

CASSAVA BREEDERS TECHNICAL EXCHANGE NETWORK (CBTEN)

Progress, Challenges and Options for Improving Cassava Breeding

Introduction

Cassava is an important food crop to millions of households in Africa and there is an increasing demand for industrial use. The crop, however, faces limited demand due to poorly developed private sector while leaders and farmers lack information and interest about it. It experiences new disease outbreaks especially cassava mosaic and brown streak viruses. It is grown in marginal and heterogeneous environments and many communities have varying perceptions on its production and use. The crop, however, has advantages such as its high starch content, requires limited labour and capital, grows in poor soils and is tolerant to drought, and its flour can be processed into several food products and for industrial production of biofuels. Its leaves have many uses and the tubers can be cooked in several ways and integrated with other foods.

African cassava breeders have a very important role to play in its improvement but they lack a strong technical exchange forum, funding and are fewer compared the pressures to improve farm productivity in the continent. Nevertheless, breeders are developing new varieties with desirable characteristics and work with farmers and the private sector to multiply, disseminate and commercialize the new cassava varieties. Other efforts have included processing and value addition in cassava to improve incomes of the target communities

Meeting objectives

The Cassava Breeders Technical Exchange Network (CBTEN) meeting objective was to stimulate exchange of information and resources as well as inspire cassava and other crop breeders to develop, share and release new and improved crops that can be adapted to specific agro-ecologies through participatory approaches. This meeting follows the inaugural one conducted during 2005 in Uganda. It featured stimulating presentations on networking, breeding and dissemination of improved cassava, sweet potato and banana in eastern, southern and western Africa. The meeting positions breeders to contribute significantly to the realization of an African green revolution, an initiative led by the Alliance for Green Revolution Africa (AGRA). It was funded by AGRA and attended by breeders and seed producers from Kenya, Uganda, Malawi, Mozambique, Tanzania, Zimbabwe, Rwanda, Nigeria and Ghana.

The duration needed to release improved varieties vary from two years to 10 and from country to country. Farmers would like short maturing cassava varieties, a target that is currently beyond the ability of breeders. The development of hybrid varieties is attractive to private seed producers unlike open pollinated varieties (OPVs) that farmers prefer to grow. While hybrids sustain sales and profits for private seed companies, farmers prefer to recycle OPV seeds in new seasons instead of buying hybrids. In the case of cassava, sale of cuttings can only be done once as farmers use their own cuttings for subsequent seasons. These conditions discourage investments in cassava multiplication ventures by seed companies and farmers. Rapid multiplication is also restricted by seasons with only one good cropping possible during the year.

Progress on efforts to deploy and access farmers new crop varieties

Researchers have developed materials for subsistence and industrial processing with combined resistance to pests and cassava mosaic virus (CMV), cassava brown streak virus (CBSD), CGM and CMB; high in starch, yields and dry matter content; tolerant to moisture stress, early maturing and adaptable to local environmental conditions and cropping systems. These varieties also have increased nutritional content, desirable cooking and processing qualities as well as delayed post-harvest physiological deterioration and acceptable to both households and industries.

Breeders and development agencies are using on-farm demonstrations, tissue culture multiplication, credit and grants to seed producers, training of breeders, new grant and development programs such as AGRA, establishment of research networks to promote sharing of germplasm, all geared at accessing farmers seeds of improved crop varieties. A combination of conventional and molecular breeding is being undertaken to accelerate development of new cassava varieties by using local and introduced parents especially for in selecting for CMD resistance. Use of decentralized cassava selection schemes, training of frontline extension personnel and pilot farmers, and establishment of key linkages with the private sector are also some of the approaches being used to multiply, disseminate and commercialize new cassava varieties.

AGRA is developing a database that utilizes the internet and mobile phone technology to collect and analyze information on breeders work in Eastern and southern Africa that will include crop varieties under development and those ready for release to farmers, incidence of diseases, pests and other crop constraints; current demand for seeds, researchers engaged in improvement of crops and needs of various actors in crop improvement. This portal is being deployed through *africancrops.net* website and if fully utilized, will greatly improve interaction and exchange of information among breeders, seed producers, farmers, extensionists, policy makers and other development stakeholders.

Use of tissue culture to multiply new varieties has been applied successfully in bananas and its application in cassava may improve variety distribution to farmers. Use of participatory breeding methods in evaluation and selection that involve the farmers, seed producers and retailers, and policymakers has been incorporated in various national programs, improving adoption of newly released varieties. Farmers' groups that demonstrate, produce, process and market bananas and sweet potatoes have been formed, trained and are undertaking these activities to sustain adoption of new varieties.

About AGRA

AGRA is a joint initiative of the Bill and Melinda Gates and Rockefeller Foundations. The drive for a green revolution is feasible given recent progress in crop improvement, availability of new tools for breeding, networking, learning and an emerging private sector. AGRA will develop and deliver improved crops and technologies through a strong MSc and PhD training in crop science, targeted grants and support to breeding teams and networks, improved capacities of private seed

enterprises and farmer associations through capital and training, linking public breeding programs with private seed companies, expanded retail input supply networks, and enhanced farmer productivity and household nutrition. In the next ten years, AGRA would have trained 80 PhD and 170 MSc breeders, released 1250 new varieties, assisted 40 seed companies, empowered 9,000 agro-dealers, improved national crop improvement programs, enhanced farmer access to new seeds and other inputs, and realized higher yields and more productive farms. AGRA and other development agencies are developing mechanisms for accessing capital and credit to established and emerging seed companies to expand seed production and distribution. These efforts are being implemented through investment funds that charge low interest rates and with extended recovery periods compared to commercial banks.

Challenges and Emerging Issues

It is evident that development of new and improved crop varieties is on course. The varieties are, however, not getting released early and fast enough by breeders for subsequent adoption by farmers which slows down efforts to improve farm productivity. At the same time, various research centers have in stock improved seeds and require support for on-farm demonstration, multiplication and release to farmers.

Breeders face various challenges in their work and need to be encouraged while strengthening young talent through advanced training. Lack of sufficient breeding materials, limited capacity for multiplication and preference of low quality varieties by farmers tend to slow breeders work to release improved crops and to improve household food security.

It is apparent the private seed companies and farmers would like to be involved early in variety development so as to hasten acceptance, multiplication and distribution of new seeds. In addition, each country has specific ecological areas and it is important to identify characteristics for crops that are relevant and adaptable to those ecologies. Integration of soil management technologies in dissemination of seed may improve acceptance and adoption of new crop varieties by farmers.

Experiences from various countries represented at the meeting indicate that it takes a long time to release new varieties and breeders face financial, logistical and seasonal constraints that prevent rapid multiplication of these varieties for testing and distribution to farmers. In some countries, regulators do not recognize on-farm data while national variety performance trials (NPTs) can only be conducted by the regulators themselves, which further delays variety release. Regulators also lack procedures for release of low priority crops including potatoes and cassava. Breeders have had to work with regulators to establish the rules and procedures, and these have been applied on ready and improved varieties without exception, further delaying deployment. In some cases, the government reserves the right to conduct independent on-farm demonstrations on the performance of new varieties and this procedure slows down release of new crops.

These challenges threaten the production of cassava and the livelihoods of households that depend on the crop for food and incomes.

Way Forward

Breeders are being challenged to conduct agro-ecology based breeding in order to accelerate development and release of improved varieties with specific adaptation. Participatory breeding through involvement of the farmer associations, regulators, breeders and seed companies as early possible will encourage investments in multiplication and adoption. Concerted efforts must be made to encourage vigorous dialogue and policy advocacy to realize support by policy makers and greater acceptance by seed companies and farmers.

Active involvement of breeders in regional networks will improve breeding and access to germplasm and information, prioritize the most common and important crop constraints as well as share and gain useful experiences. Expanded opportunities for further training for young and senior scientists are needed to improve caliber of breeders in national research centres.

AGRA should initiate policy advocacy activities in order to accelerate reform of policies and laws governing release of crops, as well strengthen capacities of emerging seed producers to undertake multiplication and distribution of new crop varieties. Policies affecting various food crops need to be developed in order to streamline crop improvement and dissemination. AGRA also needs to strengthen the capacities of regulatory bodies to hasten seed release, ensure safe delivery and development of relevant regulatory procedures for those crops that are not currently effectively regulated. Regulators should be encouraged to participate in on-farm trails so as to shorten time taken to test and release new crop varieties. AGRA and other development agencies should accelerate access to grants and capital to seed companies within flexible repayment terms.

There is need to urgently enhance opportunities for human resource development and expand facilities for variety improvement. Expansion of tissue culture facilities in the national research centers will accelerate multiplication and dissemination of new crop varieties. More education to farmers on the potential role of value-addition to cassava in improving their incomes needs to be accelerated to enhance adoption of new high starch and yielding varieties.

The application of molecular markers in selecting for resistance to cassava diseases can increase the efficiency of cassava breeding. MAS allows for selection in the absence of pathogens, pyramiding multiple sources of resistance to pest and pathogens, and scientists can work with reduced population sizes for more precise field evaluations.

The Nigerian Presidential Special Initiative on Cassava (NPSI) provides important lessons for developing the cassava sector in sub-Saharan by integrating policy support, production technologies and market access supported by monitoring, awareness and capacity building for stakeholders.

Conclusions

Scientists have developed, evaluated and released appropriate cassava varieties for household and recently, an emerging processing industry. A number of institutions will be releasing additional cassava varieties within the next five years. A population of desirable parental genotypes however, needs to be established for incorporation of resistance and novel genes into

local cultivars with farmer preferred traits. Emerging markets and new processing plants offer avenues for increased production and better returns on investments in cassava. Effective delivery of new crops requires that they are superior in yield and quality to farmers and processors while dissemination of farmer-preferred varieties must integrate science-led and farmer-driven multiplication approaches. Expected improvements in cassava varieties will impact positively on household on food security and provide new opportunities for income generation through distribution of seed and value added products by farmers and private seed companies.