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OPINION

The role of grain legumes in Sub-Saharan Africa's food security

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Abstract

Grain legumes play a multifunctional role in addressing food insecurity in Sub-Saharan Africa (SSA), yet they remain under-prioritised in agricultural policy and research. This opinion paper argues that grain legumes should be recognised as strategic crops in SSA because they greatly contribute to soil fertility through symbiotic nitrogen fixation, improve dietary protein, fibre and micronutrient intake, enhance crop and cropping system diversification, and strengthen resilience to climatic and economic challenges. Despite these benefits, poor seed systems, biotic and abiotic constraints, limited policy support, post-harvest losses, and uneven research investment continue to constrain their potential. Greater integration of grain legumes into national food security strategies, breeding programmes, extension services, and market development is essential for building productive, nutritious, and environmentally sustainable food systems in the SSA.

Keywords Food security · Legumes · Symbiotic nitrogen fixation · Smallholder farming · Nutritional security

1 Introduction

Food insecurity in Sub-Saharan Africa (SSA) remains a persistent development challenge despite decades of agricultural interventions. Rapid population growth, declining soil fertility, limited access to inputs, climate variability, and widespread poverty continue to constrain food production and dietary quality. Agricultural policy in many SSA countries has prioritised major cereals such as maize, rice, and wheat because of their central role in caloric supply (van Ittersum et al., 2025). This cereal focus has contributed to lower policy support and research investment for grain legumes despite their well-documented nutritional and agronomic benefits. Yet food security cannot be defined by calorie availability alone and must also include nutrition, soil health, and environmental sustainability. Despite the well-documented contributions of grain legumes to dietary protein quality and cropping system resilience, they continue to receive less policy support and research investment than major crops. This opinion argues that grain legumes are often treated as secondary crops in SSA agricultural systems, even though they are essential for building productive, nutritious, sustainable food, and secure systems.

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2 Grain legumes and soil fertility improvement

Grain legumes provide a locally grown and biologically fixed source of nitrogen through symbiotic nitrogen fixation (SNF), which is increasingly important as access to synthetic fertilisers in SSA remains constrained by high costs and unstable supply chains (Bizimana et al., 2026). For smallholder farmers with limited access to synthetic inputs, grain legumes offer a practical and cost-effective nitrogen source, and cereal–legume rotations consistently outperform continuous cereal cropping under low-input conditions (Giller et al., 2019). Meta-analyses in SSA showed that legume intercropping increases overall system productivity, with land equivalent ratios of 1.2–1.9, although cereal yields often benefit more from legume rotations than from intercropping (Muoni et al., 2022).

3 Grain legumes and nutritional security

Cereal-based diets across SSA often fail to meet protein and micronutrient needs, and food security - as defined by the United Nations - requires access to nutritious and adequate

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food, not calories alone (FAO, IFAD, UNICEF, WFP & WHO, 2023). Grain legumes are rich in protein, iron, zinc, and dietary fibre, and represent one of the most affordable sources of dietary protein for low-income households where animal products remain largely inaccessible (Foyer et al., 2016). Their main dietary contribution in some SSA settings appears to be improved micronutrient adequacy as much as protein supply, and legume seeds are rich source of folate, iron, zinc, niacin, vitamins, and dietary fibre that are often lacking in cereal-dominated diets (e.g., de Jager et al., 2019). Evidence from Southern Africa shows that greater integration of legumes into diets improves dietary diversity and household food security outcomes (Ngoma et al., 2025).

4 Grain legumes and sustainable farming systems

Drought-adapted grain legumes such as cowpea, groundnut, pigeonpea, and bambara groundnut play a critical role in diversified cropping systems across semi-arid regions of SSA (Fig. 1). This is supported by recent meta-analysis showing that grain legume integration enhanced intercropping performance and resource use by at least 11.5% across moisture conditions, while crops such as cowpea and bambara groundnut are specifically recognized for dryland adaptation, nutrient density, and tolerance of poor soils (Adam et al., 2025). Although cereal–legume cropping systems are widely used by smallholder farmers, their potential to improve soil health and reduce input dependency remains unrealised due to limited extension support and the absence of legume-inclusive agricultural policies (Giller et al., 2019).

Grain legumes are already adapted in SSA farming systems and contribute to soil fertility, nutrition, and resilience. However, recent studies show that uptake of improved varieties and more intensive legume production remains uneven and often slow because farmers still depend mainly on informal seed systems, limited market access, and insufficient policy support (e.g., Chisa et al., 2025). A key opportunity is to better connect agronomy, plant breeding, seed system, extension, and market development so legumes can play a larger role in SSA food systems.

5 Why are grain legumes still underutilised?

Despite their multifunctional benefits, grain legumes remain underprioritised in SSA due to several structural constraints:

1. **Cereal-centric policies:** Input subsidy programmes and related public support policies often emphasise cereal self-sufficiency, with subsidies favouring maize fertiliser and seed distribution. This bias is reinforced by political incentives that reward visible, short-term yield gains rather than long-term soil restoration. This pattern is well documented in input subsidy programme analyses across

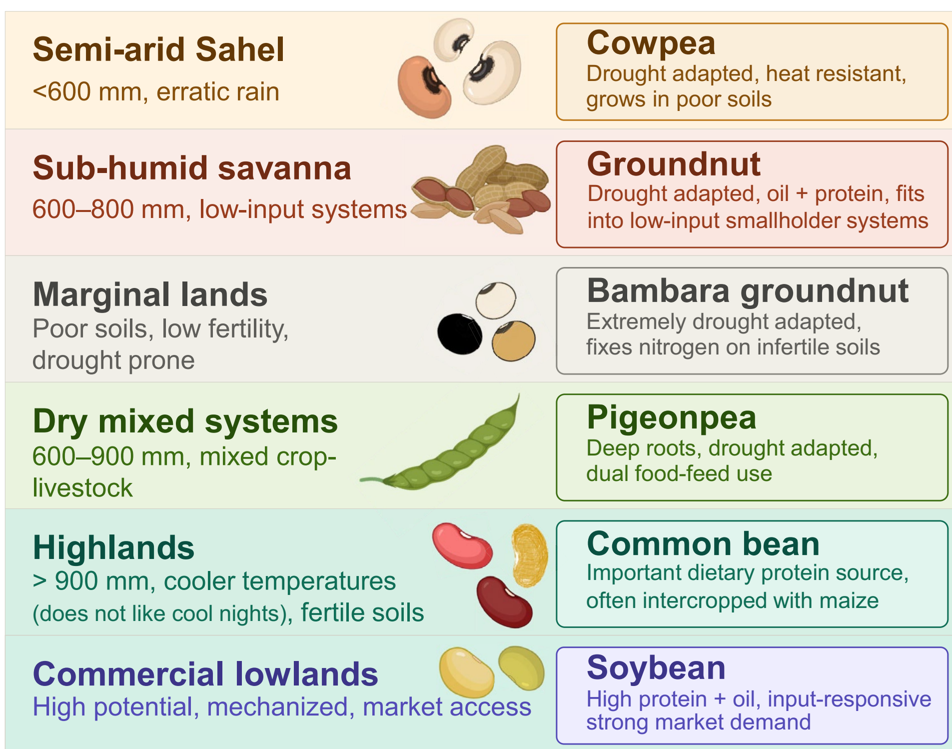

Fig. 1 Grain legume suitability across major agro-ecological zones in Sub-Saharan Africa (north–south rainfall gradient). Note: crop distributions overlap across agro-ecological zones, and cultivars with different maturity groups and adaptation traits may extend beyond the boundaries shown. Bean illustration from cowpea, groundnut, pigeonpea, common bean, and soybean are from BioRender (www.biorender.com)

SSA, particularly where maize dominates public support frameworks (Jayne et al., 2018).

2. **Poor seed systems:** Grain legume seed systems are underdeveloped, with farmers relying heavily on informal seed sources of inconsistent quality. Evidence show that smallholders highly depend on informal seed channels, while adoption is constrained by limited timely access to formal seed, high seed costs, and weak information flows (e.g., Breen et al., 2024). Strengthening early-generation seed production and supporting private seed enterprises could dramatically improve varietal turnover. Similar constraints are widely reported across African seed systems, where informal seed channels dominate grain legume seed access (McGuire & Sperling, 2013).
3. **Post-harvest losses and poor value chains:** Seed storage pests, inadequate seed storage infrastructure, and limited processing capacity continue to depress market incentives and discourage production. These losses weaken farmer incentives and limit the contribution of grain legumes to household income and food supply. Post-harvest losses in grain legumes are substantial and structurally embedded in SSA value chains, particularly due to storage pests and mycotoxin risks (Affognon et al., 2015).
4. **Limited research investment:** Cereals tend to receive more research focus, while grain legumes, despite their environmental and nutritional importance have been historically under-resourced. These imbalances contribute to persistent yield gaps and reinforce poverty traps in many smallholder farming systems. Expanding plant breeding programmes for abiotic stress adaptation, insect-pest and disease resistance, and seed quality traits including antinutritional factors would unlock productivity and consumption of grain legumes. The relative underinvestment in legumes compared to cereals has been widely highlighted as a structural constraint to sustainable agricultural transformation (Foyer et al., 2016).

   At the same time, grain legume improvement has benefited from long-term research and development efforts within the CGIAR international agriculture system. For example, ICRISAT has led breeding of pigeonpea and groundnut for dryland environments, while the IITA has focused primarily on cowpea and soybean improvement in tropical African systems. The Alliance of Bioversity International & CIAT has contributed to common bean improvement and nutritional quality improvement, particularly in East and Southern Africa. Recently, CIMMYT has begun expanding its work to grain legume improvement in SSA. Beyond these efforts, the N2Africa programme further demonstrated the value of combining improved legume varieties, rhizobial inoculants, and agronomic training to support grain legume production among smallholder farmers across SSA (Giller et al., 2013). National research programmes have complemented these efforts, yet farm-level adoption and consumption impacts remain limited not due to a lack of scientific progress, but because structural constraints in seed systems, markets, and policy prioritisation continue to impede scaling.

5. **Limited market access:** Grain legume markets in SSA are highly heterogeneous across crops and regions. While soybean and groundnut benefit from growing commercial demand, many production areas remain constrained by weak market infrastructure and variable price incentives. Market access is a key determinant of grain legume adoption and production intensity (Barnes et al., 2026). Better market integration is therefore essential if legume cultivation is to expand beyond subsistence and contribute more consistently to regional food systems.

A stronger integration of grain legumes into national food security strategies, extension services, school feeding programmes, and climate adaptation initiatives is urgently needed. This need is especially important in conflict-affected and fragile contexts, such as parts of the Sahel (Kibriya & Fatema, 2026), where governance constraints and insecurity severely limit the implementation of agricultural policies and the functioning of seed and food systems.

6 Future priorities

Looking ahead, realising the full potential of grain legumes in SSA will require a coordinated roadmap. In plant breeding, targeted selection for enhanced SNF capacity remains largely underexplored. Development and scaling of effective, locally adapted rhizobial inoculants represents one of the most cost-effective approaches available. Strengthening seed systems in grain legumes is essential to speed up the adoption of improved varieties. Value chain investment in seed processing, storage, and market linkages will be equally critical to sustain farmer incentives. The market context is already shifting domestic soybean production, but often remains below demand, with large volumes imported particularly for the expanding livestock feed sector, creating both opportunity and urgency for scaling local production. Frequent fertiliser shortages have pushed many smallholder farmers to turn to legumes, an adaptation that policy and research have not yet fully matched.

7 Conclusion

Grain legumes should be systematically integrated into SSA cropping systems as key components of sustainable agriculture. Their combined contributions to soil health and fertility restoration, protein and micronutrient supply, crop diversification, and climate resilience make them essential components of future food security strategies. Africa's future food security challenge is not simply to produce more food, but to develop agricultural systems that are productive, nutritious, economically accessible, and environmentally sustainable. We all know that legumes can contribute to all these objectives, but realising this potential will require greater investment in plant breeding, seed systems, agronomy, farmers, extension, processing technologies, and market development. Moving beyond cereal-cantered agriculture and diet is essential for building resilient and nutritionally food systems in SSA.

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Declarations

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