

Tackling the Pre-Basic Seed System Bottleneck

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National Agricultural Research Institutes in 7 sub-Saharan African countries launched a new effort to strengthen pre-basic sweetpotato seed programs. These programs will be sustained financially by channelling revenue from seed sales back into future seed production.

❖ What is the problem?

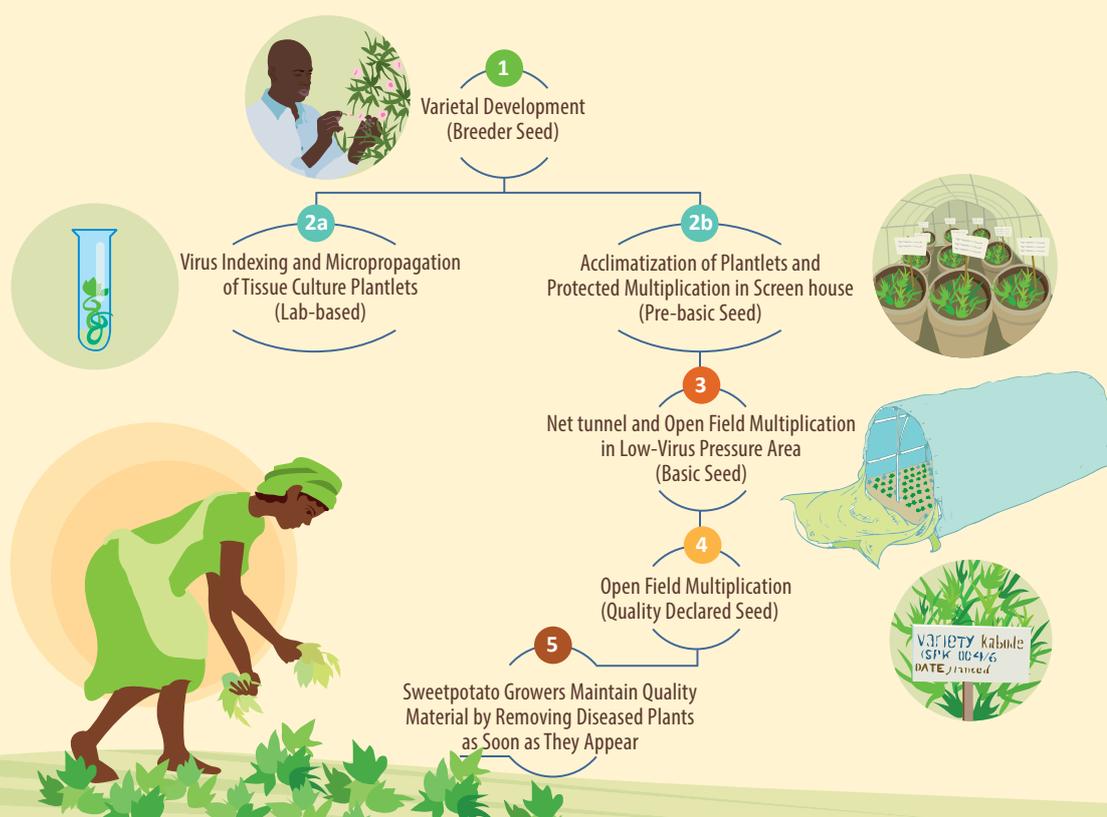
Quality seed is the starting point for any successful agricultural venture and a functioning sweetpotato seed system contributes to food security and income generation. The transition between breeder and pre-basic (i.e. first generation or foundation) seed production is a major bottleneck in the functioning of an efficient seed system for sweetpotato (Fig. 1). This is because of: limited incentives to maintain breeder seed; a lag in investment in human capacity and facilities for pre-basic seed production; inadequate coordination between seed demand and supply; together with unreliable funding streams.

❖ What do we want to achieve?

We aim to strengthen technical, financial and institutional capacities for the sustainable production of pre-basic sweetpotato seed in 11 sub-Saharan African countries. We are developing and testing different seed system technologies to increase the multiplication rate for sweetpotato and improve the supply of quality, early generation seed. We are exploring innovative partnership business models between public research programmes and private entities that may contribute to developing commercially viable seed systems.



Fig. 1 Schematic of sweetpotato seed system



Partners:

- Kenya Plant Health Inspection Service (KEPHIS Plant Quarantine)
- National Crop Resources Research Institute (NaCRRI-Uganda)
- Rwanda Agricultural Bureau (RAB-Rwanda)
- Sugar Cane Research Institute (SRI-Kibaha) & Lake Zone Agricultural Research and Development Institute (LZARDI) Tanzania
- National Root Crops Research Institute (NRCRI), Nigeria
- Southern Agricultural Research Institute (SARI), Ethiopia
- Tigray Agricultural Research Institute (TARI), Ethiopia
- Crops Research Institute (CRI), Ghana
- Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso
- Instituto de Investigação Agrária de Moçambique (Agrarian Research Institute of Mozambique) IIAM Mozambique
- Zambia Agricultural Research Institute (ZARI-Zambia)
- Department of Agricultural Research Services (DARS), Malawi



■ Dr. Beyene, (TARI, Ethiopia) explains his ideas to increase multiplication rates for sweetpotato and to ensure optimal use of screenhouse facilities. (credit M. McEwan)

❖ Where and who are we working with?

We are currently working in 7 countries (Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda), with the National Agricultural Research Institutes (NARIs), and whenever feasible, private tissue culture laboratories.

❖ How are we making it happen?

We are working with the NARIs to strengthen the technical capacity to ensure that virus-indexed (pathogen tested) starter tissue culture plantlets are available and micro-propagated under laboratory conditions. These are then acclimatized or hardened and further multiplied under screenhouse conditions. We are testing: various types of net tunnel for the protection of early generation seed; the use of hormones to speed up rooting of vine cuttings; and methods such as sandponics to determine whether different nutrient, irrigation and temperature regimes can increase the multiplication rate for sweetpotato in screenhouses. We will evaluate the cost per unit and time of these technologies against conventional multiplication technologies. Financial capacity is being strengthened, firstly, by developing business plans, including financial analysis to determine gross margins and internal rates of return. This will help to determine minimum price levels for seed at each level in the seed value chain. Secondly, together with senior NARI management, we are identifying potential financial mechanisms (e.g. revolving funds) whereby proceeds from the sale of pre-basic seed can be channeled back into continued production.

Institutional capacity is being supported through: training in tissue culture micropropagation, screenhouse multiplication; rehabilitation and maintenance for laboratories and screenhouses; together with improved systems for procurement of chemicals and reagents. In addition, the functions related to coordination of seed demand are being developed.

❖ What have we achieved and learned so far?

Screenhouse and irrigation facilities have been installed or rehabilitated in all countries. Sandponics units have been established in Uganda, Mozambique, Kenya and Malawi in collaboration with other

projects. Key challenges in tissue culture (TC) micropropagation include avoiding contamination as explants are initiated into tissue culture; optimizing the growth media, and reducing mortality as *in vitro* plantlets are transferred to *in vivo* conditions. A manual for the hardening of plantlets has been produced and KEPHIS is hosting training in July 2015 for NARI technicians. TC plantlet production is expensive – so we need to reduce costs by using locally available supplies (e.g. table sugar in place of sucrose), optimising protocols and increasing efficiencies to bring down the unit price and calculate the optimal level of plantlet production.

In Ethiopia, Tanzania and Mozambique, revolving fund mechanisms are allowable, but may be multi-purpose, and so discussions are in progress to find a way to link income from sweetpotato seed sales to crop specific expenditure requirements. In Malawi and Uganda, recent changes in government regulations have laid the foundation for revolving fund type mechanisms to be established, with sweetpotato seed production as a test case.

For pre-basic seed production to be financially sustainable, the pricing structure needs to be logical and consistent along the seed value chain. In Uganda the business case for pre-basic seed production under public and private sector management has been analysed. Preliminary findings show that there is unlikely to be a viable business case for private sector pre-basic sweetpotato seed production alone due to the limited quantities required and high facility costs. A successful business case for the private sector for the production of early generation seed also requires production of larger quantities of basic seed. Further along the seed chain, quality declared seed producers are likely to be profitable only if root production is a source of income as well.

A concerted effort is required to understand demand at the different segments in the seed value chain. Regular convening of producers and customers is critical to discuss issues of common concern, build trust through the chain, and synchronize demand with timely supply. Demand projection methods and multiplication planning calendars are essential tools to ensure that the different segments in the seed value chain are coordinated to provide timely and adequate quantities of quality seed. In the Tigray Region of Ethiopia, the Bureau of Agriculture has stepped up to take on this critical coordination role.

❖ What are the next steps?

In the coming year, Burkina Faso, Zambia, Ghana and Nigeria will join the effort. As we continue to gain experience, share and learn through face-to-face meetings and on-line discussion as part of the SPHI Sweetpotato Seed Systems Community of Practice, we hope that we will successfully address the pre-basic seed production bottleneck.



■ Tissue culture plantlets are expensive to produce, so we are looking to lower costs

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