KNOWLEDGE BRIEF

6

# Farmer-managed seed systems' essential role for food security and agrobiodiversity in Africa

Photo: ©2016 CIAT Georgina Smith

DeSIRA LIFT

Authors:
*James Onsando & Helena Posthumus*

## The importance of Farmer-Managed Seed Systems

**Farmer-Managed Seed Systems (FMSS) are community-based seed systems where farmers have control and rights over their seeds, using mainly local varieties, indigenous knowledge practices, and rules developed according to their customs as they adapt to their changing environment.[1]**

**In essence, FMSS serves as the foundational seed system for the majority of African farmers, especially smallholders, ensuring access to adapted seeds, preserving crucial biodiversity, supporting livelihoods, and contributing significantly to food and nutrition security and resilience, often despite limited official recognition and support. FMSS perform various crucial roles to ensure food and nutrition security (FNS) in Africa. This includes its contribution to seed security, food security, enhancement of genetic diversity of crop populations and *in situ* crop genetic resources conservation, and enhancement of communities' social networks.**

**Further, FMSS support local agrobiodiversity, contributing to essential ecosystem services such as pollination, soil conservation, and carbon sinks (Jarvis et al., 2011). On this basis alone the FMSS needs a much higher profile in the development agenda of seed by African Governments than is currently the case.**

## The importance of FMSS for seed security

FMSS make significant contributions to seed security by ensuring farmers have access to seeds with the required quality farmers are asking for. Seed security is defined as a situation where farmers are certain, year after year, to obtain the necessary quantity and quality of affordable seed to fulfil their production plans (FAO, 1998). Key attributes of seed security include the availability and access to quality seed, appropriate timing for planting, affordability, and equitable access for all farmers within a community.

**Importance of FMSS for seed availability.** FMSS are crucial for maintaining high seed diversity across crop species and varieties (including traditional varieties, indigenous crops, landraces and crop wild relatives), enabling communities to adapt to changing conditions and providing a vital gene pool for crop improvement and breeding (De Jonge et al. 2021; IDRC & IPGRI, 1999; Kameswara Rao, 2013). This diversity is essential for farmers to cope with stresses and risks in variable and unpredictable climatic, ecological, and economic environments (Almekinders and Louwaars, 2002; Niang et al., 2014; Nyong et al., 2007; Pascual et al., 2011). FMSS fills a substantial gap by providing seed for food security crops and minor or local food crops (such as landraces, indigenous vegetables, small grains, and root crops) that are often neglected by Commercial Seed Systems (CSS) due to a weak business case (AFSA/GRAIN, 2018; Almekinders and Louwaars, 2002; Pascual et al., 2011; Wynberg, 2024). FMSS operates as a culturally appropriate and practical system that provides biodiverse, ecologically resilient seeds, making it a vital complementary option for governments and farming communities alike to ensure seed availability and food security across Africa (AFSA/GRAIN, 2018). However, public data on volumes of FMSS seed used in the African agricultural sector remains scarce and incomplete. Seed volumes of cereals and legumes are

*1] Definition of FMSS, as formulated by the stakeholder validation workshop in Lusaka (October 14-18, 2024), organized by the African Union Commission.*

covered much more than roots and tubers or vegetables. Available data suggests that smallholder farmers source 60% to 90% of their seed for cereals and legumes from FMSS, depending on the crop, country, and context (Sperling et al., 2021). FMSS is often the sole supplier of seed of local food crops and vegetables in Africa (Almekinders and Louwaars, 2002; Wynberg, 2024).

**Importance of FMSS for seed access.** Within FMSS, farmers exchange seed through diverse channels which vary by crop and by community. The many and diverse channels deployed include farmers own saved seed, which is produced on farm, neighbours/relatives, local markets, NGOs, Governments, farmer organisations, agro-dealers, and contract growers. For commercial crops such as maize, rice and soybean, farmer source most improved seeds through agro-dealers and local shops which make part of the formal CSS. Small grains (sorghums and millets), legumes, roots and tubers, and vegetables, are predominantly sourced through FMSS channels instead. In a comprehensive study across five African countries (DRC, Kenya, Malawi, South Sudan and Zimbabwe) covering 40 crops, McGuire and Sperling (2016) show that farmers access over 80% of their seed from FMSS, with farmer-saved seed being the main source (60-65%), followed by local markets (15-20%). For vegetatively propagated crops (VPCs), neighbours, relatives and friends are still the most used channel of seed sourcing by local farmers. Use of social networks was noted as the major conduit in the access of VPCs, partly as the market option here is so limited (Sperling and Mcguire, 2010). It should be noted that the modalities of seed sourcing vary across crops and sites (Labeyrie et al., 2023).

**Importance of FMSS for seed affordability.** The FMSS networks ensure seed access, especially for the poorest farmers who may not have saved enough seed due to low production or urgent cash needs (Sperling and Loevinsohn, 1993; McGuire, 2001). Seeds in FMSS can be accessed through exchange, barter, gifting, or local purchase, reducing reliance on cash transactions. This makes seed accessible even to the poorest community members (AFSA/GRAIN, 2018). It is very difficult to find comparative price data for commercial seed and FMSS seed in the public domain. Where found, the data is scanty with many gaps, where FMSS seed is often ignored or considered as grain. Available data suggests that FMSS seed is generally cheaper than commercial seed, but the differences vary hugely by crop, location, and season (Onsando, *forthcoming*).

**Importance of FMSS for seed quality.** Within FMSS, quality seed is considered as seed that has been selected over the years for resilience against climate shocks, disease and insect pest attack and has consumer preferred organoleptic traits. In this system the farmer and consumer determine the quality, and it is predominantly based on trust relationships (Herpers et al., 2019), though farmers also use their own methods to assess the quality (e.g. AFSA, 2023a). Such FMSS methods for quality assessment, while functional, often lack the precision and objectivity of laboratory tests used in commercial seed production. Quality is thus defined differently in FMSS than in CSS. There are strong views among plant breeders and seed regulators that quality seed should be defined as seed that has been certified according to the OECD seed schemes and tested in the laboratory according to the International Seed Testing Association (ISTA) protocols and standards. According to the ISTA testing system, the seed must be compliant to physical, physiological, genetic and plant health attributes/standards to qualify as quality seed. This is, however, unattainable for seed produced within FMSS because of its reliance on natural gene flow for resilience which means that varietal material is not identical season to season, making formal varietal maintenance difficult. Furthermore, farmers intentionally manage a mix of varieties on the same plot to mitigate environmental risks. A good alternative for quality assurance is Quality Declared Seed (QDS), a semi-regulated seed certification approach recognized in various African countries, such as Tanzania, Uganda, and Ethiopia. It is considered a less stringent alternative to formal seed certification systems (FAO, 2006). The legal recognition of QDS is based on the premise that it is produced according to prescribed standards, making it trustworthy regarding its quality (e.g. appropriate germination rate, disease-free status, genetic and physical purity). It operates under nationally agreed but less stringent protocols compared to the formal CSS.

## The importance of FMSS for the preservation of genetic resources

While farmers' contributions to crop genetic resource preservation may not always be deliberate or conscious, these contributions are substantive, and address conservation needs that ex situ gene banks cannot fulfil. Further, smallholder farmers grow a greater diversity of crop species and varieties than large-scale farmers, thus supporting agroecosystem resilience (Labeyrie et al., 2023). This creates several unique opportunities for genetic resource enhancement through *in situ* conservation by FMSS:

1. FMSS enable agroecosystems to continuously generate new genetic resources through natural gene flow, thereby enhancing genetic resilience. Unlike gene banks, which can only maintain genetic material in its original collected state to prevent loss or degeneration, *in situ* conservation allows farmers to sustain living, dynamic systems. The improvement of local varieties for example, is majorly through the seed selection (using indigenous knowledge and customary rules) and natural gene flow. This approach accommodates both loss and addition of agroecosystem elements – a crucial mechanism for maintaining genetic evolutionary resilience (Labeyrie et al., 2016). This gives FMSS a significant role in the global management of Plant Genetic Resources for Food and Agriculture (PGRFA) (FAO, 1996).

2. *In situ* conservation provides modern plant breeding programs with access to desirable genes and traits from farmers' diverse gene pools that could be resistant to pests and diseases and adapted to a changing environment and climate (Dwivedi et al., 2008; Kameswara Rao, 2013). FMSS thus facilitates in-situ conservation of crop genetic diversity, which is critical for food system resilience as it allows for continuous evolution and adaptation to changing environments like climate change (Bellon et al., 2017; IDRC & IPGRI, 1999).

3. FMSS genetic resource conservation serves as a critical safeguard against the vulnerabilities inherent in ex situ gene banks, which face numerous risks including genetic drift within collections, seed viability loss, equipment failure thus loss of material, security threats, economic instability, inadequate funding, and obsolete equipment—often without adequate backup systems (IDRC/IPGRI, 1999; Frankel et al. 1995).

These genetic resource conservation opportunities collectively demonstrate the indispensable role that FMSS play in crop genetic resource preservation, complementing and strengthening formal conservation efforts through their unique capacity to maintain living, evolving genetic diversity. However, farmers face significant challenges in genetic resource preservation, primarily stemming from technical knowledge gaps. Effective *in situ* genetic resource conservation is inherently technical and technology-dependent, requiring expertise that extends beyond crop genetic resources to include crop wild relatives. This broader approach is essential because gene flow from crop wild relatives to crops serves as a critical mechanism for enhancing resilience against biotic and abiotic stresses. Such work demands specialized knowledge in genetics, plant taxonomy, molecular biology, and genotyping—skills typically beyond farmers' existing knowledge base.

The success of *in situ* conservation should not be measured solely by the number of preserved alleles or genotypes. More meaningful indicators include the number of farmers within a region who actively maintain local crop populations according to traditional practices and local criteria for their own benefit. Success can also be assessed through the integration of local germplasm into breeding programs that generate new varieties without displacing existing regional crop populations, or through the active exchange and flow of farmer varieties within and among communities. These alternative success metrics reveal that despite technical limitations, farmers possess valuable mitigation strategies to advance FMSS genetic resource preservation. Their traditional knowledge systems, community networks, and practical conservation methods remain vital components of genetic resource conservation, complementing rather than competing with formal technical approaches.

## The importance of FMSS for community social networks

**Social ties and networks.** FMSS are deeply embedded in social networks and cultural practices, facilitating seed exchange through gifting, barter trade, and trusted relationships, ensuring access for even the poorest households (AFSA/GRAIN, 2018; Bellon, 2004; Labeyrie et al., 2016, 2023; McGuire, 2001). Social interaction networks, such as kinship systems, strongly influence seed exchange networks. Studies (McGuire, 2008; Labeyrie et al., 2016; Wencélius, 2014) show that seed exchanges are favoured within residence groups and are often confined within ethnolinguistic groups, with most exchanges occurring among relatives. This highlights how social processes shape crop diversity by channelling seed diffusion.

**Community seed insurance.** FMSS are thought to function as a community seed insurance policy. Farmers who are more vigilant with their seed supply often provide for others who may not have seed for the planting season, particularly the poorest farmers who struggle to save seed. This informal system provides a crucial safety net for those who are socially connected within the community but may not work for farmers who are not socially well-connected (Sperling et al., 1993; McGuire, 2001).

**Intergenerational knowledge transfer.** FMSS are built upon intergenerational indigenous knowledge for seed selection, production, storage, and exchange, which is dynamic and supports continuous crop evolution (AFSA, 2023b; AFSA/GRAIN, 2018; De Jonge et al., 2021; Halewood and Lapena, 2016). FMSS further facilitate the intergenerational transfer of indigenous knowledge and innovations, preserving cultural practices and traditional food cultures. This continuous transfer of knowledge strengthens community identity and ensures the perpetuation of practices vital to the seed system. Despite its importance, indigenous knowledge and innovations have been ignored by some actors in the seed sector (Nyantakyi-Frimpong and Carlson, 2024) even though they are documented.

## Weaknesses and threats for FMSS

Several obstacles hinder the full potential and development of FMSS:

**Genetic erosion and loss of agrobiodiversity.** The promotion of hybrid seeds and other improved varieties has led to a decline in FMSS varieties, resulting in monocultures and varietal contamination, especially in maize (Bellon, 2004; Teshome and Nkhoma, 2010). Factors like land grabbing, climate change inducing genetic shifts, conflicts, and changes in food preferences also contribute to this loss. Further, there is a lack of awareness and technical knowledge among farmers regarding the presence and value of crop wild relatives, which are important genetic resources for crop improvement.

**Lack of knowledge and documentation of indigenous practices.** The indigenous knowledge that underpins FMSS, including seed selection, preservation, and quality assurance, is largely undocumented as it is passed down verbally from generation to generation, making it susceptible to distortions over time and erosion as national governments focus on formal systems.

**Lack of recognition, support, and policy integration.** FMSS historically receive minimal support, with governments and the private sector focusing primarily on the formal CSS (Wynberg, 2024). Currently, less than 0.5% of sustainable seed innovation investment focuses on FMSS, with most funding coming from multilateral, bilateral, and philanthropic sectors (Dalberg Asia, 2021). Furthermore, national legislation and policies often neglect or undermine FMSS, except for Mali, Uganda, and Zimbabwe, leading to insufficient recognition and support for farmer seed management practices (Herpers et al., 2019; Onsando, 2020; Vernooy et al., 2023). Furthermore, there is low involvement of farmers in the formulation of seed policies and legal frameworks, leading to irrelevant or ineffective laws (Munyi, 2022; Vernooy et al. 2023). Women, despite their crucial role as the custodians of FMSS, face marginalization and lack official recognition (Vernooy et al., 2023).

**Restrictive legal and regulatory hurdles.** In general, seed laws are framed to regulate the production of certified seed of registered varieties (Herpers et al., 2019; Louwaars, 2005). National and regional legislation often aims to harmonize seed laws that protect commercial breeders' rights (AFSA/GRAIN, 2015; Munyi, 2022). Consequently, many countries are establishing monopolistic rights over plant genetic resources, obstructing farmers' access to seeds and prioritizing commercial breeders' varieties at the expense of FMSS crop species and varieties (AFSA/GRAIN, Munyi, 2022; Otieno and Westphal, 2018). Formal seed laws often focus on standardized inspection and testing procedures, which risks criminalizing traditional seed trade (Herpers et al., 2019; Louwaars, 2005) and do not align with FMSS's trust-based quality assurance. Legislation in many African countries forbid the trade of unregulated (i.e. non-registered) seed, or provides only lukewarm support, giving the formal seed sector a comparative advantage (Louwaars, 2005; Vernooy et al., 2023). Indeed, current seed laws are rigid regarding registration requirements for seed producers, excluding most FMSS actors from formally producing and marketing seed (Munyi, 2022). The inclusion of farmers' varieties in formal variety release systems is challenging due to stringent, time-consuming, and expensive DUS (Distinctness, Uniformity, Stability) and VCU (Value for Cultivation and Use) testing criteria (Gisselquist et al., 2013), which farmers' genetically diverse landraces often cannot meet. A disparity exists between the typical characteristics of farmer varieties (with a high degree of genetic and phenotypic diversity) and the stringent requirements of formal seed certification systems based on rigorous tests such as Distinctness, Uniformity, and Stability (DUS) and Value for Cultivation and Use (VCU). Without these tests, farmers' varieties cannot be released and admitted to a national and/or regional variety catalogue, and thus not be traded in the formal seed markets.

**Technical and operational limitations.** FMSS typically cover minor or local food crops and landraces that do not attract investment from national or international seed companies (Wynberg, 2024). Varietal development is capital-intensive and long-term, compounded by low economies of scale that deter private investment (Jaffee and Srivastava, 1994). Farmers' varieties face taxonomic uncertainty, lacking the precision required for national, regional, or international recognition. The absence of isolation distance standards in FMSS seed multiplication and varietal descriptors means that farmers' selection is based on observable crop traits, resulting in bias and lack of genetic purity. There is a lack of specific, crop-by-crop regulations, protocols, and standards for seed available in FMSS. FMSS quality assurance methods, based on appearance and physical properties, lack the precision and objectivity of laboratory tests used in commercial systems. This is even found to be the case when using a Quality Declared Seed (QDS) system (Kansiime et al., 2021). Furthermore, data on FMSS remains fragmented, limited, and less robust compared to formal CSS.

**Market and distribution constraints.** Commercial seed distribution networks are more developed in urban and sub-urban areas. FMSS, on the other hand, are prevalent in rural areas with less infrastructural development (roads, agro-dealerships), hindering commercial farmers' seed exchange and access. FMSS face competition from industrial seeds, particularly hybrid maize, which are more visible and accessible due to government support and positioning of CSS.

**Perceived tensions and misconceptions.** Accusations that multinational seed companies and governments "violate" farmers' indigenous knowledge create tension and distort discussions on complementarity between FMSS and CSS (Munyi, 2022). Some views in the seed ecosystem ignore or dismiss FMSS as outdated or inferior, despite their significant contribution to food security (AFSA, 2024).

# Recommendations for strengthening and improving FMSS

## Strengthening policy and legal frameworks

**Protecting Farmers' Rights:** Governments should enact and enforce laws that safeguard farmers' rights to save, use, exchange, and sell their seeds within FMSS. These frameworks should include provisions for recognising FMSS, protecting against biopiracy and seed monopolies, and establishing mechanisms for community-based seed governance. Governments should shape legislation to allow farmers to freely exchange and sell seed within FMSS, thereby enhancing farmer livelihoods and food security. Some countries already permit this under certain conditions (e.g. Ethiopia, Malawi, Niger, Senegal, South Africa, South Sudan, Tanzania, Zambia, Zimbabwe).

**Customised regulatory procedures:** Governments should develop less stringent, farmer-friendly regulatory procedures and standards along the entire FMSS value chain, from selection to product packaging and marketing. Best local practices and farmer knowledge can inform these procedures and standards. Regulatory bodies should include farmers' varieties in variety release systems, potentially under different, less stringent criteria than formal CSS recognising their genetic and phenotypic diversity. For the inclusion of farmers' varieties in the variety release catalogue, a significant reshaping/restructuring of the variety release system is thus critical. Fortunately, this process has already begun in some countries (e.g. Benin, Ghana, Kenya, Malawi, Niger, Nigeria, Uganda) and these experiences can inform new protocols.

**Prioritising FMSS in national policies:** Policymakers should integrate FMSS practices and principles into national seed policies, recognising and promoting them as viable alternatives to formal CSS. The recognition of both CSS and FMSS systems will enhance their operational synergies as both are contributing to food and nutrition security. Inclusion of farmers in policymaking: Policymakers should ensure that smallholder farmers and their organisations are meaningfully represented in relevant authorities and policy-making bodies (e.g., seed sector government committees, variety release committees, and certification agencies) to guarantee FMSS-friendly legislation.

**Transboundary trade:** Regional Economic Communities should develop alternative mechanisms to facilitate transboundary trade of FMSS varieties and seed, overcoming phytosanitary challenges, to expand market access and enhance seed sovereignty.

## Sustainable funding and investment

**Increased funding for R&D:** Governments and development partners should allocate more resources for FMSS research and development to improve farmer plant breeding, seed selection and storage techniques, and to create robust community seed banks.

**Leveraging agricultural biodiversity and climate change agendas:** Stakeholders can use the topical nature of "green agriculture", climate action or agroecology to attract funding for FMSS, as it enhances agrobiodiversity, crop resilience and adaptation to climate change.

**Other funding options:** Governments can consider creating national funds for farmer seeds, compensation funds for local varieties, microcredits, and microfinancing, and simplifying seed certification to add value and improve farmer income.

## Recognition and documentation of indigenous knowledge

**Leveraging international platforms:** The African Union Commission can use international instruments like the UN Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) for strengthening advocacy for farmers' rights and FMSS recognition at national and continental levels (Coulibaly and Peschard, 2023; Munyi, 2022). The African Seed and Biotechnology Platform (ASBP) and its FMSS should develop a policy framework for the recognition and protection of FMSS in Africa.

**Anchoring indigenous knowledge in policies:** Governments should ensure that FMSS and its associated indigenous knowledge are formally recognised and anchored in government legal instruments (Coulibaly and Peschard, 2023). This will influence documentation and operationalisation and facilitate public sector technical and financial support. Ministries of Agriculture and public research organisations should systematically collect, consolidate, and document the indigenous knowledge that underpins FMSS, including variety/seed selection, quality assurance, preservation, storage, and exchange. This legitimises FMSS and provides a basis for future development and transferability of knowledge.

**Integrating knowledge into regulations:** Regulating bodies should integrate indigenous knowledge into seed regulations by developing FMSS-friendly quality assurance requirements that relax standards and simplify procedures for traditional and farmer varieties. This can lead to faster and cheaper variety releases, improved farmer incomes, and a greater diversity of well-adapted varieties (De Jonge et al., 2021; Santamaria and Signore, 2021).

## Enhancing Collaboration and Capacity

**Collaboration among stakeholders:** The African Union Commission and development partners should foster collaboration between governments, NGOs, research institutions, seed companies, and farmer organisations to create a supportive environment for both CSS and FMSS to flourish. This includes knowledge exchange, promoting fair market access for farmer-produced seeds, and advocating for policies that prioritise long-term sustainability.

**Embracing an integrated approach to seed system development:** Governments should support both CSS and FMSS, recognising their complementary roles rather than attempting to integrate them into one or transition FMSS to CSS. This dual approach can maximise benefits from both systems. Experiences on integrated approaches already exist, like ISSD Africa. The concept of Quality Declared Seed (QDS) offers a potential bridge, providing less stringent certification standards that can be leveraged to improve FMSS quality control while respecting local practices.

**Institutional capacity building:** Governments should create or strengthen FMSS departments within existing government agencies (research institutions, regulatory agencies, Ministries of Agriculture) to provide human capital, budgets, and infrastructural support. Note that the most effective oversight mechanism or regulation will be self-regulation by the farmers or farmer organizations after training. Governments and higher education institutes should commit to introducing FMSS curricula in educational institutions to develop technical human resources capable of supporting the entire FMSS value chain, from seed selection to marketing. Governments, public research organisations and universities should invest in agroecological research and extension services that support sustainable farming practices, biodiversity conservation, and climate resilience, engaging farmers in co-creation of knowledge.

**Promoting seed diversity through seed banks and exchanges**: Stakeholders should support the establishment of community seed banks and facilitate seed exchanges to promote the conservation and distribution of diverse and resilient seed varieties. These initiatives should be inclusive and grounded in seed sovereignty principles, ensuring farmers can access a wide range of locally adapted seeds and facilitate cross-border germplasm exchange. Researchers and plant breeders should use Participatory Plant Breeding (PPB) to involve farmers in crop improvement programs, allowing the development of new varieties adapted to local conditions and farmer preferences, including marginal environments.

## References

AFSA. 2024. AFSA Officially Launches 'Seed is Life' Campaign to Uphold Farmer Managed Seed Systems. Alliance for Food Sovereignty in Africa. April 25, 2024. https://afsafrica.org/news/afsa-officially-launches-seed-is-life-campaign-to-uphold-farmer-managed-seed-systems/

AFSA. 2023a. Building on farmer knowledge in seed quality control and quality assurance towards seed sovereignty in Tanzania. AFSA. https://afsafrica.org/wp-content/uploads/2023/12/abdallah_quality-control-eng.pdf

AFSA. 2023b. A women's lens on managing seed. Case study on gender dynamics in farmer managed seeds systems in Tanzania. AFSA. https://afsafrica.org/wp-content/uploads/2023/12/mruah_a-women_s-lens-eng.pdf

AFSA / GRAIN. 2018. The real seed producers: small-scale farmers save, use, share and enhance the seed diversity of the crops that feed Africa. https://www.grain.org/e/6035

Almekinders, C.J.M., Louwaars, N.P. 2002. The importance of the farmers' seed systems in a functional national seed sector. *Journal of New Seeds* 4(1-2): 15-33. https://doi.org/10.1300/J153v04n01_02

Bellon, M.R. 2004. Conceptualizing interventions to support on-farm genetic resource conservation. *World Development* 32(1): 159-172. https://doi.org/10.1016/j.worlddev.2003.04.007

Bellon, M.R., Dulloo, E., Sardos, J., Thormann, I., Burdon, J.J. 2017. In situ conservation—harnessing natural and human-derived evolutionary forces to ensure future crop adaptation. *Evol Appl.* 6(10): 965-977. https://doi.org/10.1111/eva.12521

Coulibaly, M., Peschard, K. 2023. *Towards legal recognition of peasant seed systems in Africa; the experience of Mali and Uganda*. MISEREOR, Aachen. https://www.academia.edu/109014247

Dalberg Asia, 2021. *Case Study: Investment in sustainable seeds for sustainable agricultural intensification.* Colombo, Sri Lanka: Commission on Sustainable Agriculture Intensification. https://archive.iwmi.org/cosai/sites/default/files/CoSAI_Seeds%20Case%20Study_0/index.pdf

De Jonge, B., López Noriega, I., Otieno, G., Cadima, X., Terrazas, F., Hpommalath, S., van Oudenhoven, F., Shrestha, S., Pudasaini, N., Singh Shrestha, D., Gauchan, D., Kasasa, P., Bwerazuva, T., Mujaju, C., Manjengwa, S. 2021. Advances in the registration of farmers' varieties: four cases from the Global South. *Agronomy* 11: 2282. https://doi.org/10.3390/agronomy11112282

Dwivedi, S.L., Upadhyaya, H.D., Stalker, H.T., Blair, M.W., Bertioli, D.J., Nielen, S., Ortiz, R. 2008. Enhancing crop gene pools with beneficial traits using wild relatives. In: Janick J. (Ed.) *Plant Breeding Reviews.* John Wiley & Sons. pp 179-230. https://doi.org/10.1002/9780470380130.ch3

FAO. 2006. 'Quality declared seed', FAO plant production and protection paper, 185, pp. 13. ISBN 92-5-105510-6. Available at: https://www.fao.org/4/a0503e/a0503e00.htm

FAO. 1998. International workshop on seed security (30th Nov. - 1st Dec 1997). Workshop Proceedings. D. Barin, 1999: Seed trade and seed security in developing counties.

FAO. 1996. Global plan of action for the conservation and sustainable utilization of plant genetic resources for food and agriculture. Food and Agriculture Organisation of the United Nations, Rome.

Frankel, O.H., Brown, A.H.D., Burdon, J.I. 1995. The Conservation of Plant Biodiversity. Cambridge: Cambridge University Press.

Gisselquist, D., Pray, C.E., Nagarajan, L., Spielman, D.J. 2013. An Obstacle to Africa's Green Revolution: Too Few New Varieties. SSRN, http://dx.doi.org/10.2139/ssrn.2263042

Halewood, M., Lapena, I. 2016. *Farmers' varieties and farmers' rights: challenges at the crossroads of agriculture, taxonomy and law.* Routledge. eBook ISBN 9781849775663.

Herpers, S., Vodouhe, R., Halewood, B.M., De Jonge, B. 2019. The support for farmer-led seed systems in African seed laws. ISSD Africa Synthesis paper, 2017 – 9.

IDRC & IPGRI (Eds.). 1999. Genes in the Field: On-Farm Conservation of Crop Diversity. CRC Press. https://doi.org/10.1201/9781003040637

Jaffee, S., Srivastava, J. 1994. The roles of the private and public sectors in enhancing the performance of seed systems. *World Bank Research Observer* 9(1), 97–117.

Jarvis, D.I., Hodgkin, T., Sthapit, B.R., Fadda, C., & Lopez-Noriega, I. (2011). A heuristic framework for identifying multiple ways of supporting the conservation and use of traditional crop varieties within the agricultural production system. *Critical Reviews in Plant Sciences*, 30(1–2): 125–176. https://doi.org/10.1080/07352689.2011.554358

Herpers, S., Vodouhe, R., Halewood, B.M., De Jonge, B. 2019. The support for farmer-led seed systems in African seed laws. ISSD Africa Synthesis paper 2017 – 9. https://hdl.handle.net/10568/81545

Kansiime, M., Bundi, J., Nicodemus, J., Ochieng, J., Marandu, D., Njau, S.S., Kessy, R.F., Tambo, J., Williams, F., Karanja, D. 2021. *Perspectives on sustainability of smallholder seed enterprises: a case study of African indigenous vegetables in Tanzania*. CABI Study Brief 36: Impact. CABI. https://dx.doi.org/10.1079/CABICOMM-62-8144

Kameswara Rao, N. 2013. Crop wild relatives from the Arabian Peninsula. Genet Resour Crop Evol 60: 1709–1725. https://doi.org/10.1007/s10722-013-9972-5

Labeyrie, V., Friedman, R.S., Donnet, S., Faye, N.F., Cobelli, O., Baggio, J., Felipe-Lucia, M.R., Raimond, C. 2023. Linking seed networks and crop diversity contributions to people: a case study in small-scale farming systems in Sahelian Senegal. *Agricultural Systems* 211: 103726. https://doi.org/10.1016/j.agsy.2023.103726

Labeyrie, V., Thomas, M., Muthamia, Z.K., Leclerca, C. 2016. Seed exchange networks, ethnicity, and sorghum diversity. Proc Natl Acad Sci USA 113(1): 98-103. https://doi.org/10.1073/pnas.1513238112

Louwaars, N. 2005. Biases and bottlenecks. Time to reform the South's inherited seed laws? Seedling, July 2005. GRAIN. Available at https://www.grain.org/article/entries/473-seed-laws-biasesand- bottlenecks.

Mazvimavi, K., Murendo, C., Gwazvo, C., Mujaju, C., and Chivenge, P. (2017). The impacts of the El Niño-induced drought on seed security in Zimbabwe: implications for humanitarian response and food security. ICRISAT, Patancheru: ICRISAT, CRS and FAO. Available at: http://oar.icrisat.org/10279/

McGuire, S., 2001. Farmers' management of sorghum genetic resources in Ethiopia: a basis for participatory plant breeding? In: Cleveland, D., Soleri, D. (Eds.) Collaborative plant breeding: Integrating farmers' and plant breeders' knowledge and practice. Wallingford, Oxon: CABI.

McGuire, S., Sperling, L. 2016. Seed systems smallholder farmers use. *Food Security* 8: 179-195. https://link.springer.com/article/10.1007/s12571-015-0528-8

Niang, I., Ruppel, O.C., Abdrabo, M., Essel, A., Lennard, C., Padgham, J., Urquhart, P. 2014. Africa. In: IPCC. *Climate Change 2014: Impacts, Adaptation, and Vulnerability.* Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 1199-1265, Cambridge University Press, Cambridge. https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartB_FINAL.pdf

Nyantakyi-Frimpong, H., Carlson, A. 2024. Seed sovereignty, knowledge politics, and climate change in northern Ghana. In: Wynberg, R. (Ed.) *African Perspectives on Agroecology. Why farmer-led seed and knowledge systems matter,* pp 115-132. Practical Action Publishing. ISBN 978-1-78853-022-4.

Munyi, P. 2022. Current developments in seed laws harmonisation in Africa. DeSIRA-LIFT report. European Commission.

Mazvimavi, K., Murendo, C., Gwazvo, C., Mujaju, C., and Chivenge, P. (2017). The impacts of the El Niño-induced drought on seed security in Zimbabwe: implications for humanitarian response and food security. ICRISAT, Patancheru: ICRISAT, CRS and FAO. Available at: http://oar.icrisat.org/10279/

Nyantakyi-Frimpong, H., Carlson, A. 2024. Seed sovereignty, knowledge politics, and climate change in northern Ghana. In: Wynberg, R. (Ed.) *African Perspectives on Agroecology. Why farmer-led seed and knowledge systems matter,* pp 115-132. Practical Action Publishing. ISBN 978-1-78853-022-4.

Nyong, A., Adesina, F., Elasha, B.O. 2007. The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change* 12(5): 787–797. https://dx.doi.org/10.1007/s11027-007-9099-0

Onsando, J.M., 2025. A scoping study ono Farmer-Managed Seed Systems in Africa. DeSIRA-LIFT report. European Commission.

Onsando J.M., 2020. The Implementation of the African Seed and Biotechnology Programme Report. African Union.

Otieno, G., Westphal, I. 2018. Building resilience through "Open-Source Seed Systems" for Climate Change Adaptation in Kenya, Uganda, and Tanzania: What are the options for policy? OSSS Policy Brief June 2018. HIVOS and Bioversity International. https://cgspace.cgiar.org/rest/bitstreams/165474/retrieve

Pascual U., Narloch, U., Nordhagen, S., Drucker, A.G. 2011. *The economics of agrobiodiversity conservation for food security under climate change. Economía Agraria y Recursos Naturales* 11(1) : 191-220. ISSN : 1578-0732

Santamaria, P., Signore, A., 2021. How has the consistency of the Common catalogue of varieties of vegetable species changed in the last ten years? *Sci. Hortic.* 277: 109805. https://doi.org/10.1016/j.scienta.2020.109805

Sperling, L., Gallagher, P., McGuire, S. March, J. 2021. Tailoring legume seed markets for smallholder farmers in Africa. *International Journal of Agricultural Sustainability* 19(1): 71–90 https://doi.org/10.1080/14735903.2020.1822640

Sperling, L., McGuire, S. 2010. Understanding and strengthening informal seed markets. *Experimental Agriculture* 46(2), 119-136. https://doi.org/10.1017/S0014479709991074

Sperling, L., Loevinsohn, M.E. 1993. The dynamics of adoption: distribution and mortality of bean varieties among small farmers in Rwanda. *Agricultural Systems* 41: 441-453.

Sperling, L., Loevinsohn, M.E., Ntambovura, B. 1993. Rethinking the farmer's role in plant breeding: local bean experts and on-station selection in Rwanda. *Expl. Agr.* 29: 509-519.

Sthapit, B., Padulosi, S., Mal, B. 2009. *Role of on-farm / in situ conservation and underutilized Crops in the wake of climate change.* Paper presented in the National Symposium on Recent Global Developments in the Management of Plant Genetic Resources, NBPGR, New Delhi, India, 17-18 December 2009.

Teshome, M.H., Nkhoma, C. 2010. Report of the Study on Agrobiodiversity Project Planning and Development based on Identified Partner and Key Collaborators in Partnership with Small Scale Farmers in Zambia. Unpublished.

Vernooy, R., Adokorach, J., Kimani, D., Marwa, A., Mayoyo, A., Nyadanu, D. 2023. *Policies, laws, and regulations in support of farmer-managed seed systems: still a long way to go.* A review of 14 countries in Africa. https://hdl.handle.net/10568/128579

Wencélius, J., Garine, E. 2014. Dans les sillons de l'alliance. Ethnographie de la circulation des semences de sorgho dans l'Extrême-Nord du Cameroun. *Les Cahiers d'Outre Mer* 265(1) : 93-116. https://doi.org/10.4000/com.7082

Wynberg, R. 2024. African Perspectives on Agroecology: *Why farmer-led seed and knowledge systems matter.* Practical Action Publishing, Rugby, UK. http://doi.org/10.3362/9781780447445

## Acknowledgements

This knowledge brief is based on the scoping study report on 'Farmer-Managed Seed Systems for increasing agricultural productivity, food and nutrition security and resilience', by James Onsando (forthcoming).

The study was co-designed and co-commissioned by the Africa Seed and Biotechnology Partnership platform (ASBP) of the African Union and DeSIRA-LIFT and funded by the European Commission.

**We gratefully acknowledge the key experts and stake-holders who provided input and feedback to the scoping study, in particular the experts who participated in the consultation workshop in Lusaka, 14-18 October 2024:**

Clement Adjorlolo (AUDA-NEPAD), Joyce Adokorach (Plant Genetic Resources Centre), Marthe Diallo (ISSD Africa), Famara Diedhiou (AFSA), Saskia Marijnissen (AUC-DARBE), Mariam Salim Mayet (Africa Centre for Biodiversity), Kouame Miezan (Africa Seeds), Alex Mutuku Mutungi (EOA Initiative secretariat), Joseph Mwitumwa (CTDT/ZAAB), Beatrice Aiimire Nakacwa Egulu (AUC-DARBE), Abdoul Aziz Saidou (Imaan Research), Justify Shawa (SPGRC), Zombe Sikazwe (MOA-SCCI), Amine Slim (National Gene Bank Tunisia), Michael Miano Waithaka (TASAI Inc).

**Citation:**

James Onsando, Helena Posthumus 2025. Farmer-managed seed systems' essential role for food security and agrobiodiversity in Africa. Knowledge Brief 6. DeSIRA-LIFT




Funded by the European Union


**Website:**
https://www.desiralift.org/
**LinkedIn:**
https://www.linkedin.com/company/desira-lift
**Email:**
info@desiralift.org

**Address:**
Wageningen Centre for Development Innovation

P.O. Box 88
6700 AB Wageningen
The Netherlands