, most of those selected to participate at level 1 were farmer group leaders or policy management staff who were not available to participate fully in further training, though they contributed to CBSD management in other ways. Based on this experience, it would be advisable to consider the ability and availability of trainees to participate in further training.

**Communication**

Extension workers and farmer groups have different levels of education. This required particular attention during joint training sessions to ensure participants followed and understood proceedings fully. This was addressed by providing translation to local languages since the facilitations were in English. However, attention needed to be paid to ensure key message was not distorted or lost during translation, especially where technical details are involved. During this training, it was observed that it is generally difficult to translate. Field demonstration trips were included to reinforce learning through coursework. At the field level, differences in education levels were also noted to hinder direct interaction between workshop participants and farmers/other stakeholders who wanted to share their experiences on CBSD management directly. This was eased by having a translation service during field visits, though this may also not fully address the issue. As an alternative, it was suggested to consider holding separate workshops and training sessions for the extension and farmer group representatives.

**Insufficient local capacity**

The cascade training proposed assumed that each sub county had a basic functional extension system that would be trained and facilitated to further train farmers. The reality, however, was observed to be that there are considerable differences in capacities and institutional structures between sub counties, which affected program implementation. Whereas functional systems exist in Lango sub region, they are considerably weak and are almost non-existent in Acholi sub region. The Acholi Sub counties were especially facing challenges that were associated with civil instabilities experienced in the last two decades. These differences between capabilities of sub counties need to be taken into consideration when designing such training programs, and where possible support should be skewed to favor those in greater need.

**Perception of CBSD as a non-threat**

In Uganda, farmers react faster to threats that are perceived as current and immediate. The CBSD training program was designed to reach communities and stakeholders that were already affected and those threatened

**Table 1. Number of extension, policy makers and farmer group members (level 1 and 2) trained on CBSD management in nine sub-counties in northern Uganda.**

<table>
<thead>
<tr>
<th>District</th>
<th>Extension</th>
<th>Policy makers</th>
<th>Farmer group representatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lango sub region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amolatar</td>
<td>15</td>
<td>3</td>
<td>235</td>
</tr>
<tr>
<td>Alebtong</td>
<td>15</td>
<td>3</td>
<td>355</td>
</tr>
<tr>
<td>Dokolo</td>
<td>15</td>
<td>3</td>
<td>325</td>
</tr>
<tr>
<td>Apac</td>
<td>15</td>
<td>3</td>
<td>325</td>
</tr>
<tr>
<td>Oyam</td>
<td>15</td>
<td>3</td>
<td>325</td>
</tr>
<tr>
<td><strong>Acholi sub region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pader</td>
<td>15</td>
<td>4</td>
<td>325</td>
</tr>
<tr>
<td>Agago</td>
<td>15</td>
<td>3</td>
<td>325</td>
</tr>
<tr>
<td>Gulu</td>
<td>15</td>
<td>3</td>
<td>325</td>
</tr>
</tbody>
</table>
but not yet affected by CBSD. With no previous experience of the devastating impact of CBSD, the threatened communities were unlikely to invest much effort to combat CBSD, even though they might have appreciated the lessons imparted through training. This slow response is particularly higher where cassava is not the primary means of supporting livelihoods. Exchange visits between farmers in different regions of Uganda could help in deepening appreciation of the threat and potentially encourage implementation of CBSD management measures.

**DISCUSSION**

Capacity building through the transfer of knowledge on CBSD symptom identification and management to stakeholders helped to build a coalition of local teams to combat CBSD in the zone. CBSD awareness campaign plays a vital role in checking the spread of the disease and has contributed to reviving cassava production in areas affected by the epidemic. At the time of initiating the awareness campaign, CBSD was already established in most parts of the zone. In addition to building capacity to recognize CBSD at sub county, parish and village levels, the training encouraged and promoted the use of available CBSD control programs, including the adoption of promising CBSD-tolerant cultivars particularly MM96 / 4271, production and distribution of clean cassava planting material. The two approaches are now widely adopted in the zone as a result of the awareness creation campaign. A number of multiplication sites for CBSD tolerant variety, MM96/4271 have been established within the zone to ensure control of movement of diseased cassava planting materials. In addition, all the sub counties were awareness creation were conducted; bylaws have been put in place to prevent distribution of diseased cassava cuttings to farmers. All cassava gardens intended for distribution to farmers are now first inspected by trained pathologists to assess their CBSD status. This is helping to curb CBSD spread through distribution of cuttings to farmers. However, complete recovery and the prevention of any further spread of CBSD are still a long way off. They require a strong commitment from local, national and international communities to sustain the ongoing and emerging research and development efforts that are devising effective and eco-friendly technologies for Uganda.

**Conclusion**

The implemented training program significantly increased the capacity of stakeholders across the zone to manage CBSD. The training strategy employed enhanced interaction between stakeholders within and between sub countries in the northern agro-ecological zone of Uganda. This has contributed to better coordination and management of CBSD through sharing of resources and experiences.

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