The Case for Developing a Sustainable Cassava Seed System

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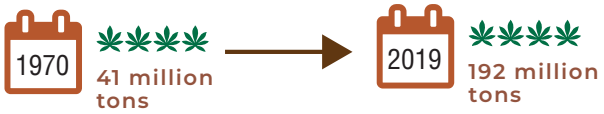
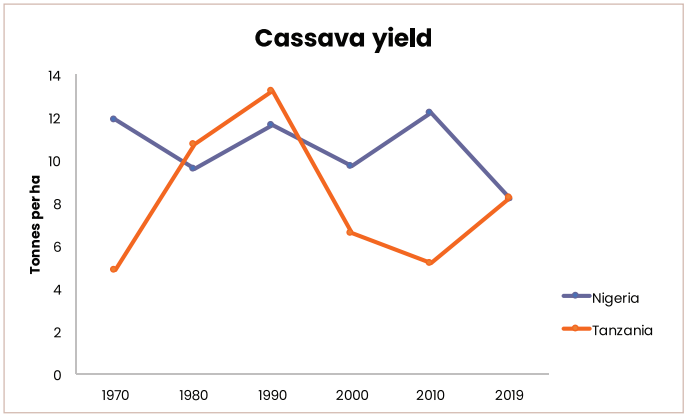
Background

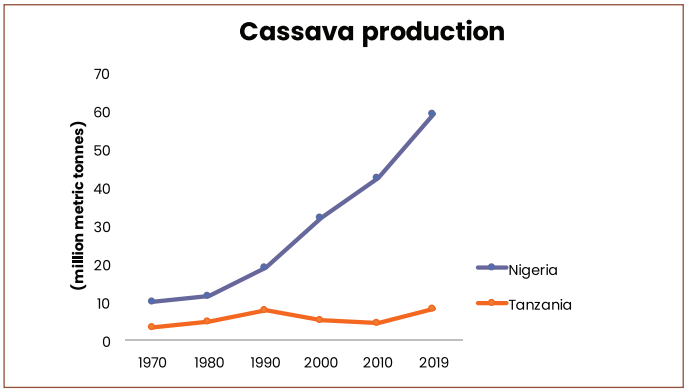
Cassava production between 1970 and 2019 increased nearly five-fold in sub-Saharan Africa(SSA), growing from 41 to 192 million tons (FAOSTAT, 2019).

Cassava production growth



Average yields, however, remained low –less than **10 tons per hectare** – compared with Asian countries that achieved yields of more than **20 tons per hectare**. A major reason for the low yields in Africa was the continued planting of old, often diseased, planting materials and the low level of adoption of new, higher yielding varieties. Breeders had developed a suite of these improved varieties but have struggled to deliver to farmers the quality stems that serve as seeds. Governments and NGOs have occasionally launched campaigns to multiply and distribute cassava stems but these efforts have been sporadic, unreliable, and unsustainable. Consequently, African farmers rarely have access to a reliable supply of disease-free planting materials of improved and preferred varieties. To address this challenge, two projects were launched in Nigeria and Tanzania to develop a new approach to cassava seed systems. The model they piloted creates new enterprises for the rapid and regular production of Early Generation Seeds that are sold to a decentralized network of Commercial Seed Entrepreneurs (CSEs) for further multiplication and sale to farmers. The focus is on economic sustainability to ensure the regular and reliable supply of quality planting materials of improved and preferred varieties that enhance yields and profitability of production. This new seed system model is ready for replication in additional cassava-growing geographies.





**Cassava production in SSA is driven by area expansion rather than yield per area (FAOSTAT, 2019).*

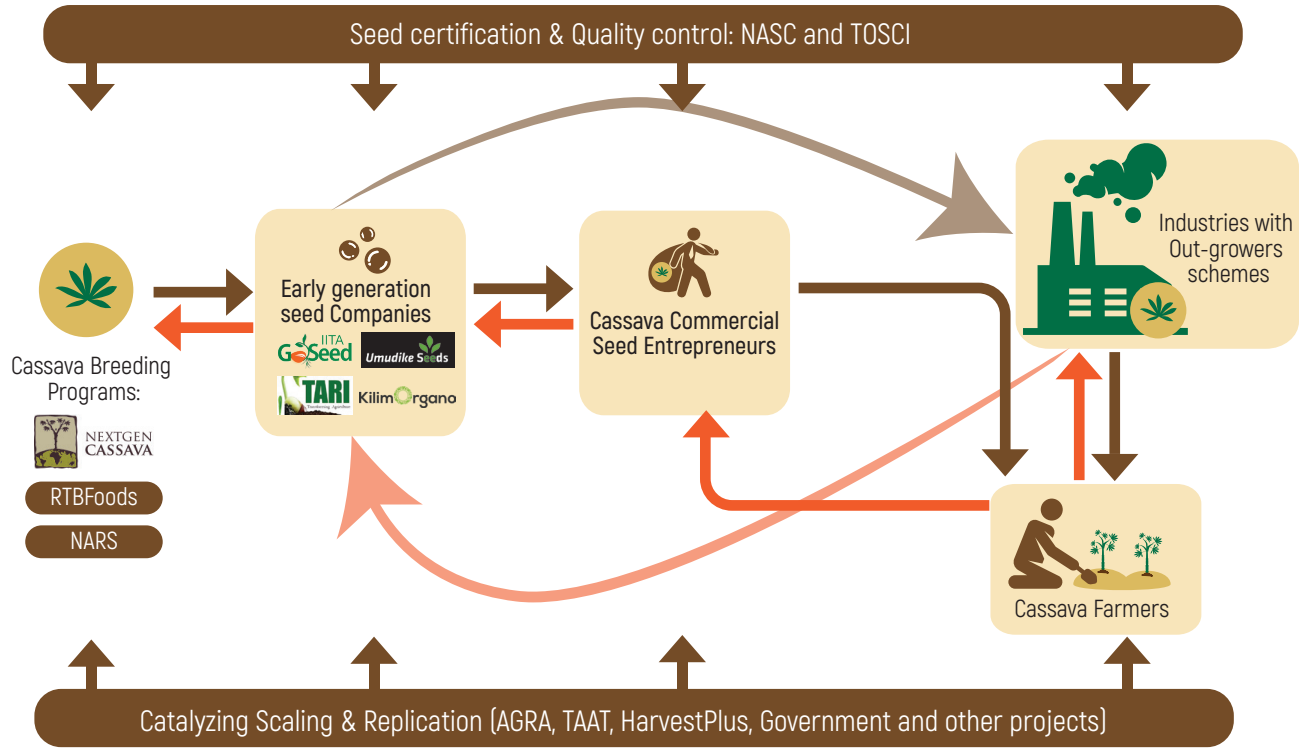
Value proposition for a sustainable cassava seed system

Africa's population and its demand for food are growing rapidly, but African crop yields are struggling to keep pace. Climate change is making farming more difficult by causing droughts, less reliable rainfall, and shifts in pressure of pests and diseases. Cassava plays a central role in the food supply of many African countries but yields must increase significantly to meet expanded demand and ensure food security. This need will not be met if farmers continue to plant diseased materials of old varieties that were not bred for the changing environment. Farmers need reliable access to

planting materials in a pipeline of new, improved, climate-smart varieties to increase yields, food security, resiliency, and supply emerging enterprises in cassava processing. Our new Sustainable Cassava Seed System model offers an opportunity to achieve that goal.

A New System for Sustainable Seed Supply

To address the challenge, our partnership designed, developed, tested, and proved the viability of a new approach to cassava seed supply. We call it the BASICS model (Building an Economically Sustainable, Integrated Cassava Seed System). Our goal is to create a sustainable formal seed system that connects the value chain from growing breeder and foundation seeds to commercial seed production, incorporating genetic purity and quality assurance for health and varietal purity. The model leverages high propogation ration methods such as the Semi-Autotrophic Hydroponic (SAH) technology to accelerate multiplication at the breeder seed level and nurtures the creation of new Early Generation Seed enterprises to produce and sell foundation seeds to a network of CSEs who multiply and sell cassava stems as seeds to farmers. A digital tracking system called Seed Tracker aids in quality control and certification.



Diagrammatic representation of the BASICS model (Godwin Atser, Alfred Dixon, and Lateef Sanni, 2021)

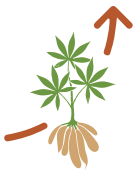
Core message of BASICS-II model

The fundamental principles of BASICS model place emphasis on the breeding of clean and disease-free varieties that are in demand by end-users. Varieties must be tolerant of the two devastating diseases—Cassava Brown Streak and Cassava Mosaic —to fit into the model. To ensure that only clean planting materials are rapidly multiplied and disseminated, the model stresses the active participation of certification actors in the seed value chain. The creation of the Early Generation Seed component ensures that breeder seeds are rapidly multiplied, overcoming the constraint from the low multiplication ratio of vegetatively propagated crops. Lastly, the BASICS model underscores the need for commercialization at all levels, through activities to create demand, advocacy, marketing, and promotion, thereby ensuring that producers of cassava seeds have access to markets to sell their products.

Profitability is the Key to Sustainability

What differentiates the BASICS model from traditional multiplication schemes is its emphasis on profitability to ensure a reliable and sustainable supply of planting materials. Farmers buy stems from CSEs who use these revenues to sustain their seed businesses and are encouraged to continue to multiply and sell stems for years to come. Early Generation Seed businesses are similarly designed to sell their foundation seeds to the CSEs, generating revenues that sustain their operations. The BASICS model incorporates quality control, inspection, and certification systems to ensure trueness to type and phytosanitation.

Benefits of BASICS model



1. Increase in cassava productivity:

The primary benefit of the BASICS model is that it enhances the availability of improved, disease-free, and genetically pure planting materials of preferred varieties that can drive productivity increase. Research data show that farmers who use improved varieties can achieve yields of **64%** higher than those who plant saved seeds of older varieties (Wossen et al., 2017). Furthermore, they are more likely to escape poverty than non-adopters.

2. Promoting quality and disease-free seeds:

The BASICS model is ensuring efficient and low-cost seed quality assurance procedures incorporating digital tools (Seed Tracker) and placement of Licensed Seed Inspectors close to seed production fields to ensure only improved disease-free varieties are multiplied and passed on to farmers.

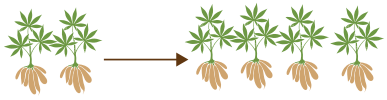
Working with seed certification agencies such as the **National Agricultural Seed Council (NASC**) in Nigeria and the **Tanzania Official Seed Certification Institute (TOSCI)**, the BASICS model ensures that only improved disease-free varieties are multiplied and passed on to farmers. This is achieved by systematically linking farmers to the seed supply chain that involves foundation seed producers and CSEs.

3. Hindering the spread of cassava diseases, such as Cassava Brown Streak.

The BASICS model ensures that Early Generation Seeds are not infected with the viruses responsible for Mosaic and Brown Streak diseases. Quality seed production procedures, including use of disease-free planting material and inspections during crop growth stage results in disease control and prevent cutting and distribution of infected stem cuttings.

Seed quality is assessed at all levels of the system, ensuring that only high quality material is sold to farmers.

4. High multiplication ratio through the SAH technology and associated complementary techniques:



In the last **five years**, we have developedand validated the use of **SAH technology for rapid multiplication of cassava seeds**.Through this approach, the low multiplication ratio that is common in cassava is being overcome.

There are currently five SAH labs operating in Nigeria: one each at IITA, and the National Root Crops Research Institute (NRCRI) in Umudike; and three in private processing companies. SAH laboratories have also been established in other African countries – Democratic Republic of Congo, Malawi, Rwanda, Tanzania, Togo, Uganda, and Zambia – through partner projects.

5. Creating jobs and wealth:

Youth unemployment is a major challenge in SSA. The BASICS model is not only addressing the question of seed quality and quantity for the adoption of improved varieties but also creating employment opportunities through the CSEs. Those CSEs who adopt it are making a decent living by growing and marketing stems of improved and preferred cassava varieties. Also, operations in the SAH lab are particularly appealing to the youth and women, providing job opportunities within these laboratories. Producing Early Generation Seeds is a great opportunity for job creation and empowerment for women and the youth.

6.Responds to feedback from end users:

This model feeds forwards and backwards, such that improved varieties reach end-users while also ensuring that feedback about preferred qualities is transmitted to breeders for further improvement.

Opportunities for Replication and Adaptation

The BASICS model for sustainable cassava seed production has proven its viability in both Nigeria and Tanzania. There are currently over 600 Commercial Seed Enterprises (CSEs) in each country, operating profitably, and the number is growing. Local governments and donors have already started replicating the system in additional geographies in Africa.

There is both a need and the opportunity to further replicate this system within Nigeria and Tanzania and in other countries that grow cassava and seek the increases in productivity that can come from a functional seed system.

Governments and development partners seeking to replicate and adapt the BASICS model should be prepared to do the following:

1. Establish a SAH laboratory and systems in their National Agricultural Research System to rapidly multiply planting materials of the most promising new cassava varieties.
2. Establish an Early Generation Seed company or business unit in a government entity, or in a private sector seed company, or both, with the responsibility to rapidly multiply breeder seeds.
3. Nurture the creation of a network of private CSEs. These are farmers who are trained and supported to multiply and sell cassava stems profitably to their neighbors.
4. Strengthen the capacity of national regulatory authorities to carry out the necessary regulatory functions for quality seed assurance.

The International Institute of Tropical Agriculture (IITA) and its partners under the BASICS-II project are ready to help with project design, advice, and even initial implementation. For more information, please contact: Lateef Sanni, L.sanni@cgiar.org

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