

How to: Seed systems



For smallholder farmers across the Global South, timely access to seed of suitable varieties is central to food security and livelihoods. Seed sits at the intersection of **several pressing challenges**: climate change and conflict are reshaping the conditions of food production, and agrobiodiversity is eroding. The seed diversity held across farmer-managed, intermediate and formal seed systems is a critical resource for responding to these challenges.

This Guide cuts through the complexity of **seed systems**: the people, practices and institutions that develop varieties, and produce and provide seed. Whether you are designing a new project, adapting one to a fragile context, or trying to understand why well-intentioned seed interventions so often fall short, it offers a practical, evidence-grounded framework for working with their actors and dynamics, and for realizing their potential to drive lasting food system change.

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1. Seed systems – significance and definitions

1.1. Why seed systems matter for food security?

Seed sits at the very start of food systems and strongly shapes what and how much is produced, and how resilient, sustainable and nutritious those systems can be:

- **Productivity and food security:** access to quality seed of suitable varieties contributes to stable yields and production gains.
- **Climate resilience:** diverse, locally adapted varieties can improve yield stability under environmental stress.
- **Nutrition security:** access to seed of a range of nutrient-rich crops broadens the daily diet and increases households' supply of nutritious food.
- **Farmer livelihoods:** access to diverse, locally adapted seed from multiple sources strengthens farmers' capacity to cope with climatic, pest and market shocks.
- **Future adaptation:** diversity maintained in farmers' fields, together with variety development in intermediate

and formal systems, sustains the continuous adaptation of agrobiodiversity to changing production conditions.

Because seed influences food systems in these interlinked ways, seed systems sit at the interface of the humanitarian, development and peace nexus, linking immediate response (restoring production after shocks), development (productivity and resilience), and longer-term stability (risk reduction and stronger local agency).

Seed systems also face persistent structural constraints: weak demand articulation, chronic underinvestment in public goods, rising seed prices, and regulatory frameworks poorly matched to farmers' realities. Reform, moreover, engages a politically sensitive sphere, touching on farmers' rights, the balance between public and private power, and national food sovereignty. These dynamics make seed system strengthening a long-term, systemic challenge, calling for systems thinking: understanding how the parts of a seed system relate, where the root causes of problems lie, and where intervention is most effective.

What is a seed?

Thinking about seeds, most people picture a grain placed in the soil that grows into a plant. That image is not wrong, but "seed" includes much more, covering a wider range of plant propagation material. Many crops are not grown from grain seed: potato from tubers, cassava and sweet potato from cuttings, banana from suckers or tissue-culture plantlets. The physical properties of the plant propagation material differ sharply from grain seed, and so do the seed systems around them. A banana sucker or a sack of cassava cuttings is bulky, perishable and disease-prone, whereas millet or rice seed is compact, storable and cheap to transport. These differences are not just technical: seed system frameworks and interventions are often designed for grain seed and do not fit vegetatively propagated crops, which can limit farmers' access to quality planting material. Programming has to be sensitive to crop-specific propagation material from the outset.



1.2. The pluralistic seed system approach

Seed systems and their functions

Seed systems encompass the actors, processes and channels through which seed is produced, distributed and accessed by farmers. Any seed system can be described through three core functions and two contextual factors (Figure 1). The three functions are the activities a seed system must perform to be effective:

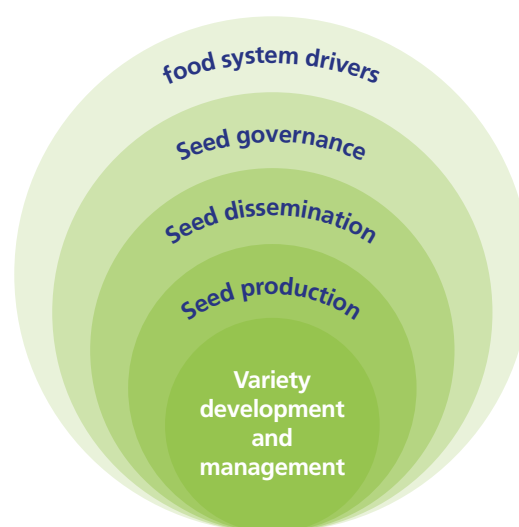
- **Variety development and management** — breeding, selection and maintenance of the varieties farmers grow;
- **Seed production** — multiplying seed of those varieties in sufficient quantity and quality;
- **Seed dissemination** — moving seed among or to farmers through exchange, markets or other channels.

These functions are shaped by two contextual factors:

- **Seed governance** — the policies, laws, standards and norms that regulate seed;
- **Food system drivers** — the wider forces of markets, climate, demographics and consumer demand.

Together, these five factors offer a common lens for analyzing any seed system and locating where it performs well or falls short.

Figure1. Westengen, O. T., Dalle, S. P., & Mulesa, T. H. (2023). Navigating toward resilient and inclusive seed systems. Proceedings of the national academy of sciences, 120(14), e2218777120.



What is a variety?

A variety is a distinct and recognizable group of plants within a crop species, sharing characteristics such as maturity, taste, fruit size, color or drought tolerance. In sorghum, for example, farmers cultivate hundreds of distinct varieties. The term covers a wide range of varieties, including modern varieties developed by professional breeding, and farmers' varieties and landraces selected and maintained by farmers and communities. In legal terms, only varieties meeting certain criteria can be registered on a national catalogue and sold as certified seed. Registration typically requires a variety to be Distinct, Uniform and Stable (the DUS criteria) and, for some crops, to demonstrate its Value for Cultivation and Use (VCU). Such requirements suit uniform bred varieties but fit poorly with the diversity of farmers' varieties, which for that reason often cannot be registered and sold as certified seed. This guide uses "variety" in the broad sense, including farmers' varieties.

A pluralistic approach to seed systems

Farmers are not a homogeneous group, and neither are their needs for seed. A smallholder in Ethiopia might : save part of her millet harvest for replanting, obtain bean seed from a community scheme, buy maize seed from a domestic company, and source tomato seed from an international supplier. This diversity is not a problem to be solved - it is a reality and an opportunity. A pluralistic approach recognizes that different seed systems have distinct strengths, serve different crops and communities, and together provide seed more resiliently and

inclusively than any system alone. Three types of systems are commonly distinguished (Figure 2):

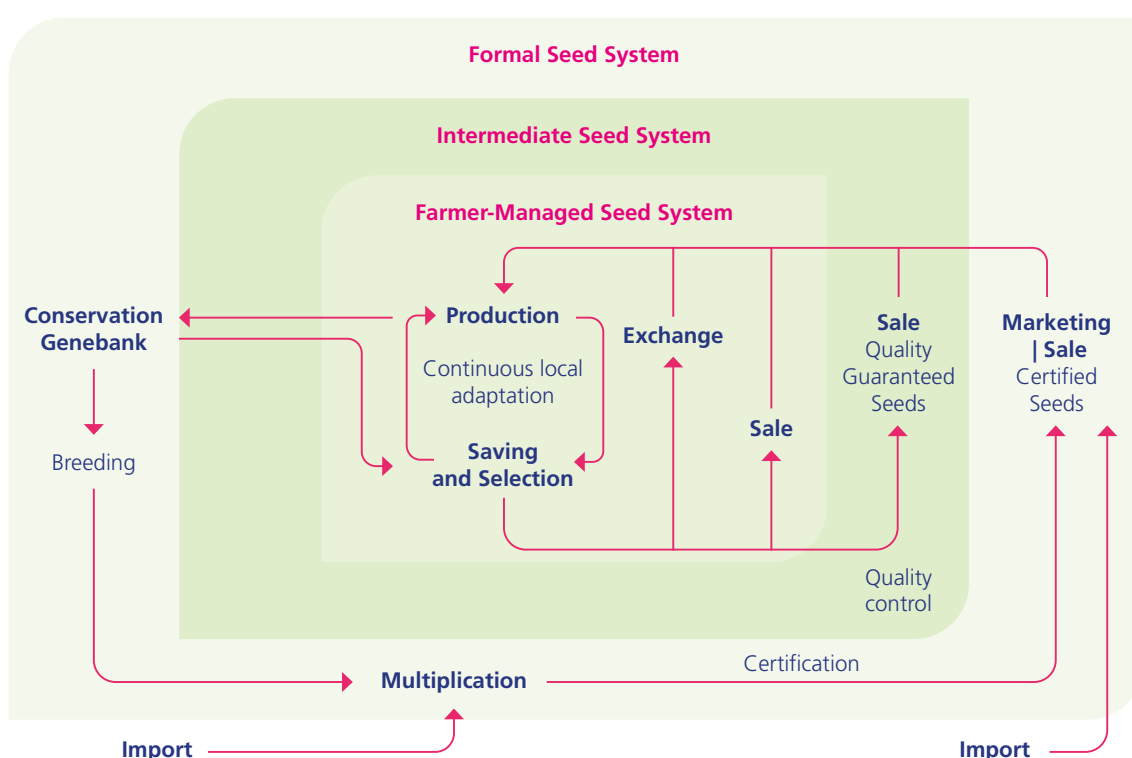
- **Farmer-managed seed systems (FMSS)** — farm-saved seed, exchange among communities and local grain markets, without formal institutions; quality resting on local knowledge and community norms.

Note: The common alternatives "informal" and "local" seed systems are avoided: FMSS follow well-established rules and are not confined to the local level.

- **Formal seed systems (FSS)** — public and private actors producing and distributing certified seed of registered varieties through commercial channels; strong on quality control and scale, but limited to commercially viable crops and comparatively expensive.
- **Intermediate seed systems (ISS)** — between FMSS and FSS, combining official recognition of varieties with simplified quality assurance; reaching farmers where neither formal nor farmer systems can ensure seed security alone.

These roles of the three systems are **complementary**, not competing: FMSS dominate supply across many regions and operate where formal systems cannot, including remote areas and crises, while FSS deliver professionally bred varieties at scale where markets and institutions allow. A pluralistic approach supports the coexistence of all three, guided by two principles: equal rights, so no system is privileged over the others, and positive interaction, so that policy actively creates space for them to complement one another.

Figure 2. A pluralistic seed system : seed moves freely between farmer-managed, Intermediate and formal system. *Source: SWISSAID.*



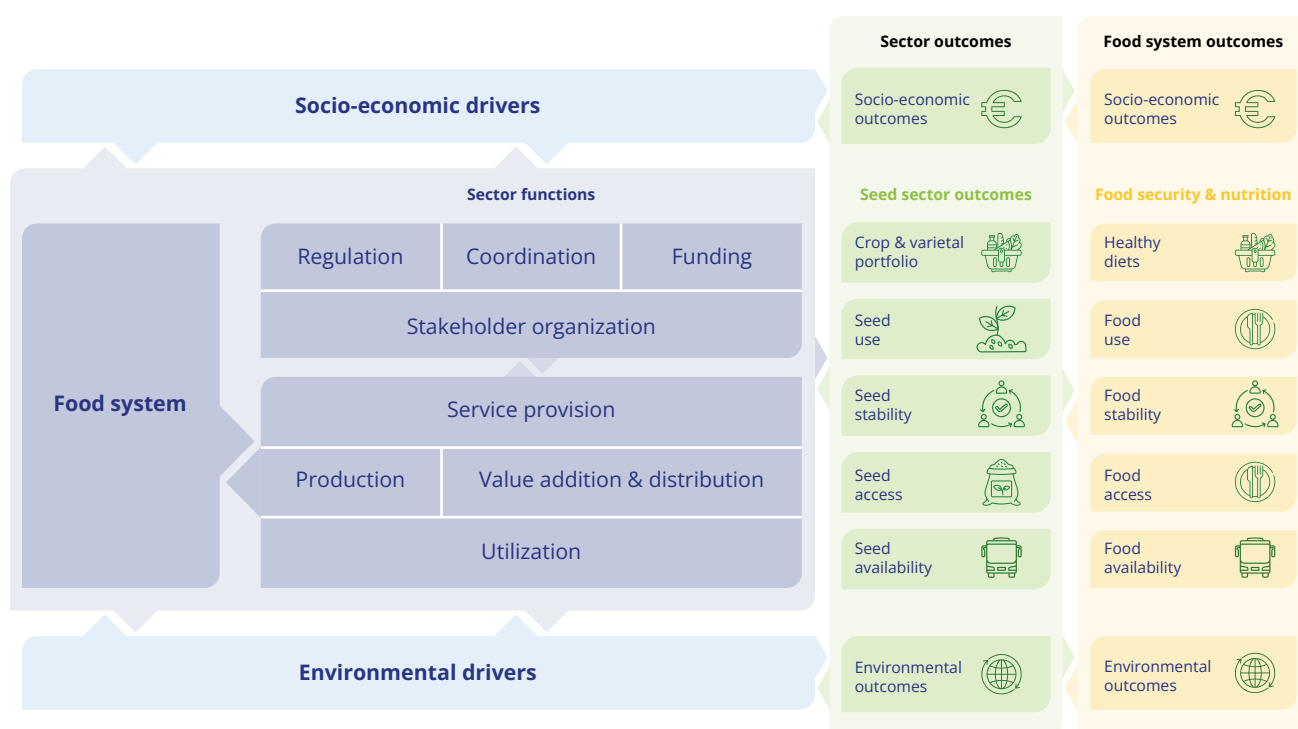
1.3. Integrating seed systems in food system development

A well-functioning seed system is not an end in itself. Its value lies in what it delivers for farmers and for the wider food system. Seed systems generate outcomes of their own: the crop and varietal portfolio available to farmers, and the availability, access, stability and use of seed. These translate into food system outcomes, namely the availability, access, stability and use of food, and ultimately healthy diets. The same socioeconomic and environmental drivers that shape the food system shape the seed system, and seed system outcomes feed back into food security and nutrition, incomes and employment, and environmental sustainability.

Seeing **seed and food systems as linked** in this way has practical consequences for interventions. It means asking what

food system outcome the intervention on seed systems aims to improve, and for whom. Projects aiming to reduce child malnutrition, improve smallholder incomes, or strengthen climate resilience will each place different demands on the seed system. The components of a seed system are interconnected, and the system connects onward to the food system, so an intervention in one place can ripple outward in ways that are easy to miss. Strengthening the supply of formal-sector seed for a commercial crop, for example, may raise incomes but can also draw farmers away from the diverse local varieties that underpin dietary diversity and resilience, potentially weakening a different food system outcome. Systems thinking helps anticipate such trade-offs and identify the leverage points where a well-placed intervention has the greatest impact.

Figure 3. Seed system outcomes and their links to food system outcomes. Based on De Boef and Thijssen, 2023.



1.4. SDC's interest in seed systems

Seed is not a niche technical topic; it is a strategic priority that cuts across SDC's core development mandate. The links are direct and well evidenced:

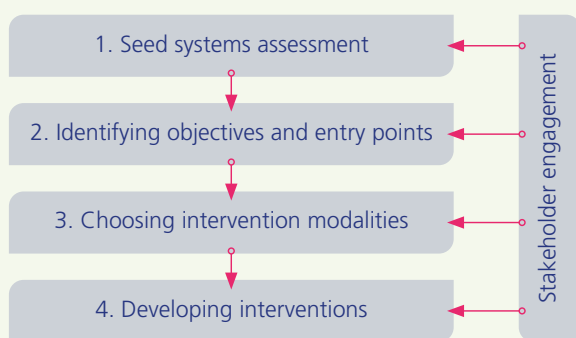
- **Seed security** underpins food security and food security underpins nutrition and poverty reduction;
- **Resilient seed systems** are among the most effective tools for climate adaptation, especially for the smallholders who produce much of the food consumed across Asia and sub-Saharan Africa.

Seeds also sit at the heart of SDC's most complex programming challenges: In fragile and conflict-affected contexts, seed system disruptions can quickly deepen a humanitarian crisis, while restoring farmers' access to seed is often central to recovery. In more stable contexts, seed system development offers pathways to sustainable agriculture that reach the poorest and most marginalized communities.



2. How to strengthen seed systems for food system outcomes

Figure 4. Four steps for designing seed system interventions, with stakeholder engagement throughout.



Seed is not a commodity like any other. It carries the cultural history of farming communities and provides the basis of their food and nutrition security. It is thus crucial to understand the local context and clearly define the objectives before designing interventions that support pluralistic seed system development.

2.1. Assessing the seed system & its broader context

Before assessing the seed system, define the problem the intervention should address : what food-system outcome is falling short, for whom and where. This initial framing should be informed by evidence and stakeholder consultation, without assuming that lack of seed is the underlying cause.

Once it is identified that a seed system intervention is required, it must start with an understanding of how existing local seed systems are structured and how (well) they function. This includes:

- **mapping actors and donors;**
- **understanding farmers' production systems and seed needs,** and which seed systems serve them;
- **identifying bottlenecks** across the core seed system functions, and their root causes;
- **situating potential interventions / entry points** within broader food system objectives.

A robust analysis should combine different sources of evidence, including seed system assessments, stakeholder consultations and field-level insights, to capture both quantitative and qualitative dimensions.

Seed System Security Assessment offers a structured way to determine whether farmers can obtain suitable, good-quality seed, and through which channels (see box). This can be complemented by a closer analysis of:

- crop and varietal diversity;
- seasonal dynamics;
- the roles and interactions of actors across the different seed systems;
- the policy environment.



Assessing seed system security

Seed System Security Assessments (SSSA) are a structured way to find out whether, and where, farmers face challenges related to seed. An SSSA examines the different channels farmers use to obtain seed and assesses each against five parameters:

- **Seed availability** — is seed of the desired crops physically present, in reach and in time for planting?
- **Physical and economic seed access** — can farmers obtain it, given their means and social relationships?
- **Varietal suitability** — do the available varieties match farmers' conditions and their production, food and market preferences?

- **Seed quality** — is the seed viable and healthy, with good germination and freedom from pests and disease?
- **Resilience** — can the channel withstand and recover from shocks and stresses across all of the above?

Appropriate interventions differ sharply depending on which parameter is failing: a shortage of seed calls for different action than seed that is present but unaffordable, or available but poorly suited to farmers' conditions. Assessments should be gender and equity sensitive, since women and men, and better and worse-off households, often rely on different channels and prefer different varieties.

Figure 5. Farmers' seed channels assessed against the parameters of seed security.



2.2. Identifying objectives and entry points

The next step is to define *what* the intervention should achieve and *where* in the system to act. Every intervention rests on a causal pathway, from seed-system change to food-system

outcomes; this step makes that pathway explicit. Seed systems can be entered at many points, and the right one depends on the food-system objective being pursued.

Objective	Entry points
Restarting production after a shock or crisis — enabling a rapid return to production through emergency interventions	Emergency seed provision — restoring affected farmers' access to quality seed of adapted varieties
Raising agricultural productivity — where food insecurity is linked to low yields, providing a lever for higher and more stable production	Seed access and distribution layer — introducing quality seed of suitable varieties into seed systems

Objective	Entry points
Strengthening climate adaptation — improving long-term food security under changing conditions	Variety development and diffusion — supporting the development and spreading of locally adapted registered and farmers' varieties
Improving nutrition — supporting dietary diversity	Crop and varietal portfolio and farmers' access — broadening the range of nutritious crops, including newly introduced nutrient-dense and biofortified varieties

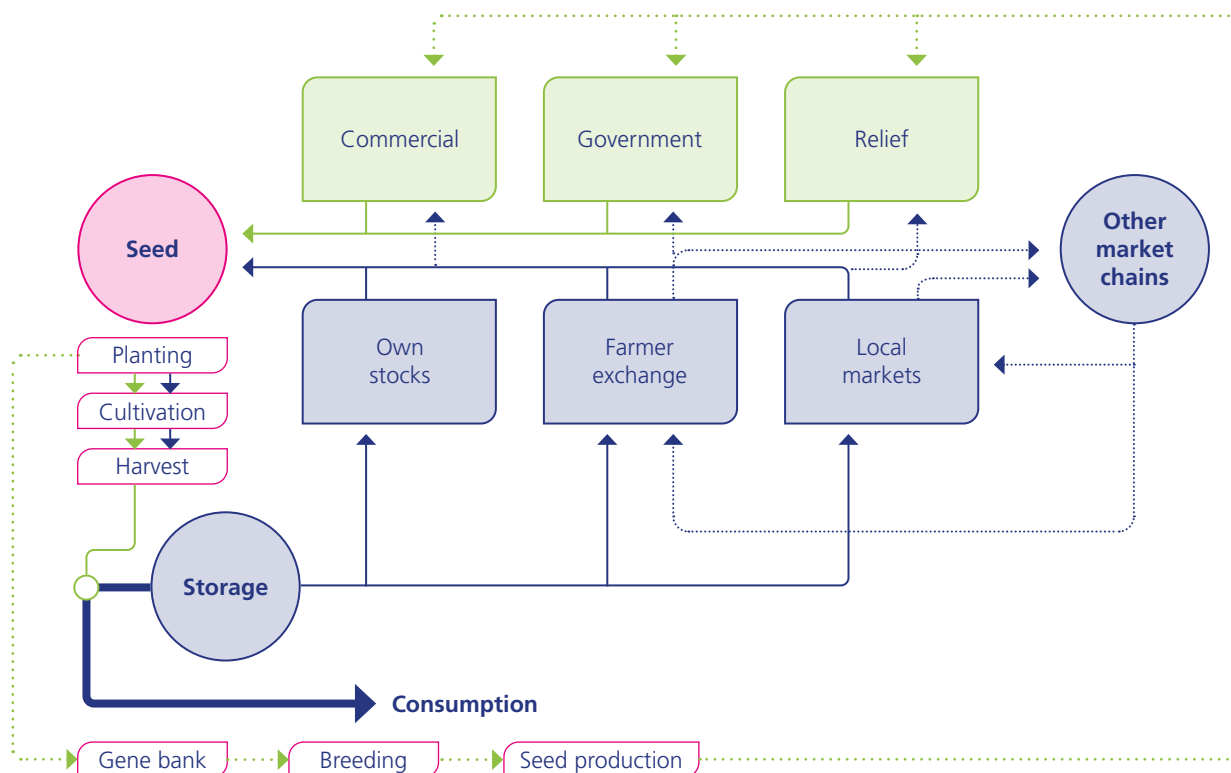
Entry points can be chosen at different levels:

- **A specific channel farmers use** (e.g. strengthening local seed markets or farmer exchange)
- **Core functions** (e.g. variety development or seed production)
- **Whole sub-systems** (farmer-managed, intermediate or formal)

- **The policy environment** (e.g. seed laws and phytosanitary regulations)

The assessment in the previous step should indicate where the binding constraints and the best opportunities lie — and thus where an intervention can most effectively strengthen food-system outcomes and long-term resilience.

Figure 6. A smallholder's seed sources. Farmers rarely rely on a single source of seed. This figure shows the range of channels a smallholder might use across farmer-managed and formal seed systems, each of which is a potential entry point for intervention. Which channels are in use varies by crop, season and political situation. Source: adapted from Sperling (2008).



Two further steps translate an entry point into a workable objective: **Defining with whom and for whom.** Setting objectives means being explicit about two distinct questions:

- **Whose practices does the intervention aim to change?** — for example seed producers, traders, breeders or authorities.
- **Who ultimately benefits?** — for example smallholder women, malnourished consumers or young entrepreneurs, with particular attention to women, youth and marginalized groups.

The two are not the same, and keeping the intended beneficiaries in focus ensures the project serves food-system outcomes rather than seed-system activity for its own sake. These choices also involve trade-offs, since advancing one objective or group can work against another, which should be weighed when objectives are set.

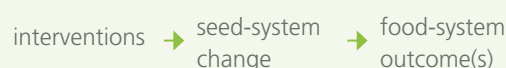
Aligning and translating into a results framework.

Objectives gain traction when they align with national strategies, relevant SDGs and SDC's priorities, which strengthens ownership and the prospects for scaling. Combined with the previous step's analysis, they form the basis of the project's results architecture and theory of change — making explicit the causal pathway:



Good practices

- Let the assessment drive the choice of entry point: act where the analysis shows the binding constraints and clearest opportunities, not where activity is easiest.
- Distinguish the actors expected to change their practices from the people meant to benefit, keeping women, youth and marginalised groups at the centre.
- Respect pluralism: strengthening one seed system should not undermine another.
- Anchor objectives in a specific food-system outcome, so seed-system work stays a means to an end.



2.3. Choosing intervention modalities

The right intervention modality depends on how stable and well-functioning local seed and food systems are. The task is to translate the assessment's results into modalities supporting seed system resilience.

In **politically and environmentally stable contexts**, the focus is on long-term capacity development across all seed systems: improving the quality of seed production, farmers' access to diverse seed sources, the capacities of seed system actors, and, where needed, the structural and legal frameworks within which they operate.

In **fragile and crisis-affected contexts**, priorities shift towards securing immediate seed access, which calls for more responsive, context-specific approaches. Formal supply chains tend to collapse quickly, while farmer-managed systems are often more resilient. Displacement tends to reshape agricultural practice, as farmers shift toward faster growing crops or toward species and varieties better suited to unfamiliar environments.

These dynamics must be understood before any response is designed. The core principle is to choose modalities that support rather than undermine existing systems:

- Where local markets are functioning, market-based modalities such as cash transfers, vouchers or seed fairs should be prioritized: they support local systems, preserve farmers' choice, and avoid displacing existing actors.
- Direct seed distribution should be reserved for situations where markets have collapsed or access is severely constrained, so as not to weaken the systems farmers will depend on afterwards.

Intervention choices should also be coherent across the humanitarian–development–peace nexus. Poorly aligned modalities can distort markets or weaken local systems, whereas coordinated approaches can meet immediate needs while contributing to longer-term resilience.



Example

Seed insecurity in fragile contexts.

Last-mile seed distribution programmes in South Sudan, Burundi, Mozambique and Niger show what a principled, context-sensitive response looks like in practice. Rather than defaulting to free seed distribution, each programme first understood local market conditions and built its response around them, engaging local farmers, refugees, rural sales agents and community seed multipliers as active participants in seed supply. Local seed markets were strengthened rather than disrupted, farmers' choice was preserved, and existing commercial relationships and community structures were left intact. The seed reached farmers either way, but only the market-based approach left the system stronger.

2.4. Developing interventions

Designing seed system interventions can be guided by four areas: *variety development and maintenance*, *seed production*, *seed dissemination*, and *the governance and enabling conditions* that shape them. Before selecting where to act, it is worth **mapping the whole system and confirming the critical parts** identified during the assessment phase with stakeholders, keeping in mind that the actors involved are not homogeneous. The private sector alone ranges from local informal seed businesses to multinational companies, each operating under different incentives, capacities and power dynamics that need to be understood and engaged with accordingly. The same is true across farmer-managed, intermediate and formal systems, where different actors have different interests.

2.4.1. Variety development and maintenance

Variety development and maintenance determine the range of crops and varieties available to farmers. In formal systems, private and public plant breeding develops new varieties for defined objectives using scientific techniques. The critical point is that breeding **objectives must serve farmers' actual needs and targeted food system outcomes**, rather than being driven primarily by commercial interests. Varieties released through formal programmes can contribute to food system outcomes but are often poorly suited to marginal production areas. Support includes:

- Involving farmers in setting breeding priorities;
- Backing public and private breeders to work on crops that farmers depend on but that are not commercially profitable;
- Respecting farmers' preferences for the breeding techniques used.

Farmer-managed systems play an equally important role, maintaining a wide range of agrobiodiversity and adapting it, directly and indirectly, to changing environmental, social and economic conditions through cultivation and selection in farmers' own fields. This continuous, *in situ* adaptation is a form of variety

development in its own right; farmers can be supported to develop, characterize and conserve the diversity they hold.

Participatory approaches bridge the two systems:

- **Participatory varietal selection:** farmers test and choose among new varieties in their own fields.
- **Participatory plant breeding:** farmers take part in the breeding process itself, selecting within still-developing material.

Both draw on farmers' knowledge of what performs locally and what they value, produce varieties better adapted to marginal conditions, and widen on-farm crop diversity.

2.4.2. Seed production

Access to quality seed of suitable varieties is one of the most powerful and cost-effective ways to raise and stabilize smallholder production. Two dimensions of quality matter:

- **Physical quality** — germination and freedom from pests and disease;
- **Genetic quality** — yield potential, resistance and suitability for the target production system.

Producing seed demands quality standards beyond those for growing a food crop, including checking that the variety in the field meets its characteristics, high germination and seed health. It depends on practices such as using seed specifically produced for multiplication by professional breeders, isolating plants intended for seed production, and careful post-harvest handling.

Seed production looks very different depending on who is producing, for which crops and farmers, and in which context. A pluralistic approach accommodates the full spectrum:

- **Domestic enterprises** producing certified seed of commercial crops at scale, under public controls and certification;
- **Community-based groups** and farmers multiplying seed for local markets and community seed banks;
- **Farmers** saving and selecting seed from their own harvests.

Each requires different support, but common needs include : access to basic material for multiplication (early-generation seed), capacity building for multiplication and seed handling, finance, infrastructure, and — where certification and labelling apply — enabling policies. The three also assure quality differently:

- **FSS** rely on external certification;
- **ISS** connect formal standards with local realities through lighter mechanisms such as Quality Declared Seed;
- **FMSS** depend on producer-led or community-based quality assurance.

Supporting quality across all three, rather than imposing a single standard, is what makes seed production both reliable and inclusive.

2.4.3. Seed dissemination

Producing quality seed is only half the challenge; getting it to farmers in the right quantity, at the right time and at an affordable price is where many seed systems fall short. Weak networks, poor handling and disconnected supply chains mean seed fails to reach the smallholders who need it most.

Value addition through *cleaning, grading, treating, packaging and labelling* turns harvested seed into a product farmers can find, trust and afford, and so directly enables distribution and uptake:

- Labelling and treatment build trust, which matters especially where poor-quality or counterfeit seed has damaged farmers' confidence.

- Affordable pack sizes widen access: large packages are often too expensive for smallholders, whereas small packets let farmers try new varieties at low risk.

Distribution moves seed through the last mile, and the right channel depends on context:

- » In **stable, market-based settings**, agrodealer networks dominate the last mile, though they are often undercapitalized and disconnected from quality assurance; strengthening them, alongside community-based models, is key to inclusive access in remote areas.
- » In **emergency settings**, the choice of modality is decisive (see 2.3): vouchers and seed fairs let farmers choose their own crops and varieties but are limited in scale, while direct distribution is fast yet should be reserved for genuine market collapse, since tying relief to formal seed alone overlooks the farmer-managed systems farmers rely on most under stress.

Getting seed to farmers is not enough if they do not take it up, and their choices are shaped by more than yield:

- **Preferences are diverse** — taste, cooking time, color, pack size and affordability all matter.
- **Preferences are gendered** — women and men in a household often value different traits and use different information channels.
- **Promotion must be sustained** — demonstration plots, field days, radio and trusted agrodealer advice work best combined and repeated, not as one-off events.

Alongside formal and market channels, farmer-managed exchange is in most contexts the main way seed moves between farmers: saving and replanting, farmer-to-farmer exchange, gifts and barter, local grain markets, and community seed banks. These channels give especially access to traditional and underutilized varieties, sustain agrobiodiversity, and strengthen local seed autonomy, especially for remote communities. Supporting rather than bypassing them is often the most effective route to **inclusive access**, and fairs built around dietary diversity can link seed access to nutrition.

2.4.4. Governance and enabling conditions

The functions above operate within a wider environment of rules, coordination, organization and finance that can either enable a seed system or hold it back. Weaknesses here often undermine progress made elsewhere and thus require attention.

Regulation : shapes the seed system's playing field, defining which varieties reach farmers, who may legally produce and sell seed, what quality standards apply, and how seed moves across borders. Well designed, it enables innovation and inclusion.

Designed or implemented poorly, it can lock out the very farmers and enterprises it should serve. In practice, many seed laws privilege formal systems, permitting only the sale of certified seed and sometimes restricting even the exchange of farm-saved seed, while plant variety protection can further limit farmers' access. Recognizing and rebalancing asymmetries is central to a pluralistic approach, ultimately balancing the different interests of the commercial seed sector (variety protection, certification standards, market access), the farmers (the right to save, exchange, and commercialize their own seed, including landraces and locally adapted varieties outside DUS frameworks), and the public interest (agrobiodiversity conservation, climate resilience, and food sovereignty). The key principle is to accommodate diversity rather than impose a one-size-fits-all standard across all systems, a coherent, flexible framework that recognises the complementary roles of the pluralistic seed systems :

- Full certification works well for major cash crops and large seed enterprises but is impractical and disproportionately costly for community producers.
- Lighter pathways such as truth-in-labelling offer legitimate, lower-cost quality assurance.
- Regulations gain legitimacy when the policy process engages farmers, the private sector and civil society, and they only work if regulatory bodies have the capacity to implement them, supported through training and infrastructure.

Coordination : aligns actors, strategies and investments around shared goals, promotes collaboration, and creates the accountability mechanisms that keeps a dedicated focus on seed systems. It usually needs a national coordinating body with a clear mandate and the authority to convene government, farmers, private sector, researchers and civil society, working across national and regional levels.

A **national seed strategy or roadmap**, grounded in sound assessment and genuine consultation, is among the most powerful coordination tools: it sets shared priorities, guides

decisions and investments, aligns donor support, and makes progress measurable.

Stakeholder organisation : Whether at the level of a farmer cooperative managing local seed production, of a national seed association advocating for policy reform, or of a value chain partnership integrating seed within broader procurement arrangements, organisation turns individual actors into a functioning system, and strengthening it is one of the higher-return investments in seed system development:

- For smallholders, collective organization is transformative: organised groups can pool resources, coordinate production, negotiate prices, meet quality standards and engage with authorities that individuals cannot reach.
- At national level, seed associations unite diverse actors, amplify their voice, and create platforms for learning and coordination.

Finance is among the most neglected functions in seed sector development :

- At **system level**, the link between service delivery and revenue generation is often broken, with certification or inspection fees absorbed into treasuries rather than reinvested, leaving regulatory bodies underfunded. Letting service providers retain their own revenues can be a practical, high-impact reform.
- At **enterprise level**, seed businesses and farmer producer groups struggle to access credit, since financial institutions rarely understand seed business models or accept seed as collateral. Advocacy, engagement with financial institutions, and instruments such as value-chain finance and loan guarantees all help.

Donor funding will remain important in the short to medium term, but the goal must be to build a sector that progressively finances itself, through viable enterprises, service fees and strategic public investment.

2.5. Engaging stakeholders

Seed system interventions are only sustainable if they are carried by the actors who make up the system, and ideally led by them. Engaging stakeholders needs to run through the whole process. Effective engagement starts with knowing who the stakeholders are and how they relate. A **stakeholder mapping**, ideally at the onset during the initial contextual assessment (see chapter 2.1), helps identify who produces, sells, uses and regulates seed, who has access to resources, markets and decision-making and who does not, who benefits and who is left out, and the power dynamics between them. In seed systems, this must reach beyond the visible formal sector actors:

- **Farmer-managed system actors** — individual farmers, farmer groups, community seed producers and local traders — are often dispersed and easily overlooked, yet central to how most seed moves. Engaging them on an equal footing with seed companies and regulators puts the principle of equal rights into practice.
- **Gender and equity** shape who selects varieties, saves seed, sells it and decides what to grow. Processes that do not deliberately include women, youth and marginalized groups tend to reflect only the priorities of those already best represented.

- **Farmers are knowledge-holders**, not only beneficiaries; their judgement of what performs and what they value is itself an input to good design, as participatory variety selection and breeding show.

Sustainability depends on working through legitimate local actors rather than around them: the authorities, farmer organizations, seed associations and enterprises already shaping the system. Formalizing these relationships through partnerships or joint plans helps align goals and hand over ownership, and a multi-stakeholder platform is a proven way to bring the actors together to align priorities, share information and resolve tensions.



Example

Strengthening seed sectors for food system outcomes

The Integrated Seed Sector Development programmes in Ethiopia, Uganda, and Myanmar illustrate what coordinated, multifunction seed sector investment can achieve in practice. Rather than targeting a single-entry point, these programmes worked simultaneously across production, distribution, service provision, utilisation, stakeholder organisation, regulation, and coordination. They recognised from the outset that lasting change required strengthening the system as a whole. In Uganda alone, local seed businesses scaled from 30 to 250 groups, farmer seed producer organisations gained formal recognition, Quality Declared Seed was institutionalised as a legitimate seed class, and a revised national seed policy embedded pluralistic principles into the country's regulatory framework. These outcomes did not happen in sequence – they happened because investments in one function consistently created the conditions for progress in others. Farmer organisations made regulation reform politically possible; regulation reform made service provision more inclusive; inclusive service provision made quality seed production more viable for smallholders. That virtuous cycle (functions reinforcing functions, investments compounding over time) is what distinguishes transformative seed sector programming from a collection of well-intentioned but disconnected projects



Good practices

Seed System Interventions

- **Analyse before acting.** A sound, stakeholder-confirmed assessment of how seed systems function, not assumptions about farmers' needs.
- **Let the assessment choose the entry point.** Act on the binding constraints and clearest opportunities, be it a channel, function, subsystem or policy.
- **Keep food-system outcomes in view.** Anchor objectives in a specific outcome and name who benefits, especially women, youth and marginalized groups.
- **Respect pluralism and do no harm.** Treat farmer-managed, intermediate and formal systems as complementary; support one without undermining another.
- **Match the modality to the context.** Market- and community-based where systems function; direct distribution only for genuine collapse; coherent across the nexus.
- **Design across the system.** Areas interconnect, so plan for the links and priorities the highest-leverage points.
- **Align and build ownership.** Connect to national strategies and SDGs; involve local stakeholders, especially female and young farmers, throughout.

3. From design to results

Designing good interventions is not the end of the task — a good design still has to prove itself in practice. That means being honest about trade-offs, making sure benefits reach everyone they should, and staying ready to adjust as things change.

Managing trade-offs. Seed system interventions inevitably involve trade-offs, and making them explicit is part of designing well:

- Formalisation can improve quality assurance but may reduce access or undermine farmer-managed systems.
- Improved varieties can raise productivity but narrow the diversity that underpins nutrition and resilience.
- Short-term seed aid can support recovery but distort local markets.

None can be fully avoided, but all can be managed, by combining formal and farmer-managed approaches, pairing productivity gains with agrobiodiversity conservation, and favouring market and community-based responses over free distribution where systems still function.

Inclusion and equity. A seed system that works on average can still leave many behind, so interventions must tend to who benefits, who participates and who is left out:

- Smallholders, women, youth and marginalized groups often face structural barriers, including limited access to land, finance, information and decision-making.
- Asymmetries within the private sector matter too, as regulations and support can unintentionally favour large actors over domestic SMEs and local enterprises.

Equity is a lens applied throughout, closely tied to the stakeholder engagement in Part 2.

Monitoring and adaptive management. Seed systems are complex and dynamic, so monitoring must go beyond outputs to track system-level change:

- Track the interventions, monitor the outcomes, such as :
 - » **Delivery and reach** : e.g. farmers reached (incl. share of women, youth and marginalized); seed producers or enterprises supported; geographic coverage
 - » **Seed availability** : e.g. incidence and duration of stockouts; proportion of communities with a functioning seed source; volume available relative to estimated demand

- » **Seed access** : e.g. share of farmers obtaining desired seed; seed price relative to household income or crop value; distance and travel time to suppliers
 - » **Quality and varietal suitability** : incidence of seed-borne pests and diseases; farmer satisfaction; performance under local conditions
 - » **Diversity and resilience** : e.g. number of crops and varieties available / cultivated; use of locally adapted varieties; diversity of seed sources; continuity of supply after shocks;
 - » **Seed system functioning** : e.g. sales and repeat purchases; distribution coverage; survival and profitability of seed enterprises; functioning farmer-to-farmer exchange;
 - » **Governance and enabling conditions** : e.g. policies or regulations adopted and implemented; recognition of farmer-managed and intermediate systems; time and regulatory service capacity; stakeholder participation
 - » **Food systems outcomes** : e.g. yield stability; household production and income; dietary diversity; climate-loss reductions.
- Watch feedback loops: detect early whether interventions are reinforcing or destabilising the system, including unintended effects across seed systems and actor groups.

All relevant indicators should be: Disaggregated by sex, age, wealth, location, displacement status and other locally relevant characteristics; Comparable across seed channels farmer-managed, intermediate and formal, rather than reporting only formal-sector performance ; Tracked over several seasons, because one successful year does not demonstrate a stronger system ; Used to detect unintended effects, such as loss of local varieties, market displacement, increased dependence, exclusion of poorer farmers or concentration among a few suppliers.

This matters most in fragile and climate-affected settings, where continuous learning keeps interventions aligned with long-term resilience. Digital tools, from traceability and market-price monitoring to mobile farmer feedback and real time dashboards, can strengthen monitoring when designed with inclusion, data protection and local capacity in mind.

Putting the approach into practice

There is no single model for strengthening a seed system. Effective interventions begin with a clearly defined problem and a sound understanding of how farmers obtain seed, then select entry points and modalities suited to the context. They engage local actors, respect the complementary roles

of different seed systems, and monitor both intended and unintended effects. Because seed systems continually change, this is an iterative process: evidence from implementation should be used to revisit assumptions, adjust interventions and strengthen local ownership. The partners, frameworks and tools in the following chapter provide further support for putting this approach into practice.

4. Selected key partners and resources

Frameworks and knowledge platforms

SeedSystem.org: a knowledge and community-of-practice platform focused on strengthening smallholder farmers' seed systems, particularly in humanitarian crises and fragile settings. It provides practical tools, guidance, training and good practice for designing seed system support.

- » [Seed System Security Assessment \(SSSA\)](#)

Integrated Seed Sector Development (ISSD): a global framework and methodology for seed sector development, focused on the three seed systems (farmer-managed, intermediate, formal), system-wide thinking, and the integration of policy, markets and farmer realities.

- » [ISSD guiding principles](#)
- » [Seed Emergency Response Tool \(SERT\)](#)
- » [Publications and tools for seed systems development](#)

International organizations

Food and Agriculture Organization (FAO): provides policy guidance, technical assistance, capacity building and emergency seed security support, helping secure farmers' access to quality seed and more resilient, inclusive seed systems.

- » [Voluntary Guide for National Seed Policy Formulation](#)
- » [Seeds Toolkit](#)
- » [Seed Security Assessment](#)

CGIAR: through its research centers and partners, [CGIAR](#) conducts crop breeding and research to develop improved, climate-resilient and nutrient-rich varieties. It supports variety testing, seed system innovation and scaling pathways, linking research to farmer adoption and policy through public and private collaboration.

International legal frameworks

International Treaty on Plant Genetic Resources for Food and Agriculture (Plant Treaty / ITPGRFA): a global agreement under the FAO for the conservation, sustainable use and fair sharing of benefits from plant genetic resources. It recognizes [Farmers' Rights](#), including the right to save, use, exchange and sell farm-saved seed as defined under national law, and supports crop diversity and food security.

International Union for the Protection of New Varieties of Plants (UPOV): an intergovernmental organization established in 1961 that administers the [UPOV Convention](#), a system of plant variety protection, providing technical assistance, training and capacity building and promoting harmonization worldwide. Its model, particularly the restrictions it places on farm-saved seed, has drawn sustained critique from UN human rights mandates and civil society as constraining farmer-managed and intermediate seed systems.

Human rights instruments

UNDROP: [Declaration on the Rights of Peasants and Other People Working in Rural Areas](#), whose Article 19 sets out the right to seeds.

UN Special Rapporteur on the right to food: [report on seeds](#), addressing seed policy from a human rights perspective.

Civil society and networks

SWISSAID: works on pluralistic seed systems and the defense of farmer-managed seed, with policy positions and documentation on the risks facing seed diversity.

- » [Seeds at Risk](#)
- » [Position paper: pluralistic seed systems and seed policies \(2023\)](#)
- » [Seeds documentation \(2019\)](#)

Alliance for Food Sovereignty in Africa (AFSA): a pan-African civil society network working on farmer-managed seed systems and their legal recognition.

- » [AFSA seed case studies](#)
- » [Farmer-managed seed systems and the legal framework \(2022\)](#)

APBREBES (Association for Plant Breeding for the Benefit of Society): a network focused on plant variety protection and its implications for farmers' seed rights.

- » [Literature review on UPOV](#)
- » [When Saving Seed Becomes a Crime](#) on the criminalization of farmers exercising seed rights

Geneva Academy of International Humanitarian Law and Human Rights: researches the right to seeds and its grounding in international human rights law.

- » [The right to seeds in Africa](#)
- » [Briefing paper on the right to seeds](#)

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