Working Paper

CONFLICT AND SEED SECURITY PROGRAMMING

Focus on Africa

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seed system Strengthening smallholder farmer seed systems

MERCY CORPS

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SeedSystem provides practical ('how-to') guidance and strategic thinking to help professionals design seed security-related assistance. It aims to foster productive, resilient, and market-oriented seed systems, even in times of emergency (high crisis!) and chronic stress. SeedSystem creates links among donors, government professionals, researchers, and humanitarians, drawing users from over 75 countries worldwide. While global, the work has a particular focus on smallholder farmers across Africa.

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About ISSD Africa

Integrated Seed Sector Development (ISSD) Africa is an international community of practice, guiding seed sector innovation and development on the African continent to alleviate the problem of limited access to quality seed. It is enabled by the Swiss Agency for Development and Cooperation (SDC) and the Government of the Netherlands.

ISSD Africa addresses seed system challenges in fragile and conflict-affected states by fostering better coordination across the Humanitarian-Development-Peacebuilding (HDP) Nexus. It works to bridge emergency seed interventions with long-term sector development, ensuring responses are timely, targeted, and sustainable. This review and analysis were conducted under ISSD Africa Action Learning Project 2 (ALP2), which explores effective seed security responses in fragile and conflict-affected contexts. ALP2 is co-led by SeedSystem and Mercy Corps.

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Aims and Scope

Africa has a longstanding history of conflict, with recent data suggesting that its incidence is on the rise. Currently, armed conflicts span at least 18 countries across the continent, and in the sub-Saharan region alone, conflicts have nearly doubled within the last decade. Smallholder farming areas are not immune to conflict and its impacts and, for farmers, continuing or intermittent conflict often translates to multiple seasons of disrupted production. For instance, in North Kivu, Democratic Republic of the Congo (DRC), farmers have navigated conflict since at least 1993—more than 60 growing seasons. Farmers in Northeast Nigeria have been similarly affected on and off since 2011—or over 28 seasons.

This paper focuses on conflict in smallholder farming areas, primarily in Africa, and adds a novel dimension around the changes unfolding in conflict zones. It homes in on the theme of seed security; *seed* being one of the core inputs of farmers' agricultural production, and *seed assistance* being among the prime interventions humanitarian practitioners use in conflict-affected contexts. The work reviews how the varied features of conflict affect, or force drastic changes in, seed system functioning. It also documents the range of seed security interventions that have been implemented and analyzes whether the type and design of these interventions have been tailored to reflect key conflict-induced seed system changes—a concept this paper introduces as ***conflict-intentional*** programming.

Conflict-intentional programming guides implementers to identify possible conflict-induced seed system changes and to steer their humanitarian response to better adapt to or mitigate those effects through explicit technical or social modifications.

Note that the term *conflict-intentional* goes beyond some of the approaches more frequently linked to humanitarian work. *Conflict-sensitive* generally emphasizes the humanitarian imperative to Do No Harm. It focuses on ensuring that interventions do not exacerbate tensions or inequalities. *Conflict-savvy* refers to the practical, often punctual, local knowledge that allows implementers to navigate risks and danger. For instance, it may include knowing which roads are mined, which markets are functioning, or how to transport goods through insecure zones. *Conflict-intentional* programming goes beyond risk avoidance and having 'street smarts' to seek intervention design types or changes that better respond to the conflict-affected realities at hand.

The paper is not intended to be an academic paper—though it gathers evidence not often amalgamated in the emergency seed security field. The work presents the most comprehensive analysis to date on seed system functioning and seed security response in conflict-affected contexts. The case material presented draws from 10 countries in Africa, with select other cases from elsewhere, such as Syria and Gaza. The work is largely based on written documentation (i.e., refereed articles, project reports, web postings), and supplemented by several interviews with private sector, non-governmental organization (NGO), and research-linked humanitarian actors. Though the evidence on seed systems in conflict contexts has been scattered and challenging to find, sources and complementary on-the-ground details have been carefully documented (see reference list of 100+ entries).

The driving aim of this comprehensive work is to improve emergency seed security responses implemented in conflict-affected areas. The work goes beyond promoting the basic tenet of humanitarian action of Do No

Harm. It fosters the notion of also *doing good* and particularly *doing technical good on a more* consistent basis: that is, steering seed security programming to become more ***conflict-intentional***.

Key Findings

The paper presents findings grouped along three major themes. Key details reported in each theme are extracted below.

1. Conflict Features and Seed System Changes

The review identified over 20 conflict-induced changes that might take place in seed systems. Each can have marked implications on seed systems and seed system programming, and the scope of possible changes proves diverse and very wide-ranging. The changes embrace phases of crop and seed management from the beginning of production to the end: e.g., what type of land will be used, what plot size, which crop, which variety, which seed source, planting time, non-seed input use, crop management, post-harvest management (processing, storage), sale, and more. The conflict-induced changes can also induce complex shifts in strategy: for instance, shifting from food to cash crops; moving away from processing; changing where seed is obtained; and altering the way specific crops are tended. While the cases identified largely involved changes that might be perceived as negative or closing options, a small number of the induced shifts opened possibilities, for example, introducing new varieties and creating novel links with seed production groups.

While it is key for humanitarians to recognize the seed system-related changes that unfold, they must also understand the rationale for a change. There can be multiple reasons for a shift, with the diverse reasons translating to different types of support. Take the case of crop choice. Farmers may shift a crop for multiple reasons: stability is uncertain and they need shorter duration crops; inputs are unavailable so they move to crops that do not need fertilizers; or the conflict patterns cause a farmer to miss the crop planting window, so they shift to another crop type. The paper identified six distinct reasons for a single possible shift in crop choice.

In sum, beyond marked violence, loss of assets, and generalized fear, **conflict may induce changes in the fundamental technical ways that farmers choose, tend, and process their crops.** Humanitarians need to understand the rationale for these conflict-induced technical changes if seed security programming is to be conflict-intentional and effective.

2. Seed Security Interventions: Broad Range

The paper identified the types of seed security interventions practically being implemented in conflict-affected contexts. Through extensive literature and web-based searches, 11 basic technical types were identified. Each intervention type—for example, direct seed distribution (DSD), seed production, or voucher transfer—was briefly described (i.e., what does it entail) and then, each case was reviewed as to whether the design or implementation showed evidence of conflict-intentional programming (i.e., was the intervention tailored to respond to conflict-induced changes). Admittedly, many activity descriptions were quite brief. In reviewing cases, the authors could only comment on what was concretely documented.

That said, a cluster of central findings emerged from the totality of cases.

1. Seed security interventions are taking place in many and diverse conflict-affected contexts in Africa. This paper cite 24 cases from 10 countries.

2. The seed security work implemented in these contexts includes a wide range of responses.
3. The basic set of interventions implemented in the conflict-affected contexts largely parallel those implemented in routine seed security programs, in normal times. There were a few exceptions identified: spurring extensive international seed networks; and, possibly, airdrop delivery.
4. The interventions reviewed embraced select technical modifications linked to conflict-induced stresses: for example, alterations in storage design to address theft and shifts in crop choice to boost nutrition and respond to dietary needs.
5. Broadly, the technical tailoring (i.e., conflict-intentional programming) seems to have been modest, especially in relation to the extent of possible conflict-induced changes.
6. Given the importance and relative stability of informal seed systems, it was surprising to find very few efforts to support the informal sector specifically.
7. As a global set, the responses mainly focused on the supply-side, and on giving something free to beneficiaries. This thrust contrasts with expert advice that market-driven systems for service delivery (i.e., not supply-led programming) should be the essence of agricultural support in conflict-affected countries.
8. In terms of actively tailoring responses in conflict-affected contexts, the cash-based responses seem much more advanced than those linked to seed security. Cash-based analysis provides specific guidance around the risks and benefits of diverse approaches (e.g., cash vs. voucher; digital vs. paper).

Overall, this review revealed relatively scant evidence that seed security interventions are being tailored to address conflict-induced stresses. This lag or gap contrasts to the significant number of interventions unfolding in an important number of countries.

3. Seed security interventions linked superficially to spurring more social cohesion

Seed security interventions with stated aims to promote greater social cohesion or spur peacebuilding were separately reviewed. Such seed security and peace-linked work may be of relevance given the current promotion of Humanitarian-Development-Peace (HDP) Nexus programming.

The paper first asked whether ‘seed’ is a good entry point for peace-linked work and suggested six features of seed and seed systems that might lend themselves to a seed and peace work coupling.

1. Seed sharing takes place and creates bonds in normal local systems. There may be a foundation of social cohesion, already linked to seed, that peace efforts can leverage.
2. Seed is sometimes closely tied to land, cultural identity, and pride—and perhaps healing. Safeguarding local varieties—and promoting joint stewardship of them—might help revitalize community pride towards broader social cohesion.
3. Seed is a relatively easy technology: ‘plug and play.’ Allied peace work might focus on the more complex cohesion processes, without major technical hurdles.
4. Seed grows: it has a future. The analogy to what is desired by peace may make seed a natural fit to social cohesion work.
5. Seed is often short cycle: it yields quick results. Seed is among the quicker technologies to mature and give results. In peace work, it may offer a short-term milestone against which possible social cohesion gains can be charted.

6. Seed management is often associated with women and youth—those most vulnerable in conflict. A focus on seed may also engage those most vulnerable.

None of these features of seed guarantees that its use will make a positive contribution to furthering social cohesion or peace. Simply, the coupling of seed and peace-linked work seems possible and potentially positive, for multiple reasons.

The paper then reviewed the relatively few types of seed interventions linked to social cohesion: DSD linked to Village Peace and Rights Days; gardens in war-torn zones; and seed sharing networks in active conflict zones. Whether seed is an especially good entry point for promoting social cohesion merits further discussion.

Actions to Move Forward

The subject matter of this paper is relatively new, as is term of *conflict-intentional* programming. Four steps are suggested below to guide this seed security and conflict field towards a more solid foundation.

1. **Familiarize humanitarians globally with the concept of *conflict-intentional***. While Do No Harm is widely understood, conflict-intentional programming is a newer concept. It seems important to socialize this term more widely in the global domain via, *inter alia,* publications, webinars, and online posts. The aim is not to reify the term but rather to spur its use in programming.
2. **Catalyze/review specific cases of seed security programming that has been conflict-intentional.** The available data on which this paper drew was modest—despite use of substantial search engines. It is possible that evidence resides in practitioners' minds and experience but has yet to be documented. A targeted workshop or expert consultation might help capture practitioner insights from active conflict regions. Documenting this field-based experience is essential for refining and advancing conflict-intentional programming.
3. **Examine the potential of seed to promote social cohesion/peace: are the two a good match?** Seed programming may support social cohesion, making it a good fit for HDP nexus goals. However, the contributions of seed to social cohesion and, possibly, peacebuilding remain largely underexplored. Joint reflection—via webinars, case calls, or integrated workshops—could clarify when and how seed system work can contribute to broader social cohesion outcomes (possibly linked to #2).
4. **Develop conflict-intentional seed security programming checklists.** As knowledge on this topic advances, a second order step would be to elaborate more detailed guidance. To operationalize the concept, conflict-intentional programming checklists might be created to guide seed security programming. Checklists should be grounded—for instance, should the crop choice be the same as pre-conflict?; do the focus crops require inputs that are available?; and more. As seed security interventions are designed and implemented by a range of technical and non-technical personnel, checklists might be intelligible also for non-specialists.

Conflict-intentional programming should help to improve seed security programming in conflict contexts. That is the fundamental notion driving this overview paper. The term needs to be socialized, and its practical implications made more clear. There is also a need to better understand what happens to seed systems in conflict-affected contexts and how to respond (tailor) programming to better mitigate and adapt to any changes. These are concrete, distinct ways forward.

I. Introduction

Africa has a longstanding history of conflict, with recent data suggesting that its incidence is on the rise. Currently, armed conflicts span at least 18 countries across the continent (Geneva Academy, 2025), and in the sub-Saharan region alone, conflicts have nearly doubled within the last decade (PRIO, 2024). These conflicts are spurred by diverse factors, including resource scarcity, political instability, ethnic diversity, and colonial legacies (SIPRI, 2022).

Smallholder farming areas are not immune to conflict and its impacts. For farmers in conflict zones, this often translates into multiple seasons of disrupted production. For instance, in North Kivu, Democratic Republic of the Congo (DRC), farmers have navigated conflict since at least 1993—more than 60 seasons. Farmers in Northeast Nigeria have been similarly plagued on and off since 2011, more than 28 seasons, and those in Tigray, Ethiopia, since 2020—more than eight seasons. While the conflicts may not be continuous or always of high-intensity, the effects are wide. Farmers may face direct shocks such as violence in their area and indirect effects like generalized uncertainty (Arias et al., 2019).

Conflicts may be ongoing for years, affecting farmers for 10, 20, or even 60 seasons.

The economic costs of conflict are severe and challenging to calculate. One study suggests that "a violent civil conflict costs the average developing country roughly 30 years of GDP growth," (Hergertun, 2023, p. 13). While there is no comprehensive study on the monetary effects of conflict on agricultural production per se, FAO estimated the damage inflicted by the conflict on agriculture in Northeast Nigeria to reach approximately USD 3.7 billion in 2015 (FAO, 2017). Narrative accounts provide further insight into farm-level trends, such as "Boko Haram attacks significantly reduce[d] total output and productivity…and reduce[d] the outputs of specific staple crops such as sorghum, cassava, soya and yam," (Adelaja and George, 2019 abstract). Notably, smallholder farmers often continue to sow and harvest in the midst of such extended and varied instability.

This paper focuses on conflict in smallholder farming areas, mostly in Africa, and adds a novel dimension around a range of changes unfolding in agricultural systems in conflict-affected contexts. It homes in on the theme of seed security; *seed* being one of the core inputs of farmers' agricultural production, and *seed assistance* being among the prime interventions humanitarian practitioners use in conflict-affected contexts. The paper first documents how the varied features of conflict affect—or force drastic changes in—seed system functioning, both in terms of seed supply options and farmer management strategies. Next, it examines the kinds of seed security interventions implemented and charts whether the intervention type and design have been tailored to reflect key conflict-induced seed system changes, a concept this paper introduces as *conflict-intentional programming*.

> ***Conflict-intentional programming*** *guides implementers to identify possible conflict-induced seed system changes and to steer their humanitarian response to better adapt to or mitigate those effects through explicit technical or social modifications.*

This paper aims to improve emergency seed security responses in conflict-affected areas. It is not intended to be an academic paper—though it documents evidence not often amalgamated in the emergency seed security field. Rather, based on an enhanced understanding of the varied effects of conflict on seed system

functioning, the paper aims to help humanitarian practitioners select and design more conflict-intentional programming. The paper goes beyond the basic tenet of humanitarian action of Do No Harm. It fosters the notion of also doing good and particularly doing technical good, consistently. In seed security programming, doing technical good means designing responses that strengthen seed systems during unstable or volatile periods and promoting practical actions grounded in knowledge of the conflict-induced constraints and farmers' changing needs.

This paper is organized as follows. After this introduction, Section II provides background on seed security and conflict programming, two humanitarian disciplines that have often been organized separately in discourse and practice. Section III reviews evidence for the effects of conflict on seed system functioning. Drawing on written accounts from 10 countries, it details conflict features that have affected informal and formal seed system functioning (e.g., labor availability, theft) and some of the resulting adaptations, such as in crop choice, plot management, and supply channels. Section IV presents the range of humanitarian seed security responses implemented in conflict-affected contexts, focusing on their technical content (e.g., direct seed distribution vs. cash, or local vs. modern variety) and whether the design choice shows signs of being *conflict-intentional* (as described in Section III.) Seed security interventions linked specifically to furthering peace or social cohesion are also included. Sections III and IV are largely drawn from written accounts but end with two boxes presenting insights based on direct interviews with private sector and research/non-governmental organization (NGO) implementers. Section V closes with reflections, general lessons and next steps forward.

This detailed analysis of seed system changes during conflict, and the subsequent tailoring of response, is believed to be the first of its kind. An important caveat is that the evidence has been scattered and challenging to find. The nature of working in conflict contexts and emergency settings, often with very short contracts, means that many humanitarian managers and implementers have not documented their processes or results with the depth that might emerge from longer or developmental programs. This paper aims to help close this gap.

II. Background

II.1. Seed Security Programming in Humanitarian Response

Seed is among the first entry points in agricultural response after a disaster. The rationale is to help farmers get back on their feet quickly through producing their own food for consumption or sale.

Emergency seed assistance can take many forms. It is most commonly conflated with direct seed distribution (DSD), where implementers directly provide free seed to farmers. Other seed assistance approaches may include giving farmers cash or vouchers to buy seed themselves—propping up the demand side—or supporting the functioning of formal or informal markets—propping up the supply side. Section IV describes these varied approaches in more detail. *Seed security programming* or *emergency seed assistance* are used as umbrella terms to acknowledge the wide range of response types.

Seed is among the first entry points in agricultural response after a disaster, including in conflict-affected contexts.

Emergency seed assistance has a relatively recent history compared to food assistance, which largely emerged after World War II. Seed assistance (mainly via DSD) escalated in Africa starting in the early 1990s, with only isolated distributions prior to that, such as in Ethiopia in 1974. Initially, seed aid was seen as an empowering response option—letting farmers take the lead to plant themselves. It was also deemed cost-effective; for instance, one kilogram (kg) of sorghum seed can yield over 100 kg of sorghum food (Sperling et al., 2022a).

In recent years, the overall effectiveness of emergency seed assistance has come under scrutiny (SEADS, 2022) as well as the value of select forms like DSD (Smits et al., 2024). One concern is that its use has escalated; for instance, FAO spent approximately USD 470 million on seed assistance in 2023 alone (Seed System et al., 2024). Another is that seed assistance—mainly DSD—is being repeated in many countries, regions and even among the same farmers. For example, Ethiopia has received near continuous seed assistance for over 42 years (Sperling et al., 2022a).

Emergency seed aid has been implemented in response to various shocks and stresses, in varying contexts. These include natural disasters—such as droughts, floods, or earthquakes—and human-induced stressors—such as civil strife and contexts of political instability (Sperling et al., 2008). Additionally, such assistance has unfolded in many stable and conflict-affected contexts, the latter being the focus of this paper.

II.2. Conflict Programming in Humanitarian Response

Much has been written about conflict programming and some of its guiding principles (Andersen, 1999 being the classic reference). Guidance is diverse, evolving, and can be quite precise. For example, advice exists on: how to navigate dangers safely (ICRC, 2015); how to better analyze conflict contexts (United States Agency for International Development [USAID], 2012; Duncan, 2015); and how to use digital interactions that Do No Harm (Burton, 2020).

Terminology

Three terms, in particular, have been applied to guide actions for those working in conflict-affected contexts. All three are important and emphasize slightly different skill sets and actions.

1. **Conflict sensitivity** is aligned with the overall principle of Do No Harm. It generally refers to processes that help ensure that humanitarian work does not contribute to or worsen conflict dynamics in any way. Important literature exists on conflict-sensitive approaches (e.g., CDA, 2012 & FAO, 2019) with documents suggesting ways to operate that spur no negative tensions or results. Some definitions also embrace positive activities, such as strengthening and contributing to stability and peacebuilding or positive gender dynamics (UNSDPG, 2022). In all cases, the term 'conflict-sensitivity' centers on the processes of operating in conflict contexts—about *how* to do the work. Only select definitions cite *what kind* of work is to be done. If there is an activity focus, it is on social strengthening: furthering stability, promoting peace, improving gender dynamics, etc.

2. **Conflict-savvy** refers to a set of skills allowing implementers to navigate the peculiarities or dangers of the conflict and to continue to complete the tasks at hand (Sperling et al., 2022b). Most humanitarians will rely on a certain level of conflict-savviness in order to conduct their work in ways that do not put them or the communities they work with in direct danger. For instance, a conflict-savvy informant can advise on which villages are accessible or which roads are mined; a conflict-savvy trader might know where to find adapted seed and how to move the goods even in turbulent times. In lay language, 'conflict-savvy' might be the equivalent of having 'street smarts.' Like conflict-sensitive, conflict-savvy refers to *how* work is done—the process. Simply, its emphasis is practical: how to navigate a challenging situation, often logistically.

3. **Conflict Integration** or **Conflict-intentional** programming is the newest term (USAID, 2023). As described in its first publication,

   > *"Conflict integration is the intentional effort to improve the effectiveness and sustainability of development and humanitarian assistance…. Doing so can move programming beyond conflict sensitivity and the principles of Do No Harm to promote better development outcomes and sustain peace and prosperity," (2023, p. 22).*

   Conflict Integration—or conflict-intentional programming, as used in this paper—goes beyond Do No Harm or having 'street smarts' towards more emphasis on actively *doing good* and driving improvement. This paper extends the concept in two directions, socially and technically. One can improve a system in conflict-affected contexts in social ways, such as through intentional efforts to promote peace or social cohesion. One can also improve a system in technical ways by improving the design of an intervention's technical elements, such as changing the crop or variety type for seed security.

All three terms—conflict-sensitive, conflict-savvy, and conflict-intentional—are complementary and important for guiding action. Conflict-intentional programming, with a technical focus, is perhaps the least explored, and is given particular emphasis in this paper.

Table 1 expands on the three terms and provides examples linked to seed security programming. The aim is not to debate existing terminologies or to reify specific definitions. Rather, it is to present three key terms useful for guiding programming in conflict-affeced contexts and to distinguish among their salient components, recognizing that the borders of the terms can be fuzzy, with some overlaps.

Table 1. Terminology linked to conflict programming

Terms	Focus and Characteristics	Practical examples
Conflict-sensitive	Do No Harm	Seed distributions are planned to avoid exacerbating social tensions, e.g., engaging diverse local groups who can help ensure equitable delivery
Conflict-savvy	Using 'street smarts'	Humanitarian partners connect with local seed traders to find ways to move goods despite road blocks or landmines
Conflict-intentional	Doing active good: designing and implementing programs to get a specific, better result	
	• Social programming	Seed programs are designed to actively foster social cohesion, e.g., through shared land access, joint garden management, or communal sales
	• Technical programming	Crop selection is changed to adapt to farmers' revised need for short-term crops that also need no processing

III. Conflict and Seed Systems: Analytical Features to Consider

The paper now moves to look at different features of conflict and how these features might affect seed system functioning. The aim is to identify seed-linked features that might shift or be compromised during volatile periods—as such shifts may warrant comparable shifts in programming. This analysis is rooted in field evidence drawn mainly from cases in Africa, with select cases from elsewhere.

Section III has two major parts. It starts by noting the existence of broader sets of knowledge on the typologies of conflict and the effects of conflict on agriculture to help to situate this very seed system-specific inquiry. Next, it focuses specifically on the seed system/seed security features that may have changed, based on insights from evidence from the field.

III.1. Broad typologies of conflict and general effects of conflict on agriculture

Conflict has long been the subject of substantial scholarly analysis. Below, two areas in particular are highlighted: work that seeks to categorize the types of conflict, and work that sketches some of the broader effects of conflict on agricultural more generally.

Box 1 brings together some of the parameters used to differentiate among conflicts, drawing from multiple humanitarian and legal sources. The parameters generally center on the scale and intensity of the conflict and the types of actors instigating and perpetuating it.

Box 2 looks specifically at agricultural activities and some of the linked aspects that may be impacted by conflict and protracted crises. While many overviews have analyzed what may happen to agricultural activities (e.g., FAO, 2023; Longley & Maxwell, 2003), Box 2 draws from a single comprehensive compilation (Rohwerder, 2017). Changes identified embrace diverse sets of factors—environmental, social, economic, and governance—suggesting the varied and complex effects of conflict on agricultural performance and populations. This list is indicative, not exhaustive, as much depends on the specific context and type of conflict (e.g., how it unfolds, the intensity, the geographic extent.)

Box 1. Conflict typologies

At its most basic, conflict occurs when two or more parties believe that they have incompatible goals. Not all conflict is violent, but it always has the potential to become so. Conflicts have deep and sometimes unseen root causes that lead to visible consequences and effects. For example, the root causes of a conflict may include discrimination, mistrust, and fear, with the visible consequences and effects being incidents of violence, displacement, and poverty.

There are a range of documents classifying conflicts, often in quite different ways. Such typologies help practitioners, policymakers, and other actors sort through the varied causes, actors, and possible dynamics—all of which are important for steering future interventions. The key parameters used vary in type and order of prominence, with some of the main classifying parameters listed below.

Some of the parameters differentiating conflicts:

- By cause: resources, rights, ideology, etc.
- By scale: intrastate vs. interstate

- By actors: state or non-state
- By nature: physical violence vs. structural violence (armed?, one-sided?)
- By duration: protracted vs. emergency; intensity
- By phase: latent vs. hot

Conflicts are rarely homogenous, with conditions often in flux. For example, farmers may be able to move in and out of regions, or some markets may work and others not.

Sources: Jehn, 2014; Bonn International Center for Conversion (BICC), n.d.; Vite, 2009 (for ICRC); Lyamouri-Bajja et al., 2012; Sperling et al., 2022b

Box 2. Possible effects of conflict and protracted crises on agriculture

This list—drawn from a single comprehensive review (Rohwerder, 2017)—suggests the varied and numerous agricultural-linked features that might be negatively impacted in conflict and protracted crises.

Environmental effects

- physical damage to agricultural land and produce, with crops destroyed or plundered; agricultural land contaminated by explosive remnants of war, and water sources and agricultural land polluted. Conditions caused by conflict and protracted crisis can be conducive to outbreaks of pests and diseases.
- damage to agricultural infrastructure including irrigation systems, veterinary services, markets, storage facilities, factories for processing produce, and agricultural extension facilities.
- agricultural coping practices, which damage the environment and soil nutrition.

Social effects

- restricted mobility for agricultural laborers, input suppliers, processors, traders, and consumers due to security concerns.
- displacement, often protracted, which leads to neglect of produce, loss of access to productive agricultural areas, loss of traditional agricultural knowledge and practice, and a decline in interest in agricultural livelihoods.
- changes in the agricultural labor force, with higher numbers of women, youth, the elderly, and the infirm left to tend the land, leading to more small-scale subsistence agriculture.

Economic effects

- high financial costs in terms of damages and losses.
- disruption to agricultural markets and value chains, which lessens incentives to engage in agricultural production beyond the subsistence level.
- higher production and marketing costs resulting in less income for farmers and lower quality inputs and processing.
- farmers forced into debt and/or lacking the capital to reinvest in agricultural livelihoods.
- a move to employment in other sectors and laborers who are unlikely to return to agriculture.
- a move to planting illegal crops by some farmers.

Governance effects

- disruption to the implementation of coherent national agricultural programs and support for farmers.
- undermining of traditional governance systems for managing natural resources.
- confusion over land rights and dispossession of land.
- increased external assistance, potentially leading to a dependency culture.

III.2. Seed security/system-specific conflict features that affect seed system functioning

Conflict affects seed system functioning and farmers' seed security in diverse and specific ways. To frame the specifics, one should start with basic questions around farming in conflict-affected contexts. For example: are farmers inclined to farm at all?; do farmers have agency to make farming choices (e.g., top-down, state-controlled agriculture vs. decentralized, smallholder farming scenarios)?; and do farmers have access to key means of production? (see Sperling, 2008, pp. 23-24 for full set of initial framing questions). If farmers can somewhat independently sow and are inclined to do so, more focused attention on crop and seed features becomes relevant.

Table 2, drawing mainly from African evidence, summarizes initial learning about changes in crop and seed systems that may be spurred in conflict-affected contexts. The table is based on site-specific observations documented by practitioners on-the-ground and research analysts. These cases focus on populations-in-place so do not include analysis of possible changes for those who may be displaced or resettled in camps, for instance.

Table 2 shows that conflict can directly affect crop- and seed-system management in multiple ways. The types of changes identified are diverse, specific, and wide ranging. They embrace phases of crop and seed management from the beginning of production to the end: what type of land will be used, what plot size, which crop, which variety, which seed source, planting time, non-seed input use, crop management, post-harvest management (processing, storage), sale, and more.

The conflict-induced features shaping seed management can also induce strong and complex changes. For instance, shifting crop strategy from food to cash crops; moving away from processing; changing where seed is obtained; and altering the way specific crops are tended. Note that the direction of change varies by context: in some conflict-affected contexts, farmers move away from cash crops to consumption crops and, in other contexts, the reverse happens—they move toward crops that can generate income. Also, while the cases in the table largely involve changes that might be perceived as negative or closing options, a small number of the induced shifts opened possibilities, for example, new varieties and novel links with seed production groups.

Table 2. Conflict features that have affected crop- and seed-system functioning*

Conflict-linked features	Type of crop/seed-system change	Case examples	References
Length of stability period	Crop management (planting time)	North Kivu, DRC: Farmers plant crops earlier to not coincide with rebel attacks.	Baributsa et al., 2021a
Length of stability period	Crop choice (shift)	Farmers move to shorter duration crops. Nigeria: Farmers move away from longer-term crops (protracted crisis).	Amare et al., 2025
Land and plot sizes	Cultivation plot sizes	Angola: Vast areas of cultivation may be 'lost', e.g., to mines/explosives.	FAO, 2000
Land and plot access	Cultivation plot sizes	Nigeria: Fighting may cut off plot access or may decrease incentives to cultivate larger areas (short- and longer-term). Areas planted are reduced.	Amare et al., 2025
Land and plot access	Crop choice (shift)	Fighting may cut off plot access intermittently. Farmers shift to perennial crops that need less tending, especially when there are violent shocks.	Arias et al., 2019
		Nigeria: Cases of decreasing allocation of perennial crops.	Amare et al., 2025
		Tigray, Ethiopia: Fighting may take place during particular crop planting period, so specific crops are shifted/suppressed. Few lands planted with sorghum, as active warfare during planting window.	Ghebreyohannes et al., 2022
Theft	Crop choice (shift)	North Kivu, DRC / Sudan: Farmers change crop choice to those less susceptible to theft: crops that require further processing before consumption (e.g., soybean, sunflower, millet) or take more time to harvest (e.g., groundnuts).	Mercy Corps, 2018
Labor (access to labor and labor sharing arrangements)	Crop loss (linked to labor availability)	South Sudan: Workers/children no longer scare away birds because it makes too much noise and attracts enemies, leading to a loss of sorghum.	FAO, 1996
Population displacement (or risk of displacement)	Storage methods	Ethiopia: Farmers change to smaller sized vessels which are put underground to hide the extent of seed stored and to be able to move vessels quickly.	Mengistu and Garrand 2014
Military stipulations	Crop management (plant height)	Northern Uganda: Military controlled the height of field plants such as cassava so that rebel fighters cannot easily hide.	J. March, *pers. comm.*, Feb, 2022
		Nigeria: government restrictions on the height of maize to keep insurgents from hiding.	Mercy Corps & USAID, 2017

Conflict-linked features	Type of crop/seed-system change	Case examples	References
Formal government seed sector functioning **(availability)**	Seed supply channel for multiple crops (formal)	Mali: Government seed institutions collapse across crops. Breeder, Foundation, and other standards of formal seed become scarce.	Kimenyi et al., 2014
	Seed supply channel for one key crop (formal)	Rwanda: Potato seed and production collapse due to stalling formal seed supply systems. The breakdown causes scarcities of clean seed, fungicide, and fertilizer.	Sperling, 1997a
Private seed sector functioning **(availability)**	Seed supply channel for multiple crops, especially those linked to value chains (formal)	South Sudan: Seed companies shut down as soon as conflict escalates.	Sperling et al., 2022b
		Northeast Nigeria: National seed companies such as Premier Seed closed their remote offices during height of conflict (2010). This prompted other national companies to stop supplying the conflict region.	Rural Resilience Activity (RRA), 2024
Informal seed sector functioning **(availability and access)**	Seed supply channel for multiple crops (informal)	Farmers sporadically are not able to travel to local market, leading to scarcity of food, and, by extension, local seeds in some areas. Change in farmers' freedom of movement.	Insecurity Insight, 2024
Informal market functioning (outputs)	Crop shift	Sierra Leone: Farmers shift from cash crops to focus on rice.	Longley, 1997
Non-seed inputs (availability and access)	Input supply linked to crop choice/variety choice	Nigeria: Government restricts use of inputs, such as urea, which can be changed into explosives.	Mercy Corps, 2018
Non-seed (input availability)	Input supply linked to specific land use	Sudan: Shortages of fuel and equipment mean that irrigated areas cannot be utilized, especially larger fields which might require mechanization.	Mercy Corps, 2023c
Non-seed (input access)	Input supply linked to freedom of movement goods	Mali: Transport/supply chains disrupted. Fertilizers delivered to Mopti, 500km from conflict zones. Farmers retrieved them in compliance with rebel rules.	Kimenyi et al., 2014
Non-seed (input access)	Input supply linked to prices	Sudan: Prices skyrocket for seeds, fertilizers, and pesticides as supply chains are disrupted (especially from capital).	El Safty et al., 2023

Conflict-linked features	Type of crop/seed-system change	Case examples	References
Processing and processing facilities functioning	Processing facility or processing efforts linked to crop choice	Central African Republic (CAR): Farmers move away from crops that require extra processing, such as cassava, sunflower, millet, and sorghum. (Note, this is also sometimes the opposite. Where theft is high, farmers move *toward* crops that need processing.)	Bauer, 2024
		Sudan: In some cases, processing facilities may collapse.	Kirui et al., 2023
Financial institutions	Credit means linked to crop choice	Sudan: Credit collapses. Move away from crops that need inputs.	El Safty et al., 2023
Changing government policy	Government policy directives linked to crop and agriculture strategy	Nicaragua: Government during war emphasized scaling up of food production, at the expense of mainly cash crops.	Guhuray and Ruiz, 1997
Changing farmer priorities	Crop shift	Sierra Leone: Farmers move away from crops that may be especially desired for sale and towards key consumption crops.	Longley, 1997
		Sudan: Farmers move toward cash crops and away from food crops (to get quick income).	Hoffman et al., 2025
Positive changes			
Variety use (single crop)	Variety expansion	Sierra Leone: Rice diversity increased due to influx of aid (although this may be partly negative as farmers may have needed to import non-local types from outside region).	Longley, 1997
Seed supply channel **(single crop)**	Channel expansion	Mali: Farmer cooperatives organize and respond to relief seed calls producing adapted pearl millet seed.	H Guindo*, pers. comm.,* 2021 Dalohoun et al., 2011 Sperling & Almekinders, 2023

**This table is an expansion of an earlier version in Sperling et al., 2022b –Table 1.*

III.3. Understanding the rationale for conflict-induced shifts

Table 2 detailed the scope of possible crop- and seed-system changes that can occur in conflict-affected contexts. However, to provide good technical support to crop and seed management in conflict contexts, one must understand the underlying reasons for those shifts. Table 3 suggests how complex the underlying factors for even a single change can be, drawing from a single conflict-induced shift: change in crop choice.

Table 3. Select examples of changes in crop choice in conflict periods, and reasons *(extracted from Table 2)*

Conflict-induced shift	Reason for shift
Crop choice (shift) ***Observed from specific cases in Table 2***	Stability period: farmers need shorter duration crops
	Security: farmers need plants that require less constant tending
	Timing of planting: farmers missed planting window for X crop and move to Y
	Inputs: farmers need crops that do not require select inputs
	Processing: Farmers need crops that do not require processing to realize their value
	Priorities: • *Food:* Farmers move away from crops that may be especially desired for sale and towards key consumption crops; • *Income:* Farmer move towards cash crops and away from food crops so as to get quick income.

Table 3 shows that for one conflict-induced shift—change in crop choice—there may be varied rationales, identifying six distinct reasons. Understanding the reasons (the underlying factors) for each shift should have practical implications and lead to a more targeted response strategy. For instance, if there is little security or freedom of movement, crops that can be left basically untended may be favored, like cassava. If processing facilities have been destroyed, a shift away from soybean may seem wise, even if the crop generated important income prior (e.g., for oil or chicken feed.) Hybrid vegetables, perhaps reliant on scarce fertilizers, may be left temporarily aside or swapped for less input-demanding ones if the input markets have collapsed.

III.4. Distinguishing between shifts that can be managed by farmers' own adaptive strategies and those that might require outside support

Tables 2 and 3 above suggest different lead actors in responding to the conflict-induced shifts in crop and seed management—from farmers to private sector to humanitarian actors.

Many of the shifts can and have been managed within the realm of farmers' own adaptive strategies, such as changing the timing of planting or moving toward crops that need less tending. In fact, most of the shifts summarized in Table 2 can potentially be managed or responded to by farmers themselves (although perhaps at some cost). The importance of farmers' own adaptive strategies needs to be made very visible in any discussion of agriculture in conflict zones. Farmers may routinely shift to shorter-duration crops, or change the functioning and use of storage pits (e.g., Mengistu & Garrard, 2014), or move to a whole new set

of more conflict-wise strategies. It is revealing that a great deal of the humanitarian response literature focusing on conflict contexts emphasizes conflict-sensitive, conflict-resilient, or conflict-intentional activity, with the central actor assumed to be the humanitarian. While much of this paper also focuses on humanitarian action, it is farming communities themselves who have taken on the onus of adopting and adapting novel strategies in periods of instability and violence.

In terms of humanitarian action, there are multiple challenges in responding effectively to conflict-induced shifts. Sequentially, responders need to: 1) recognize the shifts clearly; 2) probe and discover their causes; 3) determine what farmers themselves can mollify or alleviate; and 4) identify if or what kind of outside humanitarian support might be warranted. There are constraints that will demand outside support. For instance, in Table 2, the collapse in formal sector seed supply may demand a combination of farmer adaptive change and outside support. Farmers themselves may move to use local markets for some seed but may also welcome outside help accessing some initial clean seed for a crop like potatoes.

The importance of farmers' own adaptive strategies needs to be made very visible in any discussion of agriculture in conflict zones.

IV. Conflict and Seed Systems: Humanitarian Responses

This section looks at outside support from humanitarian and private sector entities and describes some seed security responses that have been implemented in conflict-affected contexts. Actions are clustered into two broad types: 1) humanitarian and private sector responses aiming to alleviate seed security constraints, so *technically-oriented, conflict-intentional* responses, and 2) humanitarian actions that have been designed specifically to promote peace or social cohesion, so *socially-oriented, conflict-intentional* agendas that have a seed component.

The cases were identified through literature review, general internet search, and specialized databases. The cases are not deemed good or bad, or more or less interesting; the selection simply presents examples on which written information could be located. Admittedly, the inventory is slim: finding documents on specific seed-linked work implemented in conflict contexts has proven challenging.

The inventory of cases below focuses on shorter-term seed security interventions, i.e., those likely to be implemented by humanitarians. Note that seed might also be included as a routine component in multi-year, multi-sectoral responses linked to complex crises. For instance, seed programming might be linked to agro-enterprise/value chain development, financial inclusion (e.g., Village Savings and Loan Associations [VSLA]), agriculture technology improvement, and more. These multi-sectoral, multi-year programs are often implemented in protracted crisis regions and may combine emergency and developmental approaches. See as examples two integrated programs in South Sudan: Food and Nutrition Security Resilience Programme-South Sudan (FNS-REPRO, 2025) and the five-year Agricultural Markets, Value Addition, and Trade Development Project (AMVAT) (African Development Bank Group, 2024). Multi-sectoral, multi-year programs can be very effective but their review is beyond the scope of this paper.

Section IV has four main parts. Section IV.1 reiterates the need to Do No Harm and provides a set of seed security-specific examples. The section then shifts to interventions that 'do good,' which are separated into *doing technical good* (Section IV.2) and *doing social good*, i.e., promoting peace or social cohesion (Section IV.3). Section IV.4 contains a set of Boxes (4 and 5) that present two detailed case descriptions to illustrate how the terms *conflict-sensitive*, *conflict-savvy*, and *conflict-intentional* might be operationalized in practice.

IV.1. Seed security interventions: Do No Harm

Humanitarian programs aiming to bolster seed security in conflict-affected contexts start with the premise of Do No Harm**. In seed security interventions, as with many types of aid, there is potential to exacerbate or increase hostility, rather than alleviate stress. Particularly with DSD, there are multiple accounts of free seed increasing tensions and even promoting conflict**. As examples, uneven distributions spurred community strife in Sierra Leone (Archibald & Richards, 2002; Richards et al., 2004), and were subject to elite capture in South Sudan (d'Errico et al., 2020). Targeting—deciding who gets free seed (or not)—is considered by some as so fraught that several experts specifically advise *not* to target in conflict contexts (Prendergast, 1996): giving only to some may leave others feeling slighted. Free distributions of any commodity, including seed, also pose risks that the beneficiaries gathering in central distribution venues themselves might become prey to attack. In this instance, the *promise* of aid pulls people into greater danger. The Do No Harm principles that guide all commodity transfers also apply to seed security interventions (see Section 2).

Beyond social processes, however, technical mistakes can also lead to seed security assistance doing damage. Seed aid seems to have a benign image—the notion that free seed is always welcomed by farmers and that DSD is a low-risk, safety-first strategy: 'farmers must have something to plant' (Sperling & McGuire, 2010). However, practice shows that seed aid can pose real risks to farmers in the short- and longer-term. Providing the wrong crop or variety for an area, or providing it too late to sow, wastes farmers land and labor. Without proper screening, seed aid actors can also inadvertently introduce new diseases or pests. The practice of seed aid is littered with aid doing technical harm. As examples, agencies provided long-maturing varieties when fast-maturing varieties were needed; introduced serious new weeds (Gebre-Medhin, 1992); introduced tons of seed unadapted to the stress area (Rohrbach et al., 2004); and distributed seeds so unacceptable that farmers used the subsequent crop as fodder (FAO & WFP, 2004). The *promise* of seed aid also poses technical risks to farmers, since this expectation of seed carries significant opportunity costs: farmers allocate precious labor to field preparation, or do not seek seeds elsewhere.

Practice shows that seed aid can pose real risks to farmers in the short- and longer-term. Providing the wrong crop or variety for an area, or providing it too late to sow, wastes farmers land and labor.

Recently, a set of 'Ten Guiding Principles for Good Seed Aid' was developed and disseminated. The aim of these principles is not only to minimize bad—or even dangerous—technical practice, but also to significantly improve it (SeedSystem & Mercy Corps, 2024). These might best be followed by all emergency seed aid actors.

IV.2. Seed security interventions: do good—technically

Within this Do No Harm framework, this section documents the kinds of humanitarian-linked technical interventions that have unfolded in conflict-affected contexts related to seed security. Table 4 lists a range of interventions and some examples of where and when they were implemented. The last column sketches how select technical features may have been tailored to respond to the conflict context (i.e., conflict-intentional changes). Following the table, a commentary section provides more detail.

Table 4. Seed security interventions (shorter-term) implemented in conflict settings, some examples

#	Type of intervention	Location	Date	Organization/ reference	Salient technical feature *See Commentary section below table for greater detail*
1	Direct Seed Distribution	South Sudan *(Northern Bahr el Ghazal)*	2014	FAO, 2014	Moved adapted seed from local farmers' organizations in non-conflict zone to conflict area.
		DRC *(North Kantanga)*	2007	ICRC, 2007	Focused on seed of nutritional crops due to malnutrition concerns.
2	Seed Production	DRC *(Kivu)* Chad	2016 and ongoing	ICRC, 2016	Stimulated high quality seed production with select farmers in conflict areas.
		Sierra Leone *(Northern & Southern provinces)*	1995 2000	Longley, 1997 Kent & Mokuwa, 2001	Focused on community seed production of very local rice varieties, which were highly desired for sale.
		Mali *(Douentza district)*	c. 2015 and ongoing	H. Guindo, *pers. comm., 2022*; Sperling & Almekinders, 2023	Leverages existing indigenous/local villages that are known for seed production of highly adapted (local) pearl millet varieties for farmer customers and relief supply.
		DRC *(Kivu)*	2023 and ongoing	*Kajunju et al. 2024* (spans emergency-dev)	Supports women seed entreprenuers to produce and themselves sell seed to other farmers in active conflict zones
3a	Agricultural vouchers to client farmers: *Paper vouchers*	Sudan *(South Kordofan; Gadaref)*	2023-2024	Mercy Corps, 2024	Linked voucher use to agrodealer shops which had been supported prior to the conflict and which continued to function during the instability.
		Nigeria *(Eastern)*	n.d.	ICRC, 2018	Tied commodity vouchers to certain suppliers where quality had been assured. Used one-off commodity vouchers as the organization was concerned about the quality of market seed.
3b	Agricultural vouchers to client farmers: *Digital transfer*	Syria	2020	Mercy Corps, H. Rasho, *pers. comm., 2021* (also in Sperling et al., 2022b)	Linked digital vouchers to small scale vegetable seed suppliers in target markets (private sector suppliers). Seed samples screened for physical checks and germination tests.
4	Cash transfer assistance	Sudan *(South Kordofan; Gadaref; South Darfur)*	2023-2024	Mercy Corps, 2023a Mercy Corps, 2023b	Encouraged private microfinance institution to facilitate direct cash transfers. Ebdaa bank pivoted to this role from a traditional mobile transfer way of operating.

		Nigeria *(Biu, Northeastern)*	n.d.	ICRC, 2018	Transferred cash via existing digital platform, Teasy Mobile. Market in target area was assessed as functioning, with adequate seed quality. Transport costs and 10% inflation contingency built into vouchers.
5	Market support to supply side: *formal seed sector*	Sudan *(Kassala; Gedaref; Gezira)*	2024-2025	Abdalla et al., 2025	Worked with private sector seed companies to intensify quality seed production (in non-functioning government context) and 'sold' to farmers with subsidy.
6	Market support to supply side: *informal seed sector*	Mali *(Douentza district)*	c. 2018 and ongoing	H. Guindo & E. Weltzien, *pers. comm.*, 2023	Linked farmer-managed seed villages, known to produce high quality seed of very adapted pearl millet varieties, to NGOs working in conflict zones to supply for relief seed.
		Chad	2013	Solidarités International, 2013	Technically supported traders in field seed selection, sorting, and storage—tied to DSD and fairs.
		Burundi South Sudan	c. 2005 c. 2005	CRS & S. Walsh, *pers comm.*, 2025	Provided transport subsidies to traders for bringing local seed to fairs.
7	Improved Storage	DRC *(North Kivu)*	c. 2020 and ongoing	Baributsa et al., 2021a	No change. Existing lightweight hermetic bags for seed and grain are easily movable.
		Ethiopia *(South and East)*	c. 2012	Mengistu & Garrard, 2014	Modified traditional storage pits toward improved ventilation and drainage. Some vessels put underground to deter looting.
8	Seed-related information (extension and advisory)	Sierra Leone *(countrywide)*	2014-2015	Baributsa et al., 2021b	Catalyzed novel multi-media information campaign that encouraged farmer to save the seed they already have had. Due to highly restricted movement during Ebola, interventions dramatically shifted away from bringing in seed (DSD).
9	Seed-sharing networks	Syria	2011 and ongoing	Grüne Liga, 2017 The 15th Garden (also below in Table 5)	Swapped and reproduced open pollinated seeds in and around Syria via seed sharing networks within and outside country. Initial locus: a network of German farms.
10	Drones to deliver seed (?)	Western countries and South Africa, primarily	Recent innovation and ongoing	Hassan, 2022	Seed delivery presently tied more to forestry and restoring degraded lands than seed delivery to stressed farmers in conflict areas.
	Airplane drops	South Sudan	2014	ICRC, 2014. UN-News, 2014	Humanitarian organizations have emergency seed via airdrops from airplanes. Roads may be impassable due to flooding or insecurity.
11	Conflict-resilient crops	Many African countries	ongoing	Choose crops that are difficult to steal, process, or convert to cash. See Box 3.	

IV.2.a. Commentary on seed security interventions (shorter-term) implemented in conflict-affected contexts: technical focus

Here, greater detail is added on the seed security interventions and their conflict-intentional features. Only brief summaries of the general types of interventions are provided, as full books have been written for many of these approaches (e.g., direct seed distribution (ODI, 1996); cash transfer programming (ICRC, 2018; Longley et al., 2023); agricultural vouchers and fairs (CRS, 2017); and seed banks (Vernooy et al., 2023). Sometimes the intervention types overlap categories, such as the Mali village-based seed production activity, whereby local production was then the source for DSD by relief agencies.

#1 Direct Seed Distribution (DSD)

What is it?

DSD involves the procurement of quality seed, often from *outside* the agroecological region, for free delivery to farmers in stressed areas. It is the most common form of seed security response in both normal and conflict periods and has been perceived as among the logistically easier responses. DSD is based on the assumption that farmers need seed brought in, as it is not available locally. DSD is also sometimes used to promote new (modern) varieties to farmers to help increase productivity, resilience, or nutrition.

How has it been tailored to conflict?

- There is sometimes a recognition that patterns of conflict are uneven within a region. While the conflict zones may lack sufficient seed, there are zones outside the immediate ones that produce sufficiently. In one DSD response in South Sudan (2014), FAO arranged for seed to be moved from non-violent zones into a stressed region.
- DSD responses may be tailored toward specific crops for clear purposes—e.g., in war zones where poor nutrition may be marked. ICRC, in North Katanga, DRC (2007), gave vegetable seed and promoted eggplants and tomatoes to bolster nutrition via seed interventions (ICRC, 2007).

More generally, in terms of DSD, some experts have noted that special care is needed in choice of varieties destined for war zones. Prendergast (1996, p. 74) writes:

> *"When providing seeds, part of the equation for selection of particular varieties should be their value to looters, their storage capacity, their time to germination (fast-yielding varieties in situations of chronic insecurity are often favored) and their quality (better, more adaptable seed is mobile in the sense that mobile populations take it with them.) Seed programs can create problems if they begin to dilute the rich [variety] heterogeneity that allows communities to survive. In Rwanda, there are 300 types of bean seed…."*

#2 Seed Production

What is it?

Activities are specifically organized to encourage increased seed production in the areas where farmers are actually sowing. The production might focus on producing good quality seed and/or modern varieties or very adapted local varieties. The seed production can be organized in different ways but usually has a group focus.

Working on seed production—and especially on producing quality/healthy seed—can be a multi-season or even multi-year process. While done in conflict areas, there may be need for lengthy periods of stability.

How has it been tailored to conflict?

- Much of the seed production work seems not to be tailored to conflict, technically, as seen in the ICRC Chad and DRC cases (ICRC, 2016).
- There is some recognition that existing local villages—rather than commercial seed companies—can be leveraged for very adapted types, such as in the Mali case (H. Guindo, *pers. comm.*, 2022).
- Steering local seed production to very local varieties, as in the case of Sierra Leone (Longley, 1997; Kent & Mokuwa, 2001) can be done as prices rise also due to adaptation and conflict-induced scarcity.
- Bolstering local farmer entrepreneurs in North Kivu, DRC (Kajunju et al., 2024) has proven useful. These market-oriented women continue to function and do business in volatile times and should be actively supported, rather than undermined.

#3 Agricultural Vouchers

What is it?

Vouchers (coupons) are provided physically or digitally (an e-voucher) to increase farmers' purchasing power to buy seed themselves. The approach assumes farmers' main seed constraint is access and that the right seed is available locally. Vouchers might be programmed to be redeemed at formal seed outlets, such as agrodealer stores, or sometimes at informal sources, such as local traders or community-based seed suppliers. Vouchers (vs. cash) are sometimes preferred by implementers or donors as vouchers can be explicitly tied to what are deemed quality sources of seed (ICRC, 2018).

Vouchers (paper or digital) may be *unconditional*—where farmers can, for example, buy any crops—or may be *conditional*—e.g., tied to buying certain types of crops (such as certain amounts allocated for maize, legumes, or vegetable seed). Digital vouchers (e-vouchers) have been used in contexts where digital financial providers and client mobile money use are both well-developed.

How has it been tailored to conflict?

- Paper voucher use in Sudan was possible only because agrodealers supported prior to the conflict continued to function during conflict periods. It was highly subsidized; farmers paid 20% of the price and the NGO supported 80% (Mercy Corps, 2024).
- In Syria, 2020, with the decline in government subsidies, more small, private sector vegetable seed sellers emerged. Mercy Corps, after market assessments, provided e-vouchers that were redeemed in specific supplier shops (H. Rasho, *pers. comm.*, 2022).
- Voucher use in Michika, northeastern Nigeria was tied to select suppliers where quality had been assured. A range of seeds were put on offer such as sorghum, maize, and cowpea, as well as fertilizer (ICRC, 2018).

#4 Cash Transfer Assistance (Multipurpose Cash)

What is it?

Cash transfer assistance involves delivering money, either physical currency or e-cash, to recipients. Cash transfers are, by definition, unrestricted in terms of use and distinct from restricted modalities like vouchers and in-kind assistance. Clients/farmers can use cash for whatever they want. The approach assumes that the main constraint is seed access (purchasing power) and that the right quality seed is available locally. 'Better practice' guidance for using cash in conflict settings has been developed (ICRC, 2018) and cash specifically linked to seed emergency assistance is on the rise (Keane et al., 2019; Longley et al., 2023).

Cash transfers are increasingly used by humanitarians for varied reasons. For example, cash allows farmers themselves to prioritize purchase choices (even 'individualizing' aid) and injects resources into the wider economy. Some state that the option of digital transfer (where this exists) can help reach individuals in ways that are 'faster, safer, and far easier to achieve on a large scale,' and—under selective conditions—can serve those in remote locales and high-armed conflict regions (ICRC, 2018, p. 10). In terms of risks, there is growing, specialized advice just on digital transfers—partly to ensure that recipient lists remain confidential and out of the hands of warring groups (Burton, 2020).

With the expansion in the use of cash, much has been written around their use. In one detailed overview linked specifically to conflict contexts, ICRC reflects on the use of cash or vouchers vs. in-kind transfers suggesting that the delivery choice very much depends on the specifics of the conflict situation on the ground.

> *High-value cash transfers – like those to support livelihoods or build medium-term accommodation – can expose recipients and humanitarian staff to security risks. Where security is a significant risk, the use of electronic cash transfers or vouchers is encouraged.*
>
> *On the other hand, cash transfers are sometimes chosen precisely because they reduce particular security risks in certain situations. Cash or vouchers may be less visible than in-kind assistance. This means people can receive and transport cash and/or vouchers discreetly, making them a less visible target for common criminality. … This is especially true if cash is transferred electronically. The relative absence of warehouses, supply lines and staff is more discreet and reduces physical risks, but it may also relocate risk into the digital realm, where hacking and misuse of personal data, theft, and obstruction are real concerns* (ICRC, 2018, p. 38, *edited*).

How has it been tailored to conflict?

- Banks have been specifically vetted not to have ties with the war economy. In the case of Sudan, Ebdaa bank relocated its head office out from the capital (Khartoum) to Gedaref. Ebdaa also pivoted to working with community leaders to distribute direct cash assistance—which is an important means where communities may have limited mobile phone access (Mercy Corps, 2023a & 2023b).
- Inflation has been built into the calculation for conflict zones. In Biu, northeastern Nigeria, where the market was functioning and the quality of goods available was adequate, ICRC provided cash to households, basing the cash values on agricultural items needed and their quantity, including a 10 per cent contingency for any possible inflation. ICRC worked with Teasy Mobile to transfer the cash via a digital platform whereby beneficiaries could go to any Teasy cash agent and collect their cash on the day of distribution (ICRC, 2018).

#5 and #6 Market Support

Market support interventions aim to support critical market systems on which target populations rely for goods, services, labor, or income. These interventions target specific actors, services, policies, and infrastructure (Simpson & Julliard, 2018). In terms of seed security, a distinction is made between support given to the formal seed sector and that to the informal seed sector, where very different actors, infrastructure, policies, etc. are involved.

#5 Market Support to Supply Side: Formal Seed Sector (agrodealers, private sector)

What is it?

Humanitarian market support to the formal seed sector might include support to seed companies or specific agrodealer networks on a range of themes: for seed production (including of specific crops), for packaging (e.g., in small sizes), or for delivery, including to more remote or unstable areas. As an overarching and key support type, formal sector companies benefit specifically from DSD when they receive tenders to supply emergency seed in bulk. This type of support is so common that a specialized 'Relief Seed Business' has emerged in areas of repeated disaster, for example, across Southern Africa (Bramel & Remington, 2004).

How has it been tailored to conflict?

- Private sector companies may be singled out for support to intensify high quality seed production when government institutions become non-functioning. In Sudan, through the SASAS project, several companies were supported to multiply high quality seed which was then 'sold' to farmers with a 65% price subsidy provided by aid actors (i.e., farmers pay 35%) (Abdalla et al., 2025).

#6 Market Support to Supply Side: Informal Seed Sector (traders)

What is it?

Humanitarian market support to the informal seed sector might include support: to those producing local seed (of a verified quality); to those moving local seed from one region to another (from a non-stressed to a stressed region); or to those marketing local seed within a conflict-affected region. Support to the informal sector seems logical, as smallholder farmers source upwards of 80% of their seed from informal sources in normal times (Louwaars et al., 2013; Westengen et al., 2023) and an even greater proportion in stress periods, as informal systems tend to be more resilient (McGuire & Sperling, 2016). Concerns by donors and implementers are sometimes raised around the perceived quality of seed source from local markets.

Table 4 highlighted three distinct approaches humanitarian agencies took to bolster the informal seed system in conflict-affected contexts (see the first three bullets below for more details). A fourth case, where there was no humanitarian support, is included here and particularly instructive.

How has it been tailored to conflict?

- In Mali, local (indigenous) seed production villages, located in non-conflict zones, produce highly adapted pearl millet varieties for the region, including for conflict and drought-stressed zones. They are tendered to also supply humanitarian agencies. Originally autonomous, they were more recently given outside support to establish seed cooperatives, with special seed stores, labeling, seed treatments, etc. (H. Guindo and E. Weltzien, *pers. comm.*, 2023).

- Traders in Chad—destined to supply DSD and fair responses during conflict periods—are given a range of training support around seed quality management and maintenance. The guidance/training starts from plant and seed selection in the field, to cleaning and sorting seed post-harvest, to advice on storage practices (Solidarités International, 2013).
- Traders potentially providing local seed to humanitarian fairs are given transport subsidies. This has been done in numerous places (cases cited in Table 4 for Burundi and South Sudan). Note that traders know the local context and fluctuations and are often more 'conflict-savvy' than outsiders (CRS & S. Walsh, *pers. comm.*, 2025).
- In northern Uganda, there was no formal sector for sweetpotato vines and also no/little outside humanitarian seed system support during an extremely turbulent Lord's Resistance Army (LRA) period. Informal seed producers developed a system to produce and market high quality vines, rotating marsh areas where initial planting stocks could be nurtured (Rachkara et al., 2017).

#7 Improved Storage

What is it?

Storage methods or containers might be 'improved' so as to ensure that the seed stored is: of better quality (not prone to be damaged); safer (not easily looted); and more easily movable, if displacement is necessary. Storage can take different forms: in pits; in containers (clay, plastic, tins); in metal silos; or in special hermetic storage bags that have been designed to asphyxiate insects and keep seed dry. Promoting enhanced seed storage of farmers' own stocks in conflict-affected contexts has distinct advantages—the seed is likely to be adapted, immediately accessible, and cost-free.

How has it been tailored to conflict?

- In the Ebola crisis in Sierra Leone, no technology modification was needed in terms of the hermetic bag design, as previous pilot work had already confirmed their effectiveness and acceptability. It was the training around the technology that had to be tailored to become more remote: a) the local training agents had to be trained virtually (and even across international borders via Skype/WhatsApp), and b) any face-to-face trainings in villages involved only very small groupings (e.g., 5 people or less) (Baributsa et al., 2021b).
- Hermetic bags are increasingly used in the DRC, including in North Kivu, an area of protracted conflict. The lightweight bags have some advantages over pits because they are movable, if displacement is necessary, and can be hidden up in rafters or dug into garden plots (Baributsa, 2021a).
- Traditional pits can be better reinforced for both above- and below-ground stores in the face of stress. In southern and eastern Ethiopia, GOAL helped design above-ground stores similar to traditional ones but sturdier and equipped with rat guards. The below-ground stores were also modified with improved ventilation and drainage as these underground versions could be hidden from looters or thieving neighbors in conflict periods (Mengistu & Garrard, 2014).

#8 Seed-related Information (extension and advisory)

What is it?

Beyond focus on the physical seed itself, information may warrant specific programming in conflict contexts. Reliable, up-to-date information may be a scarce commodity, making it especially important for humanitarian actors to consider explicit programming for two-way actions: to get information to and from farmers.

How has it been tailored to conflict?

An example of a seed security intervention implemented in Sierra Leone during the time of the Ebola outbreak is shared, due to the lack of an example from a conflict context. When Ebola escalated (2014-2015), the government quickly declared a public health emergency which, among others, restricted or closed movements to local zones and markets, where many smallholder farmers source their seed.

In terms of seed, key issues were for farmers to secure and store seed from the upcoming harvest (i.e., seed storage, see #7 above) to make sure that seed was available for the next season's planting. While many humanitarian agencies directed efforts on ways to import seed, a few shifted their prime focus toward safeguarding what was already in farmers' hands, including locally-saved seed.

- There was an information shift away from new seed delivery to saving what already existed in farmers' hands (a major technical shift).
- Information sharing took place through a wide range of message channels (mostly non-seed linked). Church sermons—one of the few remaining physical gathering places—preached to save seed, and remote information systems further helped spread the message. Cell phone videos and posters passed technical information outward; a text messaging system was used to get farmer feedback via Skype, WhatsApp, and SMS. Radio jingles, ads, and talk shows also promoted seed saving awareness (Baributsa et al., 2021b).

#9 Seed Networks in Conflict Contexts (during active conflict)

What is it?

Seed sharing networks are networks that can share seeds even from outside conflict zones—including outside the country—to ensure that growers have specific planting materials that they want and need. They often involve local or heirloom varieties.

How has it been tailored to conflict?

The 15th Garden is a striking case that has been implemented in besieged Syria (Grüne Liga, 2017). The 15th Garden is a bottom-up network of urban gardens in cities that have been bombed, besieged, and blocked in Syria. The network includes family gardens, farmers in rural areas, and agriculture initiatives in refugee camps in neighboring states. The network has developed fast over the past years. Information provided by the network states:

> *"Via the 15th Garden, open pollinated seeds are swapped and reproduced in and around Syria, skills for sustainable agriculture and gardening are taught in workshops and courses, and knowledge is shared about the dangers related to the promises made by agribusiness actors…."*

The network was catalyzed by an activist named Abdallah Al Shaar, specifically to support urban farming projects across besieged cities throughout Syria. It was named after the day the revolution against Assad began, the 15th of March, 2011. One major obstacle was the acquisition of seeds to get this all started. A network of German farms provided heritage seeds and money to Syrian farmers, sending the seeds through Lebanon and crossing the border. Because of blockades, activists risked their lives to get these seeds to the country (Grüne Liga, 2017). The 15th Garden seems to parallel networks elsewhere that support highly-stressed farmers, such as in Rwanda, Sierra Leone, and Liberia (Zimmerer, 2017).

#10 Drones and Airdrops

What are they?

Both drones and airdrops involve the use of airborne vehicles to drop commodities. Drones are unmanned; airdrops involve manned airplanes.

Drones

Drones are small or medium-sized unmanned aerial vehicles (UAVs). They can drive remotely and autonomously and are capable of maintaining a controlled, sustained level of flight (IFSS, 2021). Theoretically, solar-powered drones have the potential to deliver seeds and other agricultural inputs to hard-to-reach areas, particularly after disasters and in an environmentally-friendly way (with their negative environmental impacts claimed to be zero).

To our knowledge, drones have not been used in war zones in Africa for seed, although an Australian company with a satellite office in South Africa, AirSeed Technologies, has used drones to restore areas affected by climate change (Hassan, 2022). Select seed companies have also used drones to deliver seed to help tree planting in places like the United Arab Emirates (UAE), Guam, or the United States of America (USA). Specialized companies, such as DroneSeed (now Mass Reforestation) or AirSeed Technologies, provide unique reforestation services especially linked to wildfires and in mountainous terrain. Drones have also been used to deploy seed vessels that contain seeds, fertilizers, and other amendments, and experts claim that drone sowing might be six times faster than hand planting, as used in industrialized countries (Chiu, 2023). So drones, at this stage, are more of an idea than a reality for fostering seed security in conflict areas.

Airdrops

In contrast to drones, humanitarian organizations have delivered seed via emergency airdrops from airplanes. In 2014, for example, agencies such as FAO, ICRC, and the United Nations World Food Programme (WFP) conducted large-scale airdrops of food and crop seeds (including maize, sorghum, cowpea, and sesame) to conflict-affected communities in South Sudan (UN News, 2014; The Guardian, 2014). With roads rendered impassable by flooding and insecurity and the planting season approaching, airdrops were deemed critical for averting famine and supporting household food production. However, due to their high cost and logistical complexity, such interventions are considered a last resort (Vice News, 2014).

The airdrops are done in close coordination with staff and volunteers on the ground, who support distribution and complementary programming (ICRC, 2014). Clear communication with beneficiaries is essential to coordinate the drop time, location, and safety protocols, and to ensure they prepare the land and soil in advance for planting. Seeds are often delivered alongside other essential items, such as ready-to-eat meals (MREs) and high-protein biscuits, to meet immediate food needs (Vice News, 2014).

#11 Conflict-resilient Crops (cross-cutting intervention)

Conflict-resilient crops are a recent notion. They are cross-cutting because conflict-resilient crops or production systems might be promoted in many of the interventions cited in Table 4, such as in seed production, seed banks, agricultural voucher use, etc. Box 3 explores the evolving term and its content.

Box 3. Conflict-resilient crops: What are they? What are their features?

Farming communities in the face of conflict may shift toward specific crops that they sense will be less affected by existing conflict-induced stresses or less vulnerable to future ones. For instance, the special role of cassava in conflict areas has been noted for many locales.

- *DRC (n.d.): Originating from South America and introduced in the 16th century to Africa by sailors, cassava very quickly became an essential crop in time of crisis. The low maintenance required, its capacity to be stored in the ground, and the fact that bitter varieties are less likely to be looted than other crops make it particularly well adapted to conflict areas. It produces more than twice the number of calories per hectare (ha) than maize (ICRC, 2007, p. 23).*
- *CAR, 2014: "Many farmers had Seleka-proofed [rebel militia groups] their crops. They planted cassava a hardy root, rather than corn, which can be easily stolen by marauding rebels. Cassava, on the other hand, is harder to pilfer; it needs to be dug up before being carted away, and even then, the roots require days of processing before it is edible," (Bauer, 2024, p. 86).*
- *South Sudan, 1995: Southern Sudanese have expanded cassava production because it has proven useful in crises, as in Mozambique and Liberia. It resists insects and can be left in the ground for years as a food reserve safe from looters (Prendergast, 1996, p. 74).*

Conflict-resilient crops (or sometimes labeled **conflict-resistant crops**) is a recent term sometimes employed for crops that seem to respond to select stresses induced by instability or violence (Mercy Corps, 2014). Generally, across cases, the following attributes have been associated with conflict-resilient crops, with important variations by context.

Crops that:

- cannot be used directly, i.e., that need processing to realize value (e.g., coffee, soybean);
- are toxic if not processed properly (e.g., bitter cassava);
- do not need tending; can be left in the field for months or even years (e.g., cassava);
- can suffer damage but recover (e.g., cowpea);
- are more difficult to harvest (e.g., peanuts and root crops, especially if the tops are cut off); and
- are very quick to mature and have small land requirements, like some vegetable crops.

Overall, conflict-resilient crops are ones that are difficult to steal, process, or convert to cash.

The initial conceptualization of conflict-resilient crops has stimulated reflection on broader conflict-resilient production systems. Much depends on context but one set of features appears below (Mercy Corps, 2018):

- Include a selection of crops and livestock that can be movable in case of displacement and, similarly, that do not require lots of movement to tend if conflict is likely to restrict movement (for example, tree crops).
- Combine nutrient-rich and diversified products that can be consumed locally, such as bananas, with products that require processing and are less likely to be looted, such as coffee.
- Mix perennial and seasonal crops—for example, tree crops and vegetables—to ensure a short-term source of food while simultaneously maintaining long-term production and environmental protection.
- Develop biofertilizers (including local compost) to palliate restrictions of chemical fertilizers.

These concepts of conflict-resilient crops and conflict-resilient production systems are evolving. Both are already being promoted—somewhat in advance of understanding what they may embrace.

IV.2.b. Overall trends in seed security interventions aiming to 'Do Good—technically': initial summary

The descriptions above give some initial insight into the kinds of seed security interventions implemented in conflict-affected contexts. No claims are made about the effectiveness of the interventions, nor comments on farmer feedback or acceptance. The authors reviewed documentation for about 25 cases—quite some breadth—but they were thin in depth. For instance, the cases contain little information about the extent or nature of the conflict or the processes of implementation. While recognizing the limitations, this review represents a start in what has been largely an unknown, rarely discussed, and scarcely documented field.

Overall, what do the cases suggest in terms of trends in seed security interventions aiming to do good—technically? Central ones are listed below, in no order of importance.

TRENDS IN SEED SECURITY INTERVENTIONS AIMING TO DO GOOD—TECHNICALLY

1. Seed security interventions are taking place in many and diverse conflict-affected contexts in Africa. This paper cite 24 cases from 10 countries.
2. The seed security work implemented in these contexts includes a wide range of responses.
3. The basic set of interventions implemented in the conflict-affected contexts largely parallel those implemented in routine seed security programs, in normal times. There were a few exceptions identified: spurring extensive international seed networks; and, possibly, airdrop delivery.
4. The interventions reviewed embraced select technical modifications linked to conflict-induced stresses: for example, alterations in storage design to address theft and shifts in crop choice to boost nutrition and respond to dietary needs.
5. Broadly, the technical tailoring (i.e., conflict-intentional programming) seems to have been modest, especially in relation to the extent of possible conflict-induced changes.
6. Given the importance and relative stability of informal seed systems, it was surprising to find very few efforts to support the informal sector specifically.
7. As a global set, the responses mainly focused on the supply-side, and on giving something free to beneficiaries. This thrust contrasts with expert advice that market-driven systems for service delivery (i.e., not supply-led programming) should be the essence of agricultural support in conflict- affected countries.
8. In terms of actively tailoring responses in conflict-affected contexts, the cash-based responses seem much more advanced than those linked to seed security. Cash-based analysis provides specific guidance around the risks and benefits of diverse approaches (e.g., cash vs. voucher; digital vs. paper).

In brief, there is relatively scant evidence that seed security interventions are being tailored to address conflict-induced stresses, that is, that they are *conflict-intentional*. This lag or gap contrasts to the significant number of interventions taking place.

This section has focused on the short-term seed security interventions that aim for better technical results—that is, aim to strengthen seed system performance. The next section briefly reviews seed security interventions that may be also specifically tied to promoting peace.

There are also medium- and longer-term seed-linked initiatives, used especially in protracted crises and implemented over a series of years. Descriptions of a few of these are appended in Annex I. They are very important but outside the short-term, emergency scope of this paper.

IV.3. Seed security interventions contributing to peace: do good—socially

Seed security interventions have also been noted specifically in the context of work to promote peace (FAO, 2018). Seed security interventions have been suggested as one possible entry point to achieve a bigger vision of more social cohesion, more collective action, etc. Possible connections between seed security and peace-linked work are of particular relevance given the ongoing promotion of Humanitarian-Development-Peace (HDP) Nexus programming approaches (USAID, 2021).

IV.3.a. Seed and peace-linked work: a natural entry point?

Is seed a good entry point for peace-linked work? Does seed lend itself to promoting greater social cohesion? It is unclear if this theme has been previously explored but reflect on six features of seed and seed systems that might lend themselves to a possible seed-peace work coupling.

SIX SEED FEATURES THAT MIGHT LEND THEMSELVES TO A SEED-PEACE WORK COUPLING

1. **Seed sharing takes place and creates bonds in normal local systems:** Seed sharing, either between individual or within networks, is common in many rural communities, even pre-dating conflicts (Coomes et al., 2015). Such sharing is often built on trust and can facilitate intergroup coordination. Hence, there may be a foundation of social cohesion, already linked to seed, that peace efforts can leverage.
2. **Seed is sometimes closely tied to land, cultural identity, and pride—and perhaps healing.** Seed is embedded with a strong cultural identity in some communities.Safeguarding local varieties might help revitalize community pride, and joint stewardship of varieties might be one part of a broader social cohesion or healing process.
3. **Seed is a relatively easy technology: 'plug and play':** Seed is a relatively easy technology to use as farmer can usually manage it their own, with existing knowledge. Some use the term 'plug and play'. This suggests that the allied peace work can focus on the more complex cohesion processes, without substantial technical hurdles.
4. **Seed grows – it has a future:** Seed, inherently, is something that grows, has a future, and may last over seasons. The analogy to what is desired by peace may make seed a natural fit to social cohesion work.
5. **Seed is often short cycle – it yields quick results:** Seed is among the quicker technologies to mature and give results. In peace work, it may offer a short-term milestone against which possible social cohesion gains can be charted.
6. **Seed management is often associated with women and youth—those most vulnerable in conflict:** Seed systems, especially local ones, are most often managed by women, with youth doing a good deal of the labor. Conflict experts suggest that women and youth are those most affected by conflict. A focus on 'seed' may also engage those most vulnerable.

Of course, none of these features of seed guarantees that its use will make a positive contribution to furthering peace. Simply, the coupling of seed and peace-linked work seems possible and potentially positive, for multiple reasons.

IV.3.b. Seed and peace-linked seed security work: some examples

This section shares a modest but diverse set of approaches where seed security and peace work been explicitly linked to date. The first approach centered on peacebuilding itself, with seed added as a component, although there could have been other technical components like free food or tools. The second approach centered on seed itself—and particularly on its propensity to spur collective action over time through collective garden establishment and tending. The third, quite novel approach, involves linking seed sharing networks internationally so as to ensure that a range of growers (rural and urban) can get adapted and local seed. This network model is described in Table 4 as a technical innovation and below, in Table 5, as a peace-linked one as it aims to promote food sovereignty in direct conflict zones.

Table 5 and the commentary below give greater detail on each of these different interventions. Interestingly, the three approaches suggest diverse scales of seed interactions. In the first, seed is given on an individual basis and managed so; in the second (varied locales), seed is given to stimulate local group gardens; and the third involves seed sharing networks across many members and across very large geographical distances (across countries and continents). This diversity might spur reflection on future types of seed and peace-linked trends.

Table 5. Seed and peace-linked seed security interventions: some examples

#	Type of Intervention	Location	Date	Organization/ reference	Salient aspects
1	DSD linked to Village Peace and Rights Days	Sierra Leone	2001	CARE. Archibald & Richards, 2002	Non-targeting of seed aid: all-receive aid; inclusive Seed distributed through 'Village Peace and Rights Days'
2	Gardens in war-torn zones	Lebanon Israel Gaza Iraq Syria	No date	Gordon-Smith, 2023 Reflections from: 'Farms no Arms Coalition of NGOs' (Lebanon) and other projects (Israel, Iraq, Syria)	Modifications seem to be social, rather than technical, e.g., even involving former combatants Community gardening and market gardening
		Burkina Faso	2019-2024	Humanity & Inclusion and its partners (RECOSA project), 2023	Has a disability component- aiding with wheelchairs, mobility aids
3	Seed sharing networks in direct conflict zones (with ongoing fighting)	Syria	2011 - present	Grüne Liga, 2017 15th Garden (as described above in Table 4)	Open pollinated seeds are swapped and reproduced via seed sharing networks German farms provide heritage seeds and money to Syrian farmers, sending the seeds through Lebanon and crossing the border.

IV.3.c. Commentary on seed and peace-linked seed security interventions implemented in conflict-affected contexts: social focus

Here, greater detail is added on the seed and peace-linked seed security interventions.

#1 Village Peace and Rights Days, and Seed

What is it?

Village-level Peace and Rights Days were held to allow villagers to debate the vulnerabilities that facilitated the Sierra Leone civil war and to discuss local notions of human rights. In symbolizing new beginnings, seed was chosen as a useful medium through which to debate a more inclusive and less vulnerable society. Seed distribution was specifically *not* targeted, as former distributions had led to inequities and spurred tensions. For instance, follow-up of former seed distributions revealed a range of exclusions: a) smaller, more remote, and more ephemeral settlements were missed in the initial seed registration; b) displaced 'strangers' were sometimes excluded; c) poorer groups lacking friends on the seed selection committees were often overlooked; and d) youth were excluded in some sites where only people over 40 were favored (Archibald & Richards, 2002, p. 358).

How has it been tailored to conflict?

- Seed distribution specifically was not targeted, it was a blanket distribution, meaning each beneficiary received a smaller amount.
- Seed—considered a physical good but also a symbol of new beginning—was distributed in the context of Village Peace and Rights Days. These day-long events discussed and debated the war, its injustices and possible ways forward. Discussions were clustered by group: e.g., by youth, women, and elders.

#2 Gardens in War-torn Zones

What is it?

Collective gardening has been promoted in war-torn zones, generally after the active fighting has ceased. The rationale is that healing can emerge from collective work and that gardens—things that grow—can help heal wounds, address post-traumatic stress disorder (PTSD), promote social cohesion, and more. Gordon-Smith (2023) mentions several such projects and asserts that gardens in conflict-affected zones can: produce food; help restore degraded environments; empower specific groups (i.e., women); promote peace and reconciliation; and more.

Projects

- 'Gardening for Peace': UN project in Gaza using gardening for emotional expression and stability
- 'Path of Peace' garden: Israeli project bringing Jews and Arabs together
- 'Olive Branch' project: Iraq and Syria

Within Africa, the RECOSA project (2019-2024) promoted home gardens as well as plant nurseries. The project aimed to strengthen the resilience and social cohesion of conflict-affected displaced populations, especially in the cross-border regions of Burkina Faso (Sahel region) and Niger (Tillabéri region).

Households were trained and equipped to create home gardens and shared gardens and introduced to best market-gardening practices.

How has it been tailored to conflict?

- In community meetings, special emphasis was placed on recruiting individuals directly affected by conflict, including former militia members and families hosting or comprised of refugees (Sierra Leone, Archibald & Richards, 2002).
- A focus was intentionally put on shared gardens where the displaced congregate and work together (Burkina Faso, RECOSA project, 2023).

In all the cases listed, the gardens themselves do not seem to have had specific technical modifications linked to the conflict or post-conflict recovery. The social gathering was the innovation.

#3 Seed Networks in Conflict Landscapes (during active conflict)

What is it?

As noted in Section IV.2, networks share seeds from outside conflict zones—and even outside a country—to ensure that growers have planting materials that they want and need. A striking case has been implemented in Syria. The 15th Garden is a bottom-up network of urban gardens in cities that have been bombed, besieged, and blocked in Syria. The network includes family gardens, farmers in rural areas, and agriculture initiatives in refugee camps in neighboring states.

How has it been tailored to conflict?

- A network of German farms provided heritage seeds and money to Syrian farmers, sending the seeds through Lebanon and crossing the border.
- Open pollinated seeds are swapped and reproduced in and around Syria via seed sharing networks within and outside country.
- The 15th Garden movement is tied to broader food sovereignty movements (Grüne Liga, 2017).

Overall, it seems that direct work linking seed security response and peace efforts in conflict-affected contexts has been modest. Seed might have some inherent or associated properties that make it one good entry point for peace-linked efforts. In an allied field—Environmental Peacebuilding (2025)—seed is sometimes a curated resource, but usually within much broader natural resource management and peacebuilding activity scenarios.

Seed might have some inherent or associated properties that make it one good entry point for peace-linked efforts.

IV.4. Seed security interventions: two in-depth cases illustrating conflict-sensitive, conflict-savvy, and conflict-intentional programming

As a final section focusing on seed security interventions, two small vignettes (Boxes 4 and 5) are highlighted that share actions taken in Sudan and South Sudan during high intensity conflict periods. The aim of the vignettes is to sketch how conflict-sensitive, conflict-savvy, and conflict-intentional programming might unfold in practice. The boxes draw information mainly from direct interviews with humanitarian and private sector organizations. The first case, shared by CIP focuses on potato seed/planting material programming in Sudan and, among other innovations, reports use of a novel gaming approach to get new varieties known and adopted. The second, drawn from interviews with three private sector companies working in South Sudan, illustrates the challenges of companies responding to NGO/donor tendering demands, which may or may not reflect farmers' preferred needs. It also emphasizes the desire of companies (perhaps differing from contracting agents' preferences) to move toward more market-oriented approaches.

Via the cases, the aim is to highlight how conflict-sensitive, conflict-savvy, and conflict-intentional programming are essential, practically. The details of the cases also illustrate that the three types of actions may not always have discrete boundaries—for instance, a conflict-sensitive action may also have conflict-savvy elements. There is no practical need to reify the terms. All three are important and, together, emphasize useful and much-needed ways of operating in conflict-affected contexts.

Box 4. Potato and sweetpotato seed systems in a conflict-affected context: Sudan

There is a long history of international humanitarian agriculture interventions in Sudan. Even during the genocide in Darfur, which began in 2003, donors and implementing partners provided seed support for gardens within Internally Displaced Persons (IDP) camps to complement other lifesaving assistance.

Following a brief window of optimism on the prospects of agricultural-led growth in Sudan, conflict broke out in April 2023 and seed system activities required a revised framing to reflect the new reality. The impact of the conflict on lives, livelihoods, and agricultural production has been staggering, with estimates of more than 8.8 million people internally displaced, over 3.3 million crossing to neighboring countries, and half of the population (24.6 million people) facing acute food insecurity.

This box explores the use of conflict-sensitive, conflict-savvy, and conflict-intentional approaches that have allowed the International Potato Center (CIP) to operate successfully even in conflict periods.

Conflict-sensitive

Although CIP's work began during a time of peace, the selection of potato is well-suited to the context that evolved. Not only adapted to the agroecologies, potato and sweetpotato are vegetatively propagated and planting material can be shared among households, a seed delivery strategy that has proven to function even in conflicts. Potato and sweetpotato are also well-suited to the conditions that arise during conflict, such as displacement, food insecurity, and lack of access to planting land. Both are nutrient dense—a trait critical for food insecure contexts—and potato can be grown in crowded situations, such as IDP and refugee contexts, or on limited land. Further, sweetpotato, specifically, has been used in several contexts to dampen tensions between livelihood groups: in this case, herders and farmers. The tuber is a consumable and saleable commodity for the farmer, the growth form acts as a ground cover to enhance soil protection, and herders can use the silage as fodder for their animals.

A conflict-sensitive approach requires consideration of all stakeholder priorities and challenges. Even prior to the conflict, one of CIP's key partners, a large-scale potato and potato seed producer, preferred manual collection of potato for seed over mechanized harvesting. Without an opportunity for his neighbors to earn a living via manual harvest, the producer was concerned that his own success would create community resentment and friction. This field-level perspective may not be immediately obvious to an implementing partner but played an important part in understanding the local stressors, and in supporting positive, more conflict-sensitive dynamics.

Conflict-savvy

Operating during a conflict requires significant flexibility and creativity to achieve enhanced seed and food security outcomes. CIP's initial geographic area for the program was defined as the capital region of Khartoum, yet, with conflict, equipment and infrastructure for small scale production near Khartoum was compromised. CIP tapped into a network of information sources through two local partners to inform sourcing of equipment, movement of staff, and feasibility of large, mechanized planting areas. In the absence of this information, seed-focused activities can place farmers and partners in harm's way, or act as a signal to farmers that it is safe to plant when it is not. CIP's local partners were integral to finding alternative paths, whether literal paths for transport or connecting with suppliers of hard-to-find, needed inputs for the agricultural activities. Interestingly, not all local partners were agricultural partners, but they had excellent local reach and could provide real time updates on the feasibility and risks of proposed programmatic shifts.

Conflict-intentional

Anticipating increased food insecurity country wide, CIP shifted from programs targeting household production near Khartoum and prioritized highly productive sweetpotato cultivation in Blue Nile and mechanized potato production in Northern state. This shift enabled cultivation of 200+ acres of potato seed, yielding about 17 tons of seed per acre of potato, and 15 tons per acre of sweetpotato.

In terms of specific crop management, some of the conflict-sensitive and conflict-savvy elements CIP implemented—described above—moved towards a conflict-intentional approach. For instance, CIP promoted a small bag propagation technique (a conflict-intentional technical innovation) which meant that the planting materials could be mobile should farmers have to can flee. CIP's small bag also potentially reduced security risks, especially for females, by enabling them to plant close to their homes and to use less water (i.e., reducing collection efforts) (conflict-sensitive). The bag was also not a high value item, which could attract interest for theft. Similarly, the choice to alter design and relocate multiplication sites and scales—towards larger, mechanized forms and irrigated areas—had to be done for logistical reasons (conflict-savvy) but the new formats also meant very major technical shifts in expertise, reflecting conflict-intentional programming decisions.

CIP also used conflict-intentional programming with a unique approach to innovation uptake. In this conflict context, better quality seed promotion and adoption could not be achieved through traditional extension models–which are staff intensive and require large gatherings of people on a repeated basis, with potential to attract harm. CIP opted for gamification to support this extension effort. CIP worked with game producers to create a popular card game which had the aim of raising varietal awareness and uptake but also provided some punctual entertainment, spurring behavioral change. Contrasted with a traditional method of extension—like farmer field days—the game was transportable and could be played among small groups, conveying the information but avoiding large prolonged gatherings for instruction.

Finally, CIP prioritized durable strengthening of seed systems even during the conflict period. A simple yet carefully designed tissue culture lab built in Kassala (a more stable area) addressed one of the largest underlying hurdles to potato seed system functionality. The poor quality of potato seed in Sudan means that large producers typically import seed, a costly and potentially impossible feat during conflict. The simple

design emphasized linkages between the functioning private sector and the tissue culture lab to enhance the sustainability of in-country operations, even in volatile times.

CIP's work embraced major elements of conflict-sensitive, conflict-savvy, and conflict-intentional operations—resulting in some fairly major program design changes.

Note, local partner names have not been added for reasons of security.
Personal interviews conducted by Dr. Julie March, formerly USAID.
References: UN High Commissioner for Refugees (UNHCR). (n.d.); Integrated Food Security Phase Classification (IPC) (2024).

Box 5. How the private seed sector reaches last-mile farmers in South Sudan

Since its independence in 2011, South Sudan has faced recurrent cycles of armed conflict, including escalating war as this text is being written (mid 2025). Localized violence persists in the country, terrorizing civilians, displacing millions and crippling essential infrastructure (UN News, 2025). The agricultural sector, on which 95% of the population depends, has been hard hit (FAO, n.d.). Farmers contend with disrupted livelihoods and the loss of land and assets, in addition to extreme weather such as floods and droughts.

This box focuses on private seed sector operations in the context of this volatility. In terms of the supply side, South Sudan's formal seed system remains underdeveloped, with a weak research capacity and regulatory framework, and few internal early generation seed sources (van Uffelen et al., 2023b). In terms of delivery, private seed companies face myriad challenges for reaching farmers, including security risks, limited telecommunications, and unpredictable donor procurement cycles. Despite these conditions, some companies continue operating and even thrive.

Private sector seed companies working in the South Sudan conflict contexts may manage two distinct starting points, often concurrently. They may aim to serve farmers directly, via agrodealer partners or selling themselves. Alternatively, and as the overwhelming norm, companies provide seed to the other organizations who then interface with farmers, such as UN agencies or NGOs. Insights from three of these companies—two based in South Sudan and the other working cross-border from Uganda—demonstrate how private actors practically employ conflict-sensitive, conflict-savvy, and conflict-intentional business strategies in volatile settings. Their names are omitted for desires of confidentiality, but all have reviewed the text below.

1. Conflict-sensitive: Doing No Harm

Conflict-sensitivity is integral to the operations of all three seed companies. One national firm transitioned from direct seed production to partnering with community-selected out-growers to avoid land disputes, ensuring also that out-growers stayed within their very local communities rather than swapping to others. It further minimized risk by limiting activities to areas considered safe for farming and by paying out-growers via mobile money, reducing the threat of robbery or targeting by armed groups. The second national company prioritized transparency and community engagement. It consulted local leaders and security personnel throughout planning, seed production, and distribution. This helped prevent suspicion and misunderstandings and built local trust in the firm's activities.

> *"They only withdraw funds when necessary to reduce risk."* — One of the private sector seed company field staff, on the use of mobile money in insecure areas

The third company, working cross-border, managed community relations by employing South Sudanese staff familiar with the language and local customs. This reduced the risk of miscommunication and unintended tension. The company also offered reduced pricing in the conflict zones to avoid over burdening vulnerable communities.

2. Conflict-savvy: Navigating Informality and Risk

Conflict-savvy strategies were also essential to the companies' ability to navigate the South Sudanese landscape. The two national firms reduced their exposure to risk by decentralizing seed processing (using local tools and labor) and avoiding volatile transport routes. They worked through community leaders to negotiate land access, reflecting the need to understand the practical local dynamics. They also strengthened their community presence by training local extension agents and out-growers and leveraging local cooperatives as trusted distribution partners.

The Ugandan-based company emphasized the importance of managing logistical and financial risks in conflict zones. The company partnered with South Sudanese transporters, used local security escorts when needed, and eventually felt the extra need to secure insurance coverage for seed in transit. To prevent delays, the company also navigated informal checkpoints by paying unofficial fees when necessary.

> *"Businesses that want to operate in a conflict space should be really prepared and be ready with a fallback position in case things go wrong. One needs to make clear terms and conditions to avoid causing more conflicts without knowing…It's not about technical knowledge; it's about the context."* — Staff member from Uganda seed company working in South Sudan

3. Conflict-intentional Strategies for Long-term Resilience

Much of the design of the response, that is, possible conflict-intentional work, was not determined by the three companies themselves. Centering on DSD as the main response type, contracting NGOs, or the donors instructing the NGOs, dictated seed types via specific tendering requirements. Contracts generally focused on crops such as open-pollinated varieties (OPV) of maize and self-pollinated types (e.g., sorghum, groundnut, and cowpea) that humanitarians sensed 'were better for farmers'—as farmers could resow these themselves. All three companies reported frustration, particularly around the OPV choice (see rationale below), but had virtually no leverage; humanitarian contracts covered 90 to 100% of their business dealings (varying by company) as direct sale to farmers or others was low or non-existent.

The three seed companies did and do aspire to move beyond what seems like reactive and risk-avoiding approaches. They have sought several ways to address the effects of conflict through key technical shifts (i.e., conflict-intentional programming). One company, for example, began producing and distributing short-maturing varieties to ensure crops could be harvested before violence resumed. Another moved away from donor-preferred OPVs and toward maize hybrids, as these hybrid types—companies assert—are clearly favored by client farmers.

The companies, leaning on their own strategic preferences, somewhat clashed with NGO philosophy as the three sought to move toward more market-based approaches. When working together with humanitarians, one company strongly advocated for voucher- or cash-based assistance. Independently, one company also revised its out-grower contracts to allow farmers to sell seed directly into local markets rather than depending solely on buy-back schemes, aiming to reduce exposure to shifting donor priorities. Such company shifts reflect moves to respond to real market demand (including farmer-client wants) rather than to rely on institutional markets.

> *"Do not rely on the humanitarian market because you can't follow your business plan and only wait for their annual announcements, which are usually late."* — Chief Executive Officer (CEO) of one of the private sector seed companies in South Sudan

4. Cross-cutting Insights and Conclusion

Whether national or cross-border, private seed companies must adapt to conflict-affected settings by avoiding harm, navigating risk, and—where feasible—intentionally addressing the social and technical effects of

conflict. Success hinges on their contextual understanding, local partnerships, and flexible business strategies.

While humanitarian seed aid plays a critical role in crises, private sector experiences in South Sudan show how it has also distorted markets and discouraged private sector engagement. The misalignment between donor seed preferences, and those of local farmers, for example, can limit the private sector's ability to be conflict-intentional, or, minimally, client-responsive. As the CEO of one of the companies noted, *"Seed aid has been abused… Humanitarian actors assume to know what farmers want."*

A more coherent, farmer-informed strategy, rooted in local realities and supported by flexible procurement models, is essential to unlocking the private sector's role in building resilient, inclusive seed systems—especially in fragile and conflict-affected settings. More broadly, in the context of South Sudan's many years of instability, more market-oriented approaches might herald the way for varied types of seed system strengthening.

Note: Names of companies and staff have been removed for reasons of confidentiality.
Personal interviews conducted by Geoffrey Otim/Mercy Corps in February-March 2025
References: FAO, n.d.; UN News, 2025; Van Uffelen et al., 2023b.

V. Moving Forward

This paper has presented a review of seed security interventions in conflict-affected contexts, mostly drawn from cases in Africa. It has: a) identified features of seed systems that might be affected in these unstable periods; b) listed the range of seed security responses that have been implemented; and c) examined whether the responses have been to tailored to the stress, that is, whether programming has been *conflict-intentional*. The authors have been transparent about some of the limitations of the work. It was difficult to find any documented material and, especially, reports or published articles that give in-depth insight.

Limitations aside, it is believed that this paper is the first ever to give an overview of this subject matter: seed security interventions in conflict contexts. The paper provides an entry point into a subject matter that has practical importance. Seed security interventions take place widely and frequently in conflict contexts of Africa. They can help farmers get back on their feet and spur production and sale. Alternatively, they can have no effect and even do damage. A broader aim of this paper is to help steer implementers towards 'doing better' and being more effective. The notion of *conflict-intentional* programming is key in this regard—combined with the more well-known guidance inherent in *conflict-sensitive* and *conflict-savvy* programming.

As the subject matter of this paper is relatively new, below are proposed fundamental steps to help move this practical field of inquiry towards a more solid foundation.

PROPOSED NEXT STEPS

1. **Familiarize humanitarians globally with the concept of conflict-intentional.** While Do No Harm is widely understood, conflict-intentional programming is a newer concept. It seems important to socialize this term more widely in the global domain via, inter alia, publications, webinars, and online posts. The aim is not to reify the term but rather to spur its use in programming.
2. **Catalyze/review specific cases of seed security programming that has been conflict-intentional.** The available data on which this paper drew was modest—despite use of substantial search engines. It is possible that evidence resides in practitioners' minds and experience but has yet to be documented. A targeted workshop or expert consultation might help capture practitioner insights from active conflict regions. Documenting this field-based experience is essential for refining and advancing conflict-intentional programming.
3. **Examine the potential of seed to promote social cohesion/peace: are the two a good match?** Seed programming may support social cohesion, making it a good fit for HDP nexus goals. However, the contributions of seed to social cohesion and, possibly, peacebuilding remain largely underexplored. Joint reflection—via webinars, case calls, or integrated workshops—could clarify when and how seed system work can contribute to broader social cohesion outcomes (possibly linked to #2).
4. **Develop conflict-intentional seed security programming checklists.** As knowledge on this topic advances, a second order step would be to elaborate more detailed guidance. To operationalize the concept, conflict-intentional programming checklists might be created to guide seed security programming. Checklists should be grounded—for instance, should the crop choice be the same as pre-conflict?; do the focus crops require inputs that are available?; and more. As seed security interventions are designed and implemented by a range of technical and non-technical personnel, checklists might be intelligible also for non-specialists.

Conflict-intentional programming should help to improve seed security programming in conflict contexts. That is the fundamental notion driving this overview paper. The term needs to be socialized, and its practical implications made more clear. There is also a need to better understand what happens to seed systems in conflict-affected contexts and how to respond (tailor) programming to better mitigate and adapt to any changes. These are concrete, distinct ways forward.

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Annex I. Seed Security Interventions: More Medium-term (protracted crises)

Seed security interventions have also been implemented in regions experiencing more protracted crises. The intervention set below is only indicative, as many medium- and longer-term initiatives have taken place, including those that might be tied to environmental peacebuilding. Environmental peacebuilding involves efforts that address land use and natural resource management, in which seed may be one component (e.g., Ahmadnia, 2022; Ide et al., 2021).

Table 6 sketches four types of quite different interventions, each in common use. *Community seed banks* take place with farmers at very local levels. *Seed Hubs* have platforms joining many stakeholders, even at the national level. *Germplasm restoration* can be local but one case below draws on inter-country, regional collaboration. *Seed policy work* can be national (as below) but also might be shaped by a global community.

Table 6. Types of medium-term seed security interventions in conflict areas, and some examples

#	Type of Intervention	Location	Date	Organization/ reference	Salient aspects
1	Community Seed Banks	Ethiopia (Tigray)	1988 and ongoing	Berg, 1992 Berg & Abay, 2008	Set up during war in areas isolated from government services. Included local plant breeding societies. Started in response to famine/hardship due to war, and region's isolation.
		South Sudan	2023 and ongoing	Vernooy et al., 2023 Barangé, 2024	CSBs are located close to people's homes or nearby a community building (church, health center, school), close to the road, and not in the remote bush, with year-round accessibility. Crops prioritized are the ones of highest current food security interest.
		DRC (South Kivu)	2022 and ongoing	L. W. Mulonde, Pan-Africa Bean Research Alliance (PABRA)/CIAT (*pers. comm.,* 2025)	10+ seed banks set up by a Mercy Corps project. Managed by farmer committee. Stipulation that members cannot be actors in conflict. It is not evident if technically tailored to conflict.
2	Seed Hubs	South Sudan	2022 and ongoing	van Uffelen et al., 2023a	Multi-stakeholder platforms bringing together seed sector and other actors for information sharing, capturing good practice, development of policy briefs, etc. It is not evident if technically tailored to conflict.
3	Germplasm Restoration	Rwanda	1995-1997	CGIAR "Seeds of Hope" Varma & Winslow	Rwandan internal facilities destroyed so brought together regional bodies (Burundi, Kenya, Uganda, etc.) to rebuild national genebank collections and breeding program.
		Sierra Leone	2000	"Rescue from the Pot" project, Kent & Mokuwa, 2001	Project focused on local rice varieties adapted to specific agro-ecological zones that were in 'scarce' supply and 'cherished,' post-war. Modern varieties exchanged (not bought) for local 'scarce' ones—and then multiplied by labor groups on behalf of community. It built on local knowledge of community favorites and local labor.
4	National seed policy geared to conflict/fragile state areas	South Sudan	Ongoing -2024 version	Government of South Sudan document, 2024	Some recognition in national policy draft that conflict can lead to seed system instability but no specific conflict-related elements apparent; also near nil emergency seed mention.

Commentary on types of seed security interventions (medium-term) implemented in conflict-affected contexts: technical focus

#1 Community Seed Banks

What are they?

Community seed banks (CSB) are mainly informal institutions, locally-governed and managed, whose core function is to preserve seeds for local use. They have existed for about 30 years, conserving, restoring, revitalizing, strengthening, and improving local seed systems, especially, but not solely, focused on local varieties. The women and men farmers who run community seed banks handle major crops, minor crops, and neglected and underutilized species, sometimes in small quantities of a few hundred grams per accession and sometimes storing hundreds of kilograms (Vernooy et al., 2023).

Community seed banks—those existing prior to conflict as well as those catalyzed directly in conflict-affected contexts—can give farmer members access to locally-produced seed and desired varieties. Some also may help foster social cohesion (see South Sudan example below).

How has it been tailored to conflict?

- *Tigray, Ethiopia:* Developed in a war context, cut off from government services. Seed banks ”mobilized best seed selectors to supply poorer farmers with good quality seeds” (Berg & Abay, 2008, p. 101). The banks were spurred by a drive for self-sufficiency and autonomy away from central government.
- *South Sudan:* Specifically, the community seedbank in Ladu Payam, South Sudan brought together villages with a history of conflict. Researchers reported initial resistance towards seed exchange, but, following shared training on the importance of safeguarding local varieties and the role of community seedbank in this process, “beneficiaries in Ladu Payam have experienced peaceful co-existence during their interactions over the short community-seedbank implementation period” (Barangé, 2024). Also, choices around CSBs considered the conflict situation especially in terms of site location and accessibility: close to people’s homes or nearby a community building (church, health center, school), with year-round accessibility. Crops prioritized are the ones of highest current food security interest (or not the underutilized crops, sometimes focused on in such efforts).
- *South Kivu, DRC*: Seed banks established in the context of the Mercy Corps Food Security Project (FSP-Enyanya). Warehouses, pallets, and storage bags were provided. The CSBs have transparent management committees, including a cashier/treasurer (L. W. Mulonde, *pers. comm.*, 2025). It is not evident if this was technically tailored to conflict.

#2 Seed Hubs

What are they?

Seed hubs are multi-stakeholder partnership platforms that bring together seed actors and stakeholders, including representatives from government, national and international research institutes, educational organizations, development and humanitarian actors (in particular FAO), NGOs, seed companies, civil society, policy makers, and donors (van Uffelen et al., 2023a & 2023b).

Depending on specific actors and priorities, they may have fairly broad mandates. In South Sudan, for example, the hub structure lists its aims to help:

- Develop national seed policies
- Strengthen seed sector coordination
- Help transition out of seed relief to development
- Strengthen farmer-based seed systems
- Support private sector development
- Develop quality assurance systems
- Strengthen crop breeding and access to new varieties
- Etc.

How have they been tailored to conflict?

While seed hubs may be catalyzed in conflict-affected areas and countries, the documentation is unclear as to how or if they have been tailored to the specific war or unstable context.

#3 Germplasm Restoration

What is it?

Germplasm restoration involves the restoring of varieties to institutions or geographic areas where such germplasm is assumed to have been lost. Hence, it is delivering back crops and varieties that *were there before*. The specific germplasm focus is usually on local varieties but modern (improved) ones may also be included. The restoration activity assumes that the crops/varieties are still adapted and/or useful (maybe for plant breeding) and often assumes that the crops/varieties are still appreciated by end-users, especially by farmers.

The locus of restoration can be at different levels—to genebanks, plant breeding programs, farmers' fields—and with varied aims:

- To restart genebanks, research programs;
- To give back varieties that farmers may really want and are good for production stability.

Germplasm restoration is not usually an 'emergency' activity, nor it normally done by humanitarian practitioners. Rather, restoration is more associated with longer-term recovery and more developmental work.

How it has been tailored to conflict?

- *Nationally:* In Rwanda, it was recognized that the destruction and loss of germplasm was so extensive that regional cooperation among countries was warranted (Uganda, Burundi, Kenya, Tanzania, etc.).
- *Locally:* In Sierra Leone, there was a strong focus on local structures steering the processes. Farmers identified valued varieties and organized multiplication themselves. They were also rebuilding a sense of local cooperation, only lightly facilitated by an outside NGO (Kent & Mokuwa, 2001).

Note that the relationship between war/conflict and agrobiodiversity changes is not frequently documented (viz. Sperling, 1997b) but is gaining in focus (Tamariz & Baumann, 2022). In contrast, the links between natural disasters, such as floods and biodiversity loss, has been oft suggested (see, e.g., Mozambique, Ferguson et al., 2012).

In contrast to loss, germplasm retention has also been noted as an effect of war. Between 1970 and 1992, the Angolan state seed authority introduced improved varieties and distributed these in government-held areas. Over many years, the areas held by the Union for the Total Independence of Angola (UNITA) rebels were cut off from these state sources of improved seed supply and largely from other sources too. The result was that local varieties were further developed and multiplied in these isolated areas (Kundermann, 2000; Matos, 1997).

#4 National Seed Policy: Formulations (tailored to conflict areas?)

What is it?

National seed policy is a statement of principles that guide government action and explains the roles of relevant stakeholders in the coordination, structure, functioning and development of seed systems, both formal and informal sectors (FAO, 2015). It might include guidance on a range of themes: for instance, investment in crop research and plant breeding; quality assurance; biodiversity conservation; and seed legislation.

How it has been tailored to conflict?

Seed policy and agricultural policy have potential to shape emergency seed security interventions—for instance, in the quality of seed that can be given as aid. That said, it is rare to find seed policy that is tailored toward emergency contexts and, even rarer, to conflict contexts. Below is an example of recent policy being shaped nationwide for a conflict-affected country. Enabling policies—recognizing the realities of unstable conflict areas—could potentially shape more effective actions.

- *South Sudan (national forum):* the current South Sudan national seed policy draft (November 2024), recognizes the reality of this new nation—one with few formal seed sector resources and with important agroecological diversity. The current version mentions that conflict can destabilize theoretically, but with no practical link to the current national context. Emergency as a seed system factor is mentioned only once, in reference to possible biodiversity loss and need to establish a national seed bank. That said, the draft policy has a number of innovative features not usually embraced in classic seed-focused formats: e.g., the need for gender mainstreaming (gender and youth).

Policy development—tailored to conflict areas and to emergency contexts—might be as important an activity as the refinement of the actual technical interventions themselves.

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seed system Strengthening smallholder farmer seed systems

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