



Perspectives on sustainability of smallholder seed enterprises: a case of African indigenous vegetables in Tanzania

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Summary

Between 2013 and 2016, CABI's Good Seed Initiative (GSI) worked with partners in Tanzania to strengthen the seed system for Africa Indigenous Vegetables (AIVs) through promotion of farmer seed enterprises using two models - contract farming (Arusha) and Quality Declared Seed (QDS) (Dodoma). This study, conducted in 2019 aimed to assess the sustainability of farmer seed enterprises and project strategies that were important in satisfying the continued functioning of farmer seed production, 3 years after GSI project closure. Data were collected through focus group discussions (FGDs) (73 men, 69 women), and individual interviews with seed sector stakeholders. Results show that farmer seed enterprises under both models continued to thrive, creating avenues for income diversification and contributing substantially to household incomes (>50%). Quality Declared Seed was a viable strategy for providing quality seed to farmers, in central Tanzania (Dodoma), which lacks a strong formal seed sector. However, QDS production was challenged by lack of access to foundation seed, extension services, inspections and seed testing services, which are key for quality seed production. Contract farmers in Arusha continued to engage in contractual arrangements with seed companies for bulking AIV seeds, including globally important vegetables such as tomatoes and onions, building on farmers' experience in producing AIV seed. Two interviewed seed companies reported an increase in contracted seed quantities in Arusha and Manyara regions from 14 MT (2016) to 41 MT (2019), and an increase in the number of contracted farmers from 112 to 250 in the same period. However, contract farming was dominated by men, due to land ownership and decision-making dynamics, and challenges still existed emanating principally from how they were negotiated. Linking seed producers to the market through innovation platforms and contracts, stimulation of demand for AIVs through nutritional awareness, and promotion of the value of using quality seed for increased productivity were important in ensuring the continued functioning of farmer seed enterprises. The commercial viability of seed production also provided incentives for continued seed production. Development efforts supporting farmer seed enterprises should consider facilitating women to equally participate and take advantage of the benefits of contract farming to the same extent as their male counterparts. Government mandated agencies should support the functioning of the QDS system to facilitate the continued supply of quality seed in areas less served by the formal seed sector, and for crops not well integrated into the formal system.

Key highlights

- Farmer seed enterprises under QDS and contract farming continued to thrive in the two study locations, providing financial benefits to seed producers and the community at large.
- The quantity of AIV seed produced and number of farmers producing seed more than doubled under either system.
- Market linkages, nutritional awareness campaigns, and promotion of the value of using quality seed for increased productivity were important in supporting the continued functioning of farmer seed enterprises.
- Seed policy regulations, especially quality assurance should be implemented to ensure production and distribution of quality seed.

Context

African indigenous vegetables (AIVs) have traditionally been significant contributors to food, nutrition and income for smallholder farmers in East Africa, providing important sources of micronutrients, fibre, vitamins and minerals (Ghosh-Jerath et al., 2016), and increasing dietary diversity (Ochieng et al., 2018). They are an important means of livelihoods for thousands of supply chain actors, especially for women and youth who play a central role in production, and almost exclusively in handling and marketing of the AIVs (Dinssa et al., 2016; Weinberger et al., 2011). Demand for AIVs is also increasing in peri-urban and urban areas, especially for low-income populations that constitute the majority of town and city dwellers in sub-Saharan Africa (Dinssa et al., 2016). However, gaps in access to quality seed significantly affect the production and supply of AIVs (Afari-Sefa et al., 2012; Croft et al., 2018). Weinberger et al. (2011) estimate that the share of traditional vegetable seed sold in the formal market is 10%. This gap is principally due to underdeveloped seed supply and distribution systems, and a general lack of structured seed markets for AIVs (Afari-Sefa et al., 2013).

What we did

CABI's GSI in Tanzania worked to strengthen the seed system for AIVs through the promotion of farmer seed enterprises, between 2013 and 2016. Farmer seed enterprises were organised under two distinct systems: certified seed production through farmer contracts (out grower scheme) with commercial seed companies in northern Tanzania (Arusha), and QDS production in central (Dodoma) Tanzania. Farmer training in quality seed production and marketing, and promotion of the value of using quality AIV seed for increased productivity were done. Innovation platforms (one in Arusha and one in Dodoma) were established to discuss bottlenecks along the value chain and find joint solutions, and link seed producers to seed buyers. Innovation platform participants included seed companies (public and private), agro-dealers, researchers, nutritionists, farmers, processors, representatives from the Tanzania Official Seed Certification Institute (TOSCI) and Agricultural Seed Agency (ASA), and other relevant stakeholders in the AIV sub-sector. Awareness campaigns – focusing on the health and nutritional benefits of AIVs, preparation and cooking techniques, post-harvest processing and value addition – were also held to help enhance consumption of vegetables to stimulate local demand for AIVs and therefore for quality AIV seed.

When the project ended in 2016, 74 farmers (30 women and 44 men) in Dodoma had been trained and registered with TOSCI as QDS producers. In Arusha, 26 farmers were producing a range of AIV seed under contract for seed companies. An outcome evaluation undertaken at the end of the project indicated that farmers had increased their income, and household dietary diversity, while market linkages had also improved. While this was good news, the initiative's sustainability is likely to depend on its ability to continue to deliver benefits to seed producers (FAO & ICRISAT, 2015), as well as proper functioning of the system that supports quality seed production and distribution, innovation along the value chain, and appropriate regulation (van Etten et al., 2016).

This study aimed to assess the sustainability of farmer seed enterprises and evaluate project strategies that were important in satisfying the continued functioning of farmer seed production, three years after GSI project closure. Data were gathered in August 2019, from Arusha (Arumeru district) and Dodoma (Kongwa and Mpwapwa districts). Six FGDs involving 142 farmers (73 men and 69 women) from seven communities were conducted. Participants included farmers trained by the project, and some who were

not, but resided in communities where GSI interventions were implemented. Key informant interviews were also held with agro-dealers, seed companies, TOSCI, ASA, and extension workers in both regions to understand the performance of the two seed production models, and policy elements supporting AIV seed sector functioning. Perspectives of the assessment are important to guide policy and practice in seed system development.

What was achieved?

Benefits of AIV seed enterprises

The aim of farmer seed production is to contribute to increased access to quality seed, contributing to food system benefits in the long run. The benefits can be for project participants, as well as the wider community. This may take the form of inclusive participation by farmers (social), creation of opportunities for commercialization by farmers (economic), and utilization of sustainable production practices (environmental). The following benefits were reported by study participants.

Increased availability of quality AIV seed

Seed companies and agro-dealers indicated that farmer seed production contributed to an increase in availability of quality AIV seed. They indicated that the quality of farmer-produced seed had consistently improved, owing to their increasing experience in seed production, processing and handling. In particular, seed companies confirmed that seed obtained from seed producers had better germination rates, was true to type, as well as clean and pure. As a result, the rejection rate by seed companies had reduced from about 20%, 3-4 years ago, to less than 5% in 2019. Vegetable growers also reported increased availability of quality seed which enhanced seed access for seasonal planting, especially in Dodoma where seed production was under QDS.

However, differences existed in farmers' perceptions on availability of quality AIV seed between Arusha and Dodoma. In Arusha, where seed production was carried out under contract, all farmer produced seed was sold to the seed companies and hence seed sales within the community were minimal, occurring only when seed producers had excess production (above contracted quantities). Without the ability to buy from local seed producers directly, vegetable growers continued to source seed from agro-dealers at prevailing market prices, which were comparable to 2016. In Dodoma, seed users stated that there was an increase in the number of local seed producers which enhanced seed availability. With the knowledge gained on seed quality attributes and seed selection, farmers in Dodoma were able to produce seed for own consumption instead of relying on formal markets.

Increased production and consumption of AIVs

A majority (75%) of households in the study areas grew AIVs, dominated by *Amaranth spp.*, Africa nightshade, Africa eggplant, and Ethiopian mustard. Households produced vegetables primarily for sale (70-90%) and the remainder for home consumption. The number of households entering production of AIVs grew steadily from 2016, with more men and youth being attracted to the subsector because of the increasing potential for income. In all the communities, the estimated increase in the number of vegetable producers was over 100%. Farmers reported that the increase in the number of producers and quantity of vegetable produced was driven by increased access to better quality seed within the

community, and better farmer knowledge and skills on AIV production based on training received through the GSI project. There was also a reported increase in consumption of AIVs by households, attributed to increased awareness of the nutritional/health benefits of consuming vegetables, which increased demand for AIVs. Farmers also indicated that attitudes towards vegetables greatly changed and they were no longer considered a 'poor-man's food' or 'fodder for livestock', a highly held misconception in the past. This further propelled the consumption of AIVs, which saw growers supply markets outside their communities. Farmers mentioned the emergence of speciality restaurants in Arusha that serve AIVs to their clientele; and farmers in Kongwa district indicated that they sold amaranth to Dar es Salaam city, more than 200 km away.

Improved livelihoods and social status in the community

Both seed business models worked well, creating avenues for income diversification and substantially contributing to household incomes. Besides selling seed, growers also sold AIV by-products, such as amaranth leaves cleared during thinning of direct seeded crops, and leftover fruits for tomato and eggplant once the ones for seed had been harvested. These provided an additional source of income and an important component of household nutritional needs. Respondents estimated that AIV seed production contributed over 50% of total household income. Welfare benefits from the AIV seed income included; improvement in household dwellings by constructing durable houses, paying school fees, and purchase clothing and medical care for their families. In addition, some invested in other income-generating ventures such as the construction of rental houses, procurement of water pumps for rent by fellow farmers, establishment of micro-enterprises, and investment in transportation services.



I used to sell food in a makeshift tent, earning from hand to mouth. In 2013, I underwent training in seed production by GSI partner Inades Formation. I then started growing seed for Amaranth, Africa nightshade and Africa eggplant. I sold most of the seed within the community but since I sold in small quantities, I could not raise enough money to start a business. In 2016, I had a stock of 150kg of Amaranth and a seed merchant bought all of it at once giving me a total of TZS 450,000. I immediately invested it in retail business. I earn sufficient income from the business to provide for me, my daughter and three grandchildren. I still grow seed given the income benefits.
Zainabu Musa, from Tubugwe village, Kongwa district, Dodoma

In comparison to traditional crops, respondents mentioned that AIV seed fetched a higher value per unit, and its early maturity provided a regular income because farmers were able to plant several crops per growing season (2-3 times a year) compared to key staples that were grown only once a year. For example, the average earnings from Amaranth seed production in Dodoma was estimated at Tanzania Shillings 1,800,000 per ha (approx. US\$ 857) with 2-3 crops per season, which surpassed income from production of traditional crops such as

I have been producing amaranth seed since 2013 when the GSI project started to work with farmers in this village. From the sales, I have taken my children to school and provided basic needs for my family. Most importantly, I have constructed a brick house for my family. **Loti Malekela** from Ng'humbi village in Kongwa District, Dodoma.



maize, sorghum and sunflower estimated at Tanzania shillings 420,000 per ha (approx. US\$ 200) per season, according to FGD participants. Contract growers said they earned, on average, Tanzania shillings 400,000 per ha (US\$192) from AIV seed production. However, it should be noted that seed producers generally operated small plots ranging from 0.1 - 0.4 ha.

Seed system functioning

Seed system sustainability relies on the proper functioning of three key processes: (1) production and distribution of quality seed, (2) innovation for enhanced productivity, resilience and product quality, (3) regulation to ensure quality and varietal identity of seeds circulating in the system (van Etten et al., 2016). The three processes are discussed below in light of this study.

Quality seed production

Seed production under both seed business models continued, and the number of producers and quantities of AIV seed produced increased. In Arusha, more seed companies entered into contracts with farmers to bulk seed for AIVs. Farmers were also contracted to grow seed for non-indigenous vegetables e.g. tomato (*Solanum lycopersicum*), cucumber (*Cucumis sativus*), and okra (*Abelmoschus esculentus*), owing to the expertise they had demonstrated in quality seed production of AIVs. Similarly, in Dodoma, more farmers entered into seed production owing to increased demand for quality seed. For example, in Tubugwe village, Kongwa district, only two farmers were trained in seed production by the project, but up to 80 farmers were growing seed in 2019. In other study locations, the respondents also confirmed an increase in seed producers.

However, there were noticeable differences in access to services and inputs necessary for quality seed production between the two seed enterprises models. Seed producers under contract continued to access extension, quality assurance, and seed testing services, provided by contracting seed companies. Seed companies also provided inputs (foundation seed, fertiliser, pest control products), as well as cash advances to facilitate critical production activities such as seeding, harvesting, seed processing and transportation. Cash advances ranged between Tanzania shillings 71,000 and 120,000

per ha (approx. US\$ 33 - 57). However, in Dodoma, there was limited technical support to seed producers after the project had ended, and access to finance was only possible through the informal financial sector. QDS producers also lacked access to foundation seed, and seed inspections and seed quality testing had ceased to take place, so produced seed was not true QDS.

Seed distribution

Seed marketing for contract farmers in Arusha was straightforward since seed companies bought all the contracted seed at an agreed price, providing guaranteed markets. After 2016, more seed companies had entered into contracts with farmers for AIV seed production. In 2019, 45 farmers in the three study villages in Arusha had AIV seed production contracts with six seed companies – East Africa Seed Company, Beula Seed, East West Seed Company, Alpha Seed Company, AfricAsia Seed company, and Kibo Seed Company, up from three companies in 2016. Interviews with two of the seed companies (EA Seed and AfricAsia) confirmed an increase in the amount of farmer contracted seed in the region (Arusha and Babati), and interest by other seed companies to work with farmers for seed bulking. The two companies had increased their seed contracts from 14 MT (2016) to 41 MT (2019) for AIVs and other vegetables, and contracted farmers increased from 112 to 250 in the same period.

In Dodoma, QDS producers had been linked to agro-dealers during the multi-stakeholder platforms. In 2019, QDS producers confirmed that they were still supplying seed to the same agro-dealers they had connected with during the project, and also established links with other seed buyers including seed merchants, who source seed directly from communities where it was produced. Seed merchants and agro-dealers bought, on average, 150 kg of seed, and one agro-dealer bought up to 5 tons of amaranth seed from farmers in 2018. Seed sales within communities were mainly in small quantities (20-100 g).

Seed regulation

Farmer seed production is embedded in the Seeds Act 2003 and Seed Regulation 2007. Farmers can produce certified seed under supervision and contract by seed companies, and the contracting seed company is responsible for ensuring quality assurance. Initially, QDS sales were restricted to the ward they were produced in but, by helping to demonstrate the high quality of seed produced under QDS regulations, the GSI project contributed to advocacy initiatives – undertaken by the Integrated Seed Sector Development (ISSD) and others. A review of the Seeds Act of 2003 and the Seed Regulation of 2007 by the government, allowed QDS sales to take place across all wards within a district (Seed Regulation 2017), which opened up more market opportunities for registered and trained QDS seed producers.

Challenges to seed system functioning

While seed production under both models continued, with associated benefits to farmers and the wider community, there were also challenges faced by farmer seed producers, some of which are unique to the different seed production models. Some of the key challenges faced were:

- *Lack of access to foundation seed and quality assurance for QDS growers.* Farmers reported that since the project ended in 2016, they have not had access to inspection services, which affects not only the quality of seed produced, but also market prospects for QDS. The lack of inspection, and therefore proper packaging, leads to a lack of market differentiation between QDS and other farmer-

produced seed, which creates competition and low prices for farmers that follow the QDS production system.

- *Fragmented markets for QDS.* While QDS farmers expanded their markets, they reported that the market for seed was fragmented and not consistent and, as such, they could not plan their seed production appropriately; what quantities and which seed crops to produce. In addition, the piece meal sales only provided small payments yet the required investments usually needed lump sum cash payments.
- *Challenges in negotiating and adhering to contracts for farmers under contract farming.* While contract farming provided an assured market for farmer-produced seed, trust issues emerged, resulting in opportunistic behaviour in contractual relationships. Producers expressed dissatisfaction with: delayed disbursement of cash for critical operations; lack of transparency in the contracts, coupled with unfair negotiations (some contracts were still in English, which was an issue for farmers that neither read nor understand English); delayed payments for delivered seed; biased or unclear rejection practices; and failure of some companies to collect seed from farmers despite the contracts. Women reported that they were generally excluded from contract farming as most seed companies preferred entering into contracts with land owners (mainly men), despite women providing the most labour for seed production and processing.
- *Limited farmer knowledge in seed production.* While some seed producers were trained under the GSI project, new entrants into QDS production relied on farmer-to-farmer learning, which cast doubt about their acquired skills. Indeed, this study identified knowledge gaps from discussions with farmers, in particular on quality seed standards, relevant agronomic practices, seed storage, field monitoring, pest and disease management, and appropriate use of chemicals.
- *Climatic and other abiotic challenges.* During the FGDs, seed producers from both regions (most of who were growing under irrigation) mentioned that they faced climatic and environmental challenges, which have led to water shortages. In order to enhance seed production, and other agricultural activities, introduction of innovations in irrigation water management through training, and supporting access to appropriate low-cost irrigation equipment and water conservation technologies, will be key for continued seed production amidst declining precipitation and climate variability.

The way forward

The study results show that farmer seed production continued to thrive after the GSI project closure, providing a sustainable supply of quality seed for vegetable producers. This contributed to the livelihoods of a large number of households in the communities where seed was produced, particularly in Dodoma where seed production was under QDS. Seed producers also obtained income benefits from production and sale of quality seed, implying that farmer seed enterprises are commercially viable. The factors that contributed to the sustainability of the farmer seed enterprises included; 1) the commercial viability of seed production that provided households with an alternative source of income; 2) awareness activities on the value of AIVs for health and nutritional benefits increased demand for AIVs which in turn acted as a pull factor for the rise in demand for quality seed; and 3) the market-oriented approach and partnership building with the formal sector which provided an assured market for seed producers.

While farmer seed enterprises offer a potentially sustainable solution to the problem of seed supply, the challenge of implementing this approach remains formidable. In particular, the reported lack of access to early generation seed, and the lack of inspections and seed testing services under QDS render the seed not true QDS. This in turn poses challenges in vouching for seed quality because opportunities for seed adulteration abound, and also affects producers' access to premium markets due to lack of branding and product differentiation. There is a need to ensure implementation of seed policies and regulations to ensure production of true QDS that meets quality standards, particularly given increasing demand for quality seed. While contract farming was a success, there were some issues associated with contracts, emanating principally from how they were negotiated, and who was contracted. Women were generally excluded from contracts due to land ownership and decision-making dynamics at household level. Adoption of gender inclusive approaches in contract farming arrangements is therefore paramount.

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