Breeding in Africa for Africa

A major collaborative strengthening of sweetpotato breeding is underway in target countries of the Sweetpotato for Profit and Health Initiative. Sweetpotato Support Platforms in Eastern, Southern, and West Africa are working with national partners to rapidly develop improved populations and varieties with regional adaptation and desired quality traits, and to build a community of practice using improved breeding methods and tools.

What is the problem?
Traditionally sweetpotato breeding programs have taken a long time, 7 to 8 years, to produce a new variety. Frequently those new varieties do not suit the various geographic areas and the preferences of diverse farmers and consumers within a country. Indeed, most countries in Africa have no real breeding program and rely on testing materials developed elsewhere, which in some cases works well, but not when agro-ecological conditions are quite distinct. Few countries have dedicated sweetpotato breeders.

What do we want to achieve?
We want to revolutionize conventional sweetpotato breeding. We seek to redesign sweetpotato breeding protocols in Africa to produce varieties in fewer years (about 4). We are investing in developing diverse sweetpotato types that will provide national programs with a wide range of “parents” with the preferred combination of characteristics to use in their own breeding programs. Particular attention is paid to preferences of women producers and consumers of all ages. We expect our national program partners to release at least 20 locally adapted sweetpotato varieties by 2015. We want to see a cadre of sweetpotato breeders, trained in the latest techniques, using common protocols, and capable of raising funds to support the development and dissemination of new, improved sweetpotato varieties within their countries.

Where are we working?
Three Sweetpotato Support Platforms (SSPs) have been established, with CIP sweetpotato breeders based in national breeding programs in Uganda, Mozambique, and Ghana to provide technical backstopping at the sub-regional level for the 17 countries targeted under the Sweetpotato for Profit and Health Initiative: Uganda, Kenya, Tanzania, Ethiopia, Rwanda, Burundi, and DR Congo in East and Central Africa; Mozambique, Malawi, Zambia, Angola, South Africa, and Madagascar in Southern Africa; and Ghana, Nigeria, Benin, and Burkina Faso in West Africa.

How are we making it happen?
We are developing a new way of breeding sweetpotato using a combination of methods: First, in “accelerated breeding”, we conduct multilocal testing from the earlier stages of selection, in contrast to the conventional approach of using one site for two or more initial evaluations. Second, we are creating very distinct sweetpotato populations in each sub-region, which, when crossed, should result in major improvements in yield due to heterosis.

Key Partners
Major partners are the national sweetpotato programs in the target countries. The Sweetpotato Support Platform (SSP) for Eastern and Central Africa is based at the National Crops Resources Research Institute (NACRR) in Uganda and the Kenyan Plant Health Inspection Service (KEPHIS). For Southern Africa, the SSP is based at the Agrarian Research Institute of Mozambique (INAM) in Maputo. The West Africa platform is located at the Council for Scientific and Industrial Research-Crops Research Institute (CSIR-CRI) in Kumasi, Ghana.
Third, we are developing molecular markers to apply to speed up the process of identifying and selecting plants that have resistance to viruses, the most important disease of sweetpotato in SSA. Finally, we are using near infrared reflectance spectroscopy for the rapid and inexpensive evaluation of important quality attributes, including key micronutrients and different sugars.

Each sub-regional SSP is developing a program to carry out and support the research in breeding, seed systems, and other areas targeting specific needs of each region. This is a collaborative effort with institutional partners in each sub-region, working in close collaboration with the Alliance for a Green Revolution in Africa (AGRA) to build capacity in conventional sweetpotato breeding. Sweetpotato “speed breeders” meet annually to learn new techniques and share knowledge, with the goal of building a vibrant community of practice. In August 2012, a joint course with the University of Ghent focused on molecular breeding techniques.

Our breeding effort draws on the genetic diversity of African sweetpotato germplasm, exploiting its genetic potential and increasing and diversifying forms of use, to produce new locally adapted sweetpotato varieties in Africa. We also draw on CIP’s extensive global germplasm bank to provide parental material for the Africa-based population development program. We are breeding in Africa for Africa, with a focus on creating populations with major traits demanded by each sub-region, namely: 1) Sweetpotato virus disease (SPVD) resistance and high beta-carotene content in storage roots (Eastern and Central Africa); 2) Drought tolerance and high beta-carotene in storage roots (Southern Africa), and 3) High dry matter and low sweetness to align with consumer taste preferences (West Africa).

These population improvement programs are linked to national variety development programs, led by National Agricultural Research Systems (NARS) breeding programs. Farmers are active partners in the process of selecting materials to meet their conditions and preferences. We also expect that varieties and improved populations from each sub-region will have value in other sub-regions when exchanged and evaluated to select superior varieties.

**What have we achieved so far?**

These have been the major sweetpotato breeding achievements to date:

- a) We have demonstrated that heterosis can be applied in sweetpotato breeding to dramatically improve storage root and biomass yield.
- b) Building on previous investments by AGRA and HarvestPlus, the release in Mozambique in February 2011 of 15 drought tolerant orange-fleshed sweetpotato varieties in just four years proves that accelerated breeding can be applied in SSA. Four other countries have released 24 new sweetpotato varieties since 2009.
- c) Seven national sweetpotato breeding programs have obtained AGRA grants and they are implementing accelerated breeding principles.
- d) Population improvement based on two separate populations characterized using molecular markers for virus-resistance breeding is in progress in Uganda.
- e) An easy-to-use Excel-based program, CloneSelector, has been developed that facilitates routine breeding tasks such as planting trials, and analyzing data. This tool enhances the power and efficiency of sweetpotato breeding in Africa for Africa.

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