

Towards improved seed system management: use of affordable net tunnels and decentralized inspection schemes

In Tanzania and Uganda affordable net tunnel technology to protect quality sweetpotato planting material from virus vectors is being scaled out. Since May 2013, 140 net tunnels have now been established with farmer-multipliers with over 3.7 million cuttings produced. 42 multipliers and seed inspectors in Lake Zone and Zanzibar have been trained in the use of seed standards and inspection protocols which are in the final stages of ministerial approval.



Fig. 1 (A - B) Net tunnels under construction in Sengerema district, Tanzania. (credit K. Ogero)

What was the problem?

Increased sweetpotato production in sub-Saharan Africa is hampered by high incidence of virus diseases. Sweet potato virus disease (SPVD), caused by synergistic interaction between Sweet potato feathery mottle virus (SPFMV) and Sweet potato chlorotic stunt virus (SPCSV), can cause up to 98% yield losses. The crop is vegetatively propagated, and so viruses accumulate with each generation, and are difficult to control.

Farmers are encouraged to use clean planting materials to reduce the spread of viruses. One strategy is to use pathogen tested (virus indexed) materials produced through tissue culture (TC) micropropagation and channeled into the seed value chain through commercial laboratories, research stations, and NGOs. However, these sources may not always be accessible to the majority of smallholder farmers, in particular women farmers. It is therefore, important to have a reliable decentralized system where multipliers can maintain clean planting material for easy access by farmers.

What do we want to achieve?

We want to test whether healthy seed production can be maintained through a combination of farmer practices and internal and external quality assurance mechanisms. We also want to ensure that external regulatory processes are appropriate and cost effective.

We will generate evidence about the effectiveness of the net tunnel technology in enhancing farmers' access to quality planting material. In western Kenya, the net tunnels were initially piloted under research managed conditions, and were found to be successful in keeping tissue culture (TC) plantlet-sourced materials protected from aphid and whiteflies (the major virus vectors) and thus, free from re-infection. Now we are testing this technology with farmer multipliers to understand the factors which might influence further scaling up.

Working with the National Agricultural Research Institutes of Tanzania (Lake Zone and Zanzibar) and Uganda we are implementing a three-year project ("Keeping disease free vines closer to the

Key Partners

- Lake Zone Agricultural Research and Development Institute (LZARDI)
- Zanzibar Agricultural Research Institute, Kizembani (ZARI)
- Uganda National Crops Resources Research Institute (NaCCRI)
- Tanzanian Home Economics Association (TAHEA)
- Kolping Society of Tanzania (Kolping)
- Mikocheni Agricultural Research Institute (MARI)



Fig. 2 Team inspection of quality declared seed in Geita, Tanzania. (credit K. Ogero)

farmers" or "Kinga Marando") which aims to validate the net tunnel technology among farmer-multipliers. Virus-indexed starter plantlets undergo mass *in-vitro* propagation, and then are acclimatized and grown under screen-house conditions by Crop Bioscience Solutions Ltd. and BioCrops Ltd., tissue culture laboratories in Tanzania and Uganda, respectively. The project is supporting Decentralized Vine Multipliers (DVMs) to construct the net tunnels and to maintain the virus indexed planting material inside. The DVMs are also being equipped with knowledge and practices on vine conservation, quality management such as positive and negative selection of planting material, and business enterprise skills.

Farmer-multipliers maintain their basic seed in the net tunnels, and then plant out in the open field to multiply for sale to root producers. To verify the quality seed production we are training farmer-multipliers and inspectors on the use of appropriate standards and inspection protocols for production of quality declared seed (QDS).

How are we making it happen?

Together with partners, we have established 91 new DVMs (67 in Tanzania and 24 in Uganda) and constructed 140 net tunnels (92 in Tanzania and 48 in Uganda). Seven varieties of sweetpotato: Kabode (NASPOT 10), Polista, Vita (NASPOT 9), NASPOT 11, Mayai, Mataya and Kiegea were cleaned up by the Kenya Plant Health Inspectorate Service (KEPHIS) and distributed to the DVMs.

We are also conducting a special study aimed at determining over at least two years (four seasons) the rate of virus degeneration in sweetpotato planting materials multiplied under net tunnels

compared with planting material multiplied in open fields. Furthermore, following a series of consultative meetings led by the Tanzania Official Seed Certification Institute (TOSCI), Tanzania is now in the final stages of gazetted seed standards that will guide production of quality planting material for sweetpotato. Successful implementation of the proposed standards will prevent the spread of plant borne diseases and protect farmers from unscrupulous seed traders.

What are we learning?

The net tunnel technology can be successfully cascaded to farmer-multipliers provided there is adequate training and good management. Consistent irrigation is important; otherwise the material dries out and is lost. Weed pressure in the net tunnels can be a problem, and so we are testing the use of different types of mulch. The durability of the net tunnel structure is undermined by the use of binding wires to close the net tunnels. These cause holes each time the tunnel is opened contributing to increased wear and tear. We are assessing alternative options (e.g. zips and sisal or nylon fastenings) that will reduce this damage. Another factor influencing adoption of the technology is the locally availability of the insect proof nets. At the moment the net (OPTINET 50) is sourced from Nairobi, Kenya, is expensive and takes time to deliver. Identifying local suppliers in the different countries is essential.

Farmer-multipliers need a consistent market for their seed. Therefore, in addition to the technical factors related to the net tunnels, the successful uptake of this technology will depend on the local market context for quality seed, and multipliers' business skills. Thus, marketing and promotion of quality sweetpotato seed and coordinating demand and supply of planting materials are also crucial components of seed system management. Lastly, the proposed standards for production of quality planting materials will play a great role in enhancing farmers' access to clean planting materials. However, caution is needed to avoid over-regulation which could stifle the system. CIP and national scientists will continue monitoring the implementation of the seed standards and inspection protocols to understand the institutional implications and what benefits actually accrue to farmers.



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