

Improving Seed Systems to Enhance Agricultural Productivity: Tanzania Seed Sector Development Strategy

Key Messages

- Agricultural research institutions and the Agricultural Seed Agency (ASA) encounter difficulties in producing pre-basic and foundation seeds due to poor infrastructure (e.g., irrigation, harvesting, drying, storage, and relevant facilities) and the lack of knowledge of effective seed demand. The lack of cold rooms and poor varietal maintenance negatively affect the maintenance of breeder seeds.
- Low demand creates a lack of incentives for the private sector to get involved in producing and selling open-pollinated seed varieties and vegetatively propagated crops.
- Increasing the annual agricultural budget, followed by increased allocation to the seed sector, is essential for transforming the agricultural sector and the wider economy.
- On various technical, social, economic, and financial levels, Tanzania's vision to become a regional seed trade hub in Eastern and Central Africa is realistic following the needed strategic investments.
- Co-created strategic plans of research centers coupled with proper monitoring, evaluation, accountability, and learning (MEAL) plans and improved coordination among the key seed sector players (ASA, Tanzania Agricultural Research Institute, Tanzania Official Seed Certification Institute, Tanzania Seed Trade Association, and the Ministry of Agriculture's Seed Coordination Unit) are key in meeting the set targets defined for this vision.

Introduction and Background

The agricultural sector plays an important role as a key driver for the economic growth of Tanzania, where nearly 65% of the population depends on it directly or indirectly for sustenance. The sector contributes to about 28% of the country's GDP and about 24% of the total exports and ensures national food security (Ministry of Finance and Planning, 2021). However, productivity is low (Ministry of Agriculture, 2021) due to several factors: rainfall-dependent agriculture, climate change, land degradation, and low adoption of modern farming techniques, including the use of improved seeds. The area planted with improved seeds accounts for only 22% of the total cultivated area (Ministry of Agriculture, 2021). However, farmers' use of improved seeds is key to improving productivity and contributing to food security and trade in domestic and international markets (AGRA, 2016).

This brief summarizes the key findings from fieldwork and a literature review that examined the current situation, challenges, opportunities, and needs in the seed sector toward a new Tanzania Seed Sector Development Strategy (TSSDS). TSSDS aims to address the sectoral gaps and help the Ministry of Agriculture (MoA) achieve its set targets by 2030 (Box 1). Improved availability, accessibility, and utilization of high-quality seeds are arguably important priorities in transforming agriculture since they build the foundation of agricultural production. The targets include addressing the 66,000 tons of seed availability deficit, increasing the number of agrodealers from 3,000 currently to 12,000 (one in each village), and doubling the current area planted with improved seeds from 3 to 6 million hectares and the improved seed use by smallholder farmers from 33 to 66% of this population.

By addressing the seed sector challenges and increasing the improved seed adoption, Tanzania can easily realize its vision of becoming a regional seed trade hub and a gateway to several landlocked African countries. The seed sector is currently marred with several challenges and constraints: one of the most important is the low adoption rate of improved seeds and low utilization rates, with only about 30% of farmers using improved seeds (USAID, 2013). As a result of this, the average crop yields are very low at 1.2 tons/ha for cereals, compared to 4-5 tons/ha of the global average (Figure 1). Despite this, the country has maintained self-sufficiency in food for over 20 years, with a 15-20% surplus available for food trade. If food production is doubled and even possibly tripled, Tanzania can tap a huge

opportunity in seed trade with neighboring countries with perpetual food deficits, especially in grains. Moreover, it can harvest a bigger market share through regional food export,

especially since it ratified the Africa Continental Free Trade Area in 2021. Africa's food market is expected to reach \$1 trillion by 2030 (World Bank, 2013).

Box 1. MoA High-level Targets

Target area	Current Status	High Level Target by 2030
Seed Availability	Demand: 130,000 tons	Availability: 250,000 tons
	Availability: 64,000 tons	
	Deficit: 66,000 tons	
Seed Accessibility	Current Number of Agro-dealers: 3,000	12,000 agro-dealers (one per village)
Seed Utilization	Current area planted with improved seed: 3 mil ha	Area planted with improved seed: 6 million hectares
	Smallholder farmers using improved seed: 33%	Smallholder farmers using improved seed: 66%

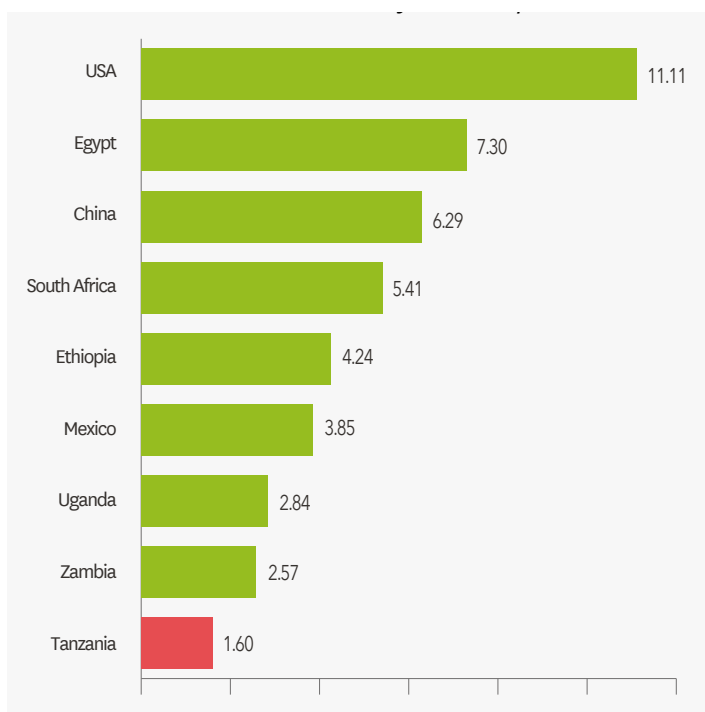


Figure 1. Maize yield in ton/ha

Efficient use of Tanzania's abundant land and water resources is critical for adopting improved seeds and fostering crop yields. Insufficient water supply has been one of the reasons for this low utilization rate of improved seeds and, consequently, low yields since water for irrigation is critical to the production of early-generation seeds and the multiplication of certified seeds. Tanzania has abundant natural resources and diversity in agroecology from temperate to semi-arid climates and lowlands to the highest point on the African continent. These conditions provide the country with yet another opportunity to produce for the rest of Africa. There is a need to transform the comparative advantage based on its natural resources (e.g., the three largest water bodies in Africa, several large rivers, and rich soils) to an economic, competitive advantage with a leap in productivity and generating an increased surplus for exports both for the seed and the grain (food).

To help Tanzania tap this potential, the Tanzania Seed System Development Strategy (TSSDS) aims to increase the adoption of improved seeds and average crop production.

Methods

TSSDS aims to transform Tanzania's current seed system into a dynamic, sustainable, efficient, and equitable version. International Water Management Institute, on behalf of CGIAR's Ukama Ustawi Initiative and ASPIRES with USAID's Sera Bora Program, partnered to technically support the Ministry of Agriculture in achieving this goal. We seek improvements in the seed sector in seven categories selected based on a literature review and prior consultations that shape TSSDS's core. Four of these categories are the main pillars: production, availability, accessibility, and utilization of seeds. The three remaining are crosscutting: capacity strengthening, financing, and the enabling legal, policy, regulatory, and institutional environment. We identified key expected outcomes and key performance indicators for each category. A participatory method we call co-creation (characterized by stakeholder participation, inclusivity, and openness) was used during empirical data collection. We conducted fieldwork in three zones (Arusha, Iringa, and Morogoro) in March-April 2024. We brought together about 150 participants from different backgrounds in the seed industry to make creative inputs based on their respective roles in the seed sector value chain (e.g., farmers, extension officers, and agrodealers). These participants were grouped separately for focus group discussions, mainly targeting their nodes, and then all participants were given the opportunity to present their key findings and discuss them in plenary. The node focus enabled them to concentrate on their different roles, interests, and expertise through focus group discussions (FGDs). Participants were informed about the purpose of the discussions and invited based on who we thought was able, willing, and ready to share information and eager to participate in discussions. A checklist of data and information required was shared with those who accepted the invitation so that they could familiarize themselves with the information requested before



Photo: Lien Arits / IWMI.

FGDs and collect inputs from their networks.

A deep dive into getting experts' opinions on the seed system (beyond the FGDs) was necessary. These experts were consulted about the following specialized matters:

- Research to develop new seed varieties with higher yields, alignment with consumer preferences, disease and drought tolerance, and nutritional quality.
- Establishment of quality assurance protocols and standards for seed production, handling, and storage.
- Guidance on seed certification procedures, seed testing methods, and quality control measures to ensure that seeds meet regulatory requirements and perform well in the field.
- Policies, regulations, and institutional frameworks related to seed systems. The experts offered recommendations for policy reforms, regulatory harmonization, and institutional strengthening to create an enabling environment for seed sector development, investment, and innovation.

We also used these experts to get feedback on human capacity, physical infrastructure, and financial constraints since this information can only be obtained from well-informed individuals within the seed system.

Findings

Principal findings based on fieldwork FGDs in each of the four information categories were as follows:

Production: The underlying key challenges in the production of early-generation seeds (EGS) include an inadequate supply of breeder, pre-basic, and basic seeds due to shortage of skilled personnel and inadequate infrastructure, especially irrigation infrastructure to span production beyond the rainfall season

and lack of storage facilities to allow safe storage of breeder and pre-basic seeds for the following seasons. Challenges related to the production of certified seed include a lack of interest by private seed companies to be involved in open-pollinated variety (OPV) seed production due to the low demand caused by the fact that most farmers recycle instead of buying new seeds for each season, as well as inadequate land for seed multiplication (Louwaars and Manicad, 2023).

Availability: Stakeholders mentioned that the biggest challenge in terms of seed availability is inadequate production and distribution networks (20% of respondents). A group of agrodealers argued that because of the inefficient seed production systems, quantities of seeds produced are insufficient and fail to meet farmers' demand. This shortage particularly affects remote rural areas where farmers face limited access to markets and distribution networks. On another note, farmers in the three regions stated that geographical disparities and inadequate distribution networks have led to unequal distribution of seeds, with certain communities having better access to seeds than others. This has exacerbated disparities in agricultural productivity and has contributed to seed insecurity in some rural settings. Extension officers, NGOs, and government officials cited that weak distribution networks result in delays and mishandling during transportation and storage and, inevitably, delayed seed delivery to farmers, leading to poor availability of quality seeds.

Accessibility: The high cost of quality seed was the most important challenge affecting seed availability, as mentioned by 26% of all stakeholders. It was stated that smallholder farmers often have limited financial resources and find it difficult to afford the high upfront costs associated with purchasing improved seeds. As a result, they usually opt for cheaper, low-quality seeds or rely on traditional seed-saving practices, which result in low yields. Seed producers and breeders mentioned that the high cost of improved seeds leads to low adoption rates among farmers, particularly those with limited access to credit or other financial services. With limited financial resources, farmers become

reluctant to invest in expensive seeds without assurance of their performance or profitability, especially if they face uncertain market conditions or weather-related risks. FGDs with NGO participants added that the high cost of improved seeds does not only affect low-income families but highly disproportionately affects vulnerable groups, such as women, youth, and marginalized communities, who have limited access to productive resources and face additional socioeconomic barriers. Agrodealers and extension officers pointed out that high prices pose challenges for seed producers regarding market competitiveness, as they struggle to attract buyers willing to pay higher prices for improved seeds. This limits the scale of seed production and investment in research and development of new seed varieties, ultimately negatively affecting seed availability in the market. Another challenge is the high transport costs to remote areas and poor road conditions. High transport costs discourage seed suppliers from reaching remote areas where the population shaping the customer base is widely dispersed.

Utilization: FGDs showed that the first and arguably the most pressing challenge regarding seed utilization is limited farmers' awareness and training (21%). Lacking awareness and training drives farmers to struggle to select the most suitable seeds for their specific agroecological conditions, cropping systems, and market preferences. As a result, many farmers in Tanzania end up using seeds that are ill-suited to their needs, leading to lower-than-average yields, lower-quality crops, and reduced profitability.

Another challenge is inadequate extension services (13%). The FGD participants explained that extension services are often the primary source of information for farmers on new seed varieties, improved farming techniques, and market trends in Tanzania. Thus, when extension services are inadequate or unavailable, farmers lack access to critical information to make informed decisions about seed selection, management, and utilization.

Strategic Focus Areas for the Tanzanian Seed Sector

Several strategic focus areas outlined in this section will shape the essence of the TSSDS. These areas were identified based on the literature review, FGD findings, experts' consultations, and firsthand observations from fieldwork and research station visits. They are as follows:

The government of Tanzania must build a robust and effective crop breeding research program that will result in farmer and market-preferred varieties. This will call for human capacity, infrastructure, and financial resources. Strategic plans must be created for each research center following the broad strategic plan of the Tanzania Agricultural Research Institute (TARI) and contain an elaborate monitoring, evaluation, accountability, and learning (MEAL) plan. Currently, the number of scientists employed at TARI centers is low. Not enough staff is trained at PhD level. The staff lacks the experience and knowledge available to international experts, putting them at a

competitive disadvantage. Each crop should have at least one specialized breeder with a PhD degree and a younger scientist to support and understudy the senior scientist for every center by 2030. Effective breeding requires diversity in germplasm (building block). Research centers must maintain a diverse germplasm collection to ensure a wide genetic base for breeding but currently lack facilities for the safe maintenance of germplasm or breeder seed. In addition, they have limited capability in maintaining the EGS of released varieties due to a lack of processing facilities, cold rooms for maintaining the viability of seeds, and lack of funding and knowledge. Stakeholders recommended that the Tanzania Seed Certification Institute (TOSCI) has a gene bank to keep a reference set of released varieties and can assist with some of these problems.

Infrastructure and funding available at research centers are inadequate. Each research center needs to improve machinery and equipment to assist in mechanical land preparation, weeding and pest control, harvesting, drying, threshing, sorting, packaging and storage, a well-equipped laboratory, a reliable irrigation system, and sustainable funding. Funding is a major constraint. Through strategic planning, annual review and planning meetings, centers should include budget for the operational costs which should be approved and funded on time.

Producing high-quality EGS to meet standards and demand requires a systematic approach. EGS includes breeder, pre-basic, basic, and registered seeds critical for maintaining the genetic purity and quality of crop varieties. Their production must be supported by proper irrigation and not rely on rainfall. Moreover, adequate land for their production must be available. Excess land held by the Agricultural Seed Agency (ASA) can be used by private seed companies and willing large-scale farmers to produce seeds.

Collaboration with other research institutions, universities, CGIAR centers, and private companies is important to share resources and knowledge and to improve breeding to meet farmers' needs. TARI and ASA should conduct market surveys or digital platforms and engage with stakeholders, quality-declared seed (QDS) producers, seed companies, and extension services to estimate the demand for different crop varieties. This will allow the production of different classes of EGS based on demand. Certified seeds sold in Tanzania by regional or international companies are mostly imported. The government encourages them to produce their seeds within the country.

Public seed institutes (i.e., ASA and TARI) should operate as businesses by ensuring that they conduct market surveys and engage with stakeholders, including farmers, seed companies, and extension services, to estimate the demand for different crop varieties and develop a detailed production plan that aligns with the projected demand.

Concerning seed availability, public and private seed companies must ensure that produced seeds meet the quantity and quality demanded by farmers and are packed and distributed in a timely manner aligned with the crop cultivation calendars. In addition, developing a robust

supply chain is necessary to transport seeds to agrodealers that stock seeds. Supporting a regional value harmonization to support trade as an aspect of value chain development is paramount, as the literature addressed (Rohrbach et al., 2003).

It is recommended to expand the agrodealer and seed retailer networks to improve the availability of seeds in remote and rural areas. It is also important to ensure that farmers are informed about the availability of different types of seeds and their specific benefits and prices, which can be achieved through establishing digital platforms, which include SMS and WhatsApp services, as well as through agrodealers and extension staff.

Capacities of agrodealers and extension staff can be enhanced through training and of farmers through training, field days, and seed fairs. The Ministry of Agriculture's seed coordination unit, in collaboration with the Tanzania Seed Traders Association (TASTA), can maintain a vibrant digital platform that will display in real-time varieties available and where and provide other relevant details that can help prospective buyers make decisions on procuring them.

Key interventions around seed accessibility must include improving logistics and infrastructure for seed storage, transportation, and distribution to ensure timely seed delivery. The government is recommended to implement programs that provide seeds at subsidized rates to ensure affordability, guide seed producers to pack seeds in small (2kg), medium (5-10 kg), and large packs to give farmers flexibility in buying according to their needs and facilitate loan options to help farmers overcome their financial

restrictions, enabling them to purchase high-quality seeds.

Farmers' existing knowledge of seed utilization is not always sufficient. This must be improved with training and supported by agrodealers, government extension services, and NGOs who will educate farmers on appropriate seed choice based on climate variability and agroecological conditions and continuously build knowledge of corresponding best seed utilization practices. Training packages must involve awareness-raising components on authentic TOSCI labeling to reduce the use and sales of fake seeds. Facilitating information exchange among farmers and information dissemination through TV, radio, field days, and demonstrations are necessary to improve seed utilization practices. Lastly, it is crucial to inform farmers that seeds alone cannot help high-yielding seed varieties reach their yield potential. Instructions regarding the use of other inputs, such as fertilizers, as well as good agricultural practices pertaining to varieties, must be included in all training packages.

Creating an enabling legal, policy, regulatory, and institutional environment for seed is critical. For the seed system to remain relevant, it must contribute to and adhere to the protocols agreed upon regionally and globally while observing Tanzania's short-, medium-, and long-term agriculture and seed sector goals. Various instruments exist nationally (TOSCI, ASA, TARI, the ministerial seed coordination unit, and TASTA) and internationally (International Seed Testing Association, International Union for the Protection of New Varieties of Plants, and the Rules and Regulations of the OECD Seed Schemes). These must be used to provide a level playing field to all seed sector participants.



A group of participants in sessions. Photo: ASPIRES.



Conclusion

Deliberate and strategic investments in these strategic focus areas and ensuring that the MEAL system is implemented with effective and efficient coordination among key seed value chain actors will help achieve the targets by 2030. The ultimate goal is to contribute to increased agricultural productivity, food security, and economic growth in Tanzania.

Based on strategic interventions tailored by the government according to these focus areas, we expect several outcomes:

- Enhanced research and development will yield high-performing seed varieties tailored to local agroecological conditions, addressing specific challenges such as climate variability and pest pressures.
- Empowering farmers with knowledge and skills in good agricultural practices, including seed selection, planting techniques, and crop management, will enable them to make informed choices and maximize the potential of improved seeds.
- Strengthening seed production systems through rigorous quality control measures and certification processes will ensure the availability of reliable and high-quality seeds for farmers.
- Building strategic alliances and fostering collaboration among government agencies, research institutions, private sector actors, agro-dealers, extension staff, NGOs, and farmers' organizations will help facilitate efficient dissemination and adoption of improved seeds across diverse farming communities.
- As the above unfolds, we anticipate intermediate outcomes, including increased access to improved seeds, enhanced agricultural productivity, improved resilience to local climate variability and environmental stressors, and strengthened seed markets.

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The authors

David A. Nyange, PhD, Associate Professor, Michigan State University. (dnyange@gmail.com), Idil Ires, PhD, International Water Management Institute South Africa. (i.ires@cgiar.org)

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The CGIAR Initiative on Diversification in East and Southern Africa, also known as Ukama Ustawi aims to help smallholders transition to sustainably intensified, diversified, and derisked agri-food systems based on maize in 12 ESA countries. Specifically, it seeks to enable 50,000 value chain actors, including farmers (at least 40% women, 40% youth), to adopt climate-smart maize-based intensification and diversification practices and one million to access digital agro-advisory services. Emphasizing the role of the private sector in driving such transformation, UU targets to support at least 60 start-ups and SMEs.

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International Water Management Institute (IWMI)

Headquarters
127 Sunil Mawatha, Pelawatte,
Battaramulla, Sri Lanka

Mailing address:
P. O. Box 2075, Colombo, Sri Lanka
Tel: +94 11 2880000
Fax: +94 11 2786854
Email: iwmi@cgiar.org
www.iwmi.org

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