



**Airbel Impact Lab**  
Research & Innovation at the IRC



# **Seed Security in Fragile and Climate Vulnerable States:** System Disruptions and Solutions for Niger, Pakistan, South Sudan and Syria

**CLIMATE-RESILIENT  
AGRO-PASTORAL  
LIVELIHOODS**



**Seed selection is one of the most important and high-impact climate adaptation actions that a farmer has available to them.**

For most of the world, climate change is the crisis of tomorrow; for the conflict-affected communities in which the International Rescue Committee (IRC) works, climate change is the crisis of today. These communities, such as those in Niger, Pakistan, South Sudan and Syria, are on the front lines of complex and compounding conflict and climate crises. Despite this urgent need, these conflict-affected communities are being left behind by global efforts on climate action, receiving disproportionately little funding and ineffective solutions. Moreover, despite the fact that adaptation is an immediate priority in frontline communities, the distribution of global climate finance predominantly favors mitigation efforts, leading to an alarming scarcity of funds designated to address critical adaptation needs.

Agro-pastoral communities across Niger, Pakistan, South Sudan and Syria continue to confront the effects of climate change, persistent insecurity and conflict in some areas, economic deterioration, food and supply shortages, and high prices for essential items including food and agricultural supplies, as well as health concerns exacerbated by the COVID-19 pandemic. The Airbel Impact Lab, IRC's Research & Innovation Unit, and IRC's Country Teams, in coordination with farmers and local stakeholders, have identified opportunity areas ripe for innovation and transformation that have the potential to alleviate the high risk and significant uncertainties in the seed system posed by climate impacts and protracted conflict.

In Niger and South Sudan our work is just getting off the ground, however in Pakistan and Syria, where our work is later stage, we have already generated and are now testing a resilience and adaptation-oriented (instead of reactive or mitigation-based)

set of solutions to achieve an overall enhancement of seed and food security for farmers. The approach is showing early promise, demonstrating that building climate resilience in conflict-affected contexts is possible. A concerted effort by a coalition of governments, multi-lateral bodies, peer organizations and funders is needed to invest in the full range of conflict-sensitive solutions to transform climate resilience in conflict-affected countries, those most affected by and least responsible for climate crisis.

## **RESEARCH OBJECTIVES, METHODS AND SCOPE**

In 2021, as part of a new global research and innovation priority focused on climate-resilient livelihoods, the IRC launched a new design initiative in Niger, Pakistan, South Sudan and Syria with the aim of enhancing farmers' access to quality climate-adapted seeds. The objective of this research was to analyze the issues and barriers impeding seed security in all four countries, as well as identify opportunities and potential solutions to mitigate these limitations; solution areas pertain to **enhancing seed availability, accessibility** and **quality**, as well as enhancing **access to information**. Methods included formative evidence reviews and desk reviews, interviews and focus group discussions with agro-dealers, agricultural extension workers, representatives from international agriculture organizations and NGOs, seed producers and farmers (both male and female), and a series of design workshops with the IRC's country-based agricultural livelihoods technical teams and farmers.



**Seed Security in Northeast Syria**



	Number of people experiencing food insecurity	Number of farmers in need of food and agricultural assistance
<b>Syria</b>	15.0M	455K
<b>Northeast Syria (target)</b>	1.62M	122K



A farmer inspects mature wheat as part of the first year of the IRC’s seed security pilot in northeast Syria.

The lack of access to good-quality seeds is interlinked with limited financial capacity, as both farmers and agro-dealers are adversely impacted by inflation, unstable exchange rates, and the absence of government support and financial institutions. Farmers resort to borrowing cash from relatives and friends, accumulating debt, and having to sell seeds at unfavorable prices to service these loans; as farmers struggle to service their debts, agro-dealers, in turn, limit sales on credit. Transportation, labor and agricultural inputs including pesticide, fertilizer and fuel are increasingly cost prohibitive for farmers.

It is also relevant to highlight the gendered dimensions of seed security. Although female farmers are very active in northeast Syria, they usually have less decision-making and purchasing power, and their activities in the agricultural realm are largely dictated by social norms. Women are culturally discouraged from operating farming machinery, instead relying on manual labor, and are typically limited to the cultivation of vegetables and barley for animal feed, which, compared to wheat, are less lucrative and subject to much greater cost volatility.

These social factors are compounded by climatic and hydrological conditions—namely, widespread drought, fluctuating rainfall patterns and decreasing water levels in the Euphrates basin—which have reduced food production and availability in the region. In the 2020/21 season, erratic rainfall and abnormally high temperatures affected main eastern cereal-producing areas, resulting in the loss of some 90% of wheat and barley crops in northeast Syria (NES AWG et al., 2021). Additionally, the Alouk Water Station, a critical source of potable water in northeast Syria, ceased functioning in September 2022, further exacerbating the water crisis.

Together, these issues have resulted in a negative feedback loop in northeast Syria wherein seeds are decreasing in quality and availability and increasing in price season after season. This complex and compounding crisis poses a serious threat to seed system security and is rendering agricultural livelihoods in the region particularly vulnerable.

## SEED SECURITY SOLUTION PACKAGE

The design process informed the creation of a seed security solution package, consisting of two solutions that leverage contests, prizes, field experiments and peer learning to identify and multiply high-yielding and climate-adapted seed varieties, increase seed quality and availability, and enhance the resilience of agricultural livelihoods in the face of complex and compounding crises in northeast Syria. Importantly, both solutions are conflict-sensitive interventions at the farmer level, designed to promote the acceptability of solutions and mitigate the high risk associated with local contextual changes.

The individual solutions in the package are elaborated below:

### 1. A competition to test new seed varieties:

The end users of the first solution in the package are **expert farmers (both male and female)**. Independent experimentation with new varieties is incentivized among participants through free agricultural inputs (for testing) and the potential to win prizes (e.g., solar panels, irrigation system, motorized backpack sprayer for pesticides and herbicides). Winners are selected based on their adherence to core project requirements and protocols. Clients engage in peer-to-peer knowledge exchange throughout the competition, are able to keep all of their harvest after the end of the competition, and are incentivized to continue to participate in future competitions.

### 2. Seed multiplication as a collaborative and rewarding process:

The end users of the second solution in the package are **farmers (both male and female)**. Farmers who sign up for the seed multiplication program receive seed varieties that have previously been tested for quality within the scope of solution 1, additional in-kind and cash support to cover seeds and other required agricultural and labor inputs, and free expert support (i.e., initial training, bimonthly field visits, ongoing WhatsApp groups). To participate in the program, farmers must be willing to work on their own land for the entire season (leveraging otherwise unused land), have access to a water source (irrigated land), and commit to donating 15% of their yield from the project to other farmers who will participate the following year. As with the testing component of the package, to further incentivize participation, winners are selected at the end of the season based on their adherence to project guidelines and are provided with rewards. Ultimately, the insights and learnings from the seed testing inform the selection of seed varieties that will be expanded for larger-scale multiplication.

A family walks through their rows of flourishing crops. Strong seed systems are critical to ensure farmers have access to appropriate and high-quality seeds at the right time.

**A farmer-focused approach to enhance access to quality, climate-adapted seeds.**



## PROGRESS AND IMPACT

The pilot for this solution package launched in October 2022 and ran for 12 months, during which we worked directly with 30 expert farmers in wheat seed testing activities (20% of participants in this component are women) and 100 farmers in wheat seed multiplication activities (18% of participants in this component are women) in Trbaspiyah and Ar Raqqa. The scale of women's participation is notable, given cultural norms around who typically participates in wheat cultivation. At the end of the season, 10 “champion” farmers were selected based on their level of engagement in project activities, application of climate-smart agricultural practices, and the size of their yield; four of these champion farmers are women. Several of the women farmers noted that they had never participated in wheat cultivation before, that men in their villages have now come to them for advice given their comparatively higher yields, and that they see this project as having the potential to enhance trust in women's knowledge and expertise in agriculture.

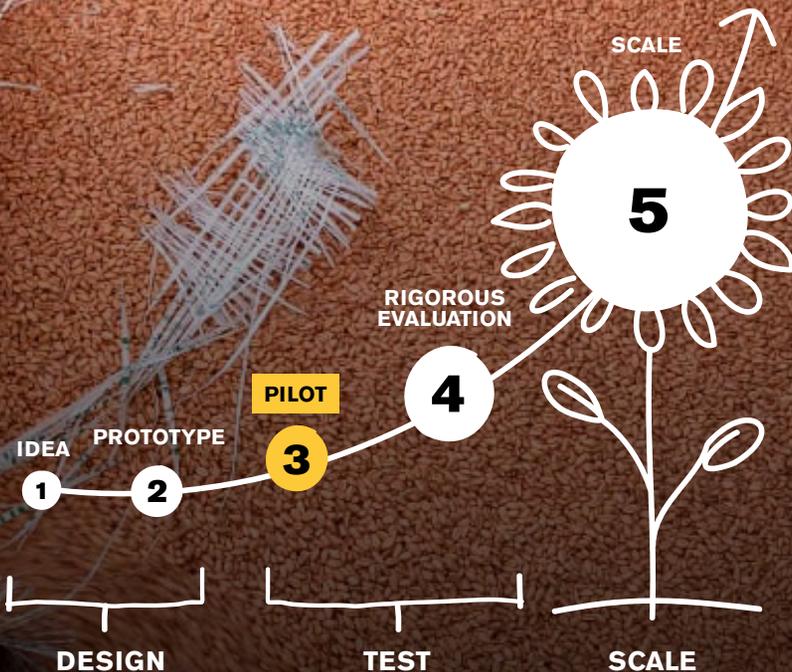
According to our preliminary modeling, within five years we expect to partner with up to 2,200 farms<sup>1</sup> in seed multiplication, producing more than 17,000 MT of wheat seed while continuously improving the quality of the wheat seed available in the system. We project that this wheat seed will reach approximately 14,000 farms<sup>2</sup> (approximately 114,000 people in farming households<sup>3</sup>) through market interactions, thereby enhancing access to quality seed for farmers throughout northeast Syria and generating an additional \$8.8M in revenue<sup>4</sup> for the seed multipliers. Through the systems-strengthening approach, there is a multiplier effect of at least six; every farmer multiplying quality seed is producing enough seed for six additional farmers to plant. We see farmer-to-farmer networks as a key pathway to scale for this project, with potential additional support from local authorities and peer organizations. The initiative has the potential to significantly bolster both food security and climate resilience within the region, fostering greater agricultural productivity, adaptive capacity and self-reliance among local farmers, and reducing dependence on centralized services that may be disrupted due to shocks in the crisis.

<sup>1</sup> Represents cumulative projected reach; actual number will depend on farmer attrition rate and project budget

<sup>2</sup> This projection assumes five hectares per farm.

<sup>3</sup> This projection assumes a household size of eight.

<sup>4</sup> This projection does not account for volatile inflation or market dynamics.



A client pours wheat seeds into a seeder as part of the IRC's seed security pilot in northeast Syria.

## PAKISTAN: KHYBER PAKHTUNKHWA (KP) & SINDH PROVINCES



	Number of people experiencing food insecurity	Number of farmers in need of food and agricultural assistance
Pakistan	14.6M	1.74M
Khyber Pakhtunkhwa & Sindh (target)	12.0M	1.43M



Female farmers in KP and Sindh encounter distinctive hurdles in gaining access to seeds and resources. They typically lack landholding rights and decision-making capacities, rendering them particularly vulnerable to the effects of climate change.

## SYSTEM DISRUPTIONS THREATENING SEED SECURITY

In KP and Sindh, critical challenges threaten both seed and food security. Political instability and governance gaps have hindered effective agricultural policies, rendering farming communities especially vulnerable. Socioeconomic disparities exacerbate food insecurity; women and smallholder farmers have particularly limited access to quality seeds and resources. Finally, ongoing security threats—particularly in KP province—disrupt farming activities, causing displacement and hampering agricultural productivity.

In both KP and Sindh provinces, significant barriers and limitations to ensuring seed security predominantly revolve around issues of accessibility. This primarily pertains to accessing quality seeds, land, technology, information and financial resources. Female farmers, in particular, encounter distinctive hurdles in gaining access to these resources due to prevailing patriarchal norms that restrict their participation in the agricultural sector. Generally, farmers in both provinces face challenges in accessing information concerning climate risk and climate-resilient agricultural practices, as well as obtaining improved seed varieties and more efficient farming equipment. Furthermore, farmers have limited access to financial resources and support, and when available, these mechanisms tend to be either difficult to access or financially burdensome. Both national and regional governments lack the necessary resources, including human, financial and logistical, to produce substantial quantities of high-quality seeds and distribute them effectively through market systems and other means to local farmers. This has resulted in a situation wherein farmers often source lower-quality (typically, more affordable) seeds from the local market or rely on informal seed exchange systems. As mentioned, female farmers face all of these same issues, as well as additional, gendered barriers in the agricultural sector including lack of access to seed markets (rendering them especially reliant on informal seed exchange). Moreover, in KP and Sindh provinces, female farmers typically lack landholding rights and, relatedly, decision-making capacities, rendering them particularly vulnerable to the effects of climate change (which require clear, concerted and informed efforts to enhance resilience in the seed system).

These social impediments to seed security are compounded by climatic and hydrological factors, which pose a substantial threat to seed security in both provinces. Pakistan is one of the 10 countries most affected by climate change; increasingly, erratic weather patterns, including rising temperatures and increased droughts and floods, are disrupting planting seasons and damaging crops, leading to uncertain harvests. Notably, both KP and Sindh were severely impacted by the historic 2022 floods that devastated Pakistan, which affected around 33 million people (15% of the total population), washing out crops, livestock assets, forests and important infrastructure, and compounding an already alarming situation for agricultural communities (GoP, 2022). The government has estimated that around 6.5 million acres of crops were affected, and farmers lost vital agricultural inputs, including seeds (Baigal, 2023). More generally, diminishing water resources and inefficient technologies strain irrigation systems in both provinces, leaving fields parched and hindering crop growth. These challenges disproportionately impact smallholder farmers who lack resources and knowledge to apply adaptive practices or take adaptive actions. The escalating climate crisis not only jeopardizes seed security but also heightens the risk of food shortages, demanding urgent strategies that empower farmers with climate-resilient seeds and sustainable farming practices.



**In Pakistan, climate change has disrupted planting seasons, damaged crops and led to uncertain harvests.**

During the 2022 floods, farmers in Sindh lost the current year's crop and seeds stored for the future.

## PROPOSED SEED SECURITY SOLUTION PACKAGE

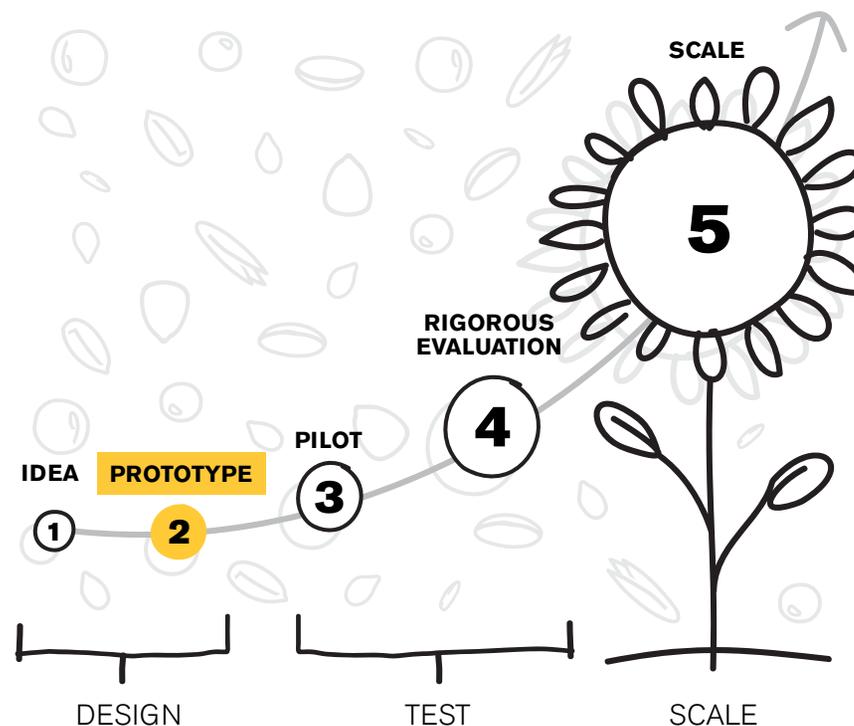
The design process informed the creation of a seed security solutions package, consisting of two solutions that leverage local testing and incentivized experimentation, accessible media for information dissemination (e.g., social media, WhatsApp groups), and competitions to identify and multiply high-yielding and climate-adapted seed varieties. These interventions aim to increase seed quality and availability and ultimately enhance the resilience of agricultural livelihoods in the face of complex and compounding crises in KP and Sindh. Importantly, both solutions are rooted in local communities and market actors to both promote the acceptability of the solutions and to enhance their resilience to potential political shocks and contextual changes. The individual solutions in the package are elaborated below:

### 1. Seasonal seed experimentation and demonstration plots:

Selected farmers across five districts (Swat, Burner and Peshawar in KP; Umerkot and Tando Allahyar in Sindh) will be given seeds, fertilizer, extension support and training to test locally adapted seed varieties in their fields. These early adopters and lead farmers will test seed varieties under different treatments to evaluate their quality, suitability, resilience and productivity. The farming calendar in Pakistan has two main seasons and as such, two crops will be considered per season for each of the two provinces, i.e., wheat (winter) and maize (summer) in KP and wheat (winter) and mung beans (summer) in Sindh. Importantly, this intervention will democratize seed testing and experimentation—typically done in research institutions and outside the reach of farming communities—to ensure that knowledge transfer and skills development reaches smallholder and tenant farmers. This farmer-led approach will ensure that the best known practices are shared with farmers and will enable farmers to identify quality seeds, identify priority questions about seed varieties, and finally answer their own questions through experimentation plots.

### 2. Seasonal Seed Multiplication:

Farmers across the five districts in Sindh and KP will get full support from the IRC to multiply climate-resilient varieties of wheat, maize and mung beans during both the winter and summer seasons (wheat and maize in KP; wheat and mung beans in Sindh). In the first year of the project, these seed varieties will be selected based on government recommendations, thereafter the varieties will be determined based on the results of seed testing within the scope of Solution 1 in this package. The IRC will provide seed multipliers with access to foundation seed for climate-resilient varieties and will provide training to farmers in climate-smart agricultural practices and seed multiplication best practices. A fraction of the seed multipliers will be enlisted for seed experimentation (described in Solution 1, above). The seed multipliers will be expected to adhere to recommended guidelines including seeding rate and fertilizer application. Moreover, where possible and socially acceptable, female farmers will be engaged as seed multipliers, thereby ensuring that women are not left behind in training, acquiring knowledge and being actively involved in the seed production process.<sup>1</sup>



<sup>1</sup> Our goal is to have equitable representation of male and female farmers in our trainings, although the feasibility of this goal is dependent upon local contexts; in KP, for example, it is more difficult to ensure the participation of female farmers due to local social and cultural norms.



A farmer holds up wheat at a grain silo. With the proposed seed security solution package for Pakistan, we project that this wheat seed will reach approximately 25,000 farms through market interactions.

## PROGRESS AND IMPACT

The proposed seed security solution package for Pakistan is an adaptation of an ongoing innovation project showing promise in northeast Syria, discussed on pages 3 to 6 of this brief, where we recently concluded the first pilot year. After an analysis of challenges and opportunities in Pakistan, as well as early user testing, we have found that an adapted version of this model shows potential to enhance the resilience of farmers and the seed system in KP and Sindh. Notably, while the project in northeast Syria focuses exclusively on wheat, the project in Pakistan will additionally include mung bean and maize seed testing and multiplication in alignment with the unique needs and preferences of farmers and ecological suitability in Sindh and KP.

According to our preliminary modeling of potential reach within Pakistan's wheat value chain alone, within five years we expect to partner with up to 1,375 farms<sup>2</sup> in multiplication, producing more than 4,000 MT of wheat grain and approximately 2,000 MT of wheat seed while continuously improving the quality of the wheat seed available in the system. This project aims to achieve a 10-15% wheat yield improvement per acre, considering that the current average wheat yield per acre ranges from just 1 to 1.2 metric tons. We project that this wheat seed will reach approximately 5,000 farms<sup>3</sup> (approximately 40,000 people in farming households<sup>4</sup>) through market interactions, thereby enhancing access to quality seed for farmers throughout Sindh and KP.

In the year ahead, we will engage farmers and other seed system stakeholders across both provinces in a co-creation exercise to develop a functional model, tailored to Pakistan, which can then be tested through pilot implementation on a small scale. As we refine the package, we will also generate and refine impact and scale projections across all three value chains (wheat, mung bean and maize), identify cost drivers and develop relationships with potential local partners to support implementation at scale.

<sup>2</sup> Represents cumulative projected reach; actual number will depend on farmer attrition rate and project budget.

<sup>3</sup> This projection assumes three hectares per farm.

<sup>4</sup> This projection assumes a household size of eight.

## NIGER: DIFFA REGION



Number of people experiencing food insecurity

Number of farmers in need of food and agricultural assistance

Niger

3.12M

816K

Diffa Region (target)

133K

34.8K



Kelou Kiari feeds her 16-month-old son, Bidi, who suffered from malnutrition after their family was displaced from their home when members of Boko Haram attacked their village.

## SYSTEM DISRUPTIONS THREATENING SEED SECURITY

Since its independence from French colonization in 1960, the Republic of Niger has experienced several coups—the most recent of which began just days prior to the writing of this case study in July 2023—which have resulted in ongoing political instability (Tangaza & Chothia, 2023; BBC, 2023). Further, conflicts involving non-governmental armed groups have posed significant threats to the Nigerien population, particularly in the Diffa region. Additional security concerns in Niger stem from conflict in neighboring countries—such as fallout from the Libyan civil war and conflict in northern Mali and Burkina Faso—as well as threats of terrorist insurgencies in the region. Diffa—located in the southeastern region of Niger, along the border with Nigeria—has been host to Nigerian refugees fleeing violence in Nigeria’s northern states since 2013. Complex and compounding crises in the Diffa region—including the Boko Haram crisis that began in 2015, intense and violent attacks from Armed Opposition Groups (AOGs), mass population displacements within the region, and climate change-induced stresses and shocks—have exacerbated the vulnerability of Diffa’s population, the majority of which is engaged in smallholder (one hectare maximum) farming and has resulted in food insecurity and chronic malnutrition in the region. The ongoing coup has not only intensified political instability but has also heightened uncertainties and security concerns, posing significant challenges to the effective delivery of humanitarian aid by international actors who rely on government cooperation. Ultimately, the evolving political situation continues to exacerbate the vulnerability of the local population.

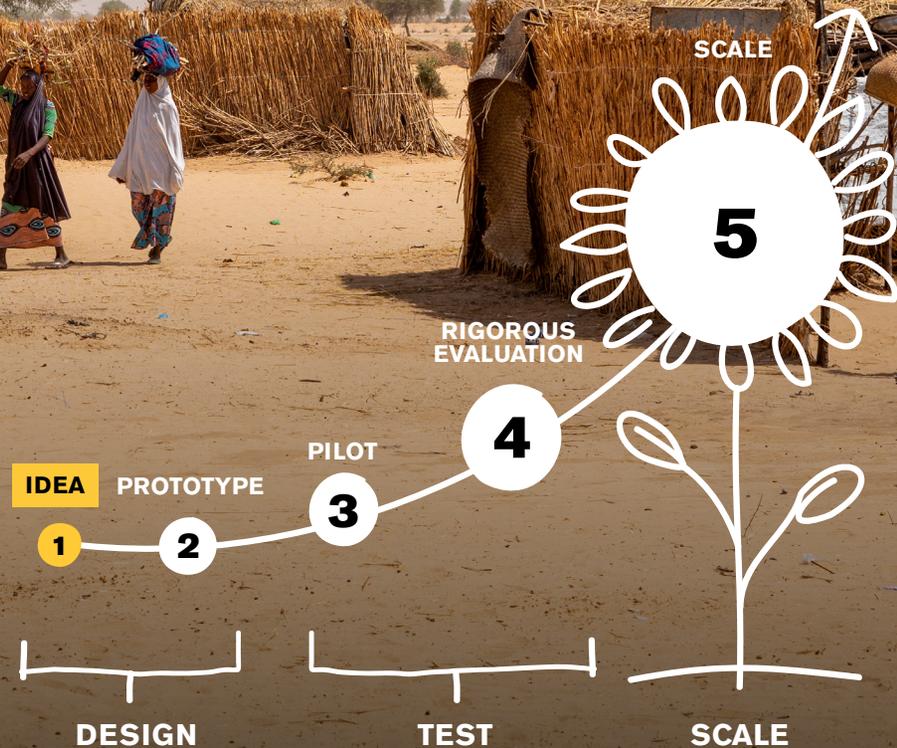
The Republic of Niger is an agricultural state, with the majority of its population concentrated in the south of the country, a region favorable to the cultivation of basic cereals (millet and sorghum), as well as irrigated market gardening and various cash crops. Today, more than 80% of the Nigerien population is dependent upon agriculture for their livelihoods. These livelihoods are rendered increasingly vulnerable as a result of climate change, as they are adversely impacted by frequent droughts, flooding and land degradation.

## Seed Security in Niger's Diffa Region

Another significant constraint for agricultural livelihoods in Niger is the limited access to technological advancements. Irrigation infrastructure is limited—resulting in a reliance on rainfall, particularly in the Diffa region—and most farmers lack access to improved seed varieties and other climate-smart agricultural technologies. In addition to technological limitations pertaining to agricultural production, there are substantial technological limitations in the processing and marketing of agricultural products in Niger.

Overall, the unavailability and inaccessibility of high-quality, climate-smart seeds deteriorates the security of the seed system in Niger. This is the result of a number of complex and interrelated factors, including limited seed multiplication at the community level, significant post-harvest losses, a high rate of dependency on NGOs for access to seed, limited market access, lack of access to agricultural information and an unstructured seed supply chain with very limited seed quality controls. These factors are further compounded by environmental shocks (such as erratic hydrological patterns), farmers' financial constraints and ongoing conflict and insecurity in certain regions of the country (e.g., Diffa). Despite actively contributing to agricultural production across Niger, female farmers are especially vulnerable, given a variety of gendered barriers to seed security, such as a lack of access to high-quality land and farming equipment, and limited decision-making ability. Women also carry a disproportionate burden of domestic responsibilities, and, in some regions, social and cultural norms impede their active participation in agricultural production—especially their access to land and farm inputs, including quality seeds and necessary farming tools—while also limiting their financial inclusion.

**More than 80% of the Nigerien population is dependent upon agriculture for their livelihoods.**



A refugee camp in Awaridi village, 4 kilometers from downtown Diffa, where the IRC team operates.

## SOUTH SUDAN: UNITY STATE



Number of people experiencing food insecurity

Number of farmers in need of food and agricultural assistance

South Sudan

7.8M

1.9M

Unity State (target)

761K

185K



A man tends to his crops in South Sudan. Floods, droughts and pest attacks have pushed farming communities across South Sudan to become increasingly reliant on humanitarian seed aid.

## SYSTEM DISRUPTIONS THREATENING SEED SECURITY

South Sudan, the world's youngest nation, gained independence in 2011 after a decades-long civil war and struggle for autonomy from Sudan. Despite initial optimism, the country has faced significant challenges, including political instability, ethnic tensions, and economic instability and uncertainty. Ongoing power struggles among political elites have hindered development and led to cycles of violence. Ethnic divisions have fueled conflicts, resulting in displacement and humanitarian crises. Weak institutions, a struggling economy and limited infrastructure further compound the nation's difficulties. International efforts are focused on fostering stability, peace and development, but South Sudan's sociopolitical landscape remains fragile and complex.

Over 95% of households in South Sudan depend on subsistence agriculture for their livelihoods, rendering access to and availability of high-quality seeds an essential security question for the majority of South Sudanese households (FAO). In South Sudan, both seed and food security are undermined by a number of factors, including floods, droughts and pest attacks. Food security varies with the degree of conflict and scale of its impact and can deteriorate sharply when conflict persists in an area. Other factors that influence food security in South Sudan include climate (variability), soil types, topography, drainage, access to markets, access to wild plant foods, and biotic constraints.

Decades of civil war and the post-independence crisis have negatively affected agricultural production and hampered the development of the local seed systems in the country. These issues are further compounded by high rates of human displacement and, relatedly, loss of labor and production (including the extinction of indigenous staple food crop genetic resources). Many efforts have been made by the Government of South Sudan (GoSS)—along with many relief and development partners—toward restoring and enhancing agricultural systems, fostering local seed multiplication, and improving and maintaining indigenous seed systems and traits. Nevertheless, farming communities across South Sudan have been increasingly reliant on humanitarian seed aid for over three decades, with humanitarian organizations distributing more than 10,000 tons of seed aid across the country annually.

## Seed Security in South Sudan's Unity State

This aid is normally provided on the assumption that many farmers (especially those from vulnerable groups, such as women, youth, people with disabilities, internally displaced persons (IDPs) and returnees) often lack access to the local seed market, which remains underdeveloped.

South Sudan is characterized by a tropical climate with distinct wet and dry seasons. The wet season lasts from May to October, bringing heavy rains and often leading to flooding, particularly across Unity State (Sabr et al., 2023). Certain areas of the country face water scarcity and access issues, exacerbated by population growth and limited infrastructure. In the past four years, however, floods have posed a significant challenge to water management and food security across the majority of South Sudan, rendering agricultural livelihoods vulnerable. South Sudan is susceptible to drastic climatic changes, with primary concerns including rising temperatures and heightened flood and drought risk of varying intensity and duration.

Another significant constraint for agricultural livelihoods in South Sudan is the limited access to technological advancements, with the majority of agricultural operations reliant on rainfall and low-tech agricultural practices; most farmers lack access to improved seed varieties and climate-smart agricultural technologies. In addition to technological challenges pertaining to agricultural production, lack of key infrastructure and essential services also hinders agricultural livelihoods. In Unity State, insufficient transportation infrastructure makes it difficult to transport agricultural products to markets (particularly during the wet season), leading to post-harvest losses and limiting income for farmers. Extremely limited access to the electrical grid hampers

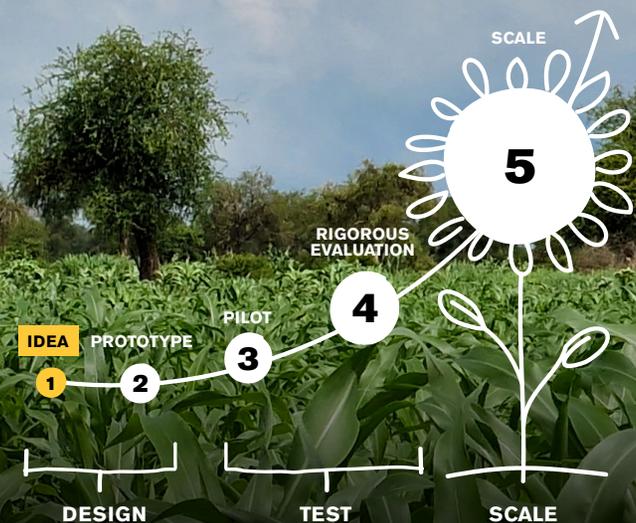
the implementation of modern irrigation systems and food processing technologies, restricting agricultural productivity and income. Further, limited access to information and communication technologies inhibits farmers from accessing timely weather forecasts, market prices and farming best practices, reducing their ability to make informed decisions.

Overall, the unavailability and inaccessibility of high-quality, climate-smart seeds and associated agricultural technologies has deteriorated the security of the seed system in South Sudan. This is the result of a number of complex and interrelated factors, including limited seed multiplication at the community level, significant post-harvest losses, a high rate of dependency on NGOs for access to seed, limited market access, limited access to agricultural information, and a lack of seed quality controls. These factors are further compounded by environmental shocks (such as hydrological cycles), farmers' financial constraints, and ongoing conflict and insecurity, particularly in Unity State. Female farmers, youth farmers, displaced farmers and farmers with disabilities are more vulnerable, given a variety of specific barriers to seed security, such as a lack of access to arable land and farming equipment, the disproportionate burden of domestic responsibilities and, in some regions, social and cultural norms that impede their active participation in agricultural production.

The design process informed the identification of a number of opportunity areas for innovation. The IRC is currently working to generate solutions within these areas with the aim of transforming seed security in South Sudan's Unity State; this case study will be updated when the solution package is finalized.

# Seed system insecurity in South Sudan is compounded by climate shocks and ongoing conflict

Farmland in South Sudan. The IRC is working to transform seed security in South Sudan's Unity State.



## TOWARD SUSTAINABLE SEED SECURITY

Our seed security work across four distinct fragile and climate vulnerable contexts—in northeast Syria, Pakistan's KP and Sindh provinces, South Sudan's Unity State, and Niger's Diffa region—are all still in early (though varying) stages. In Pakistan and Syria, where we are refining and testing solutions, our modeling and early pilot findings demonstrate the potential to transform climate resilience, even in the most fragile and protracted situations, through direct investments in farmers, their communities, and the systems in which they operate. In Niger and South Sudan, where we are currently generating solutions, our design research has successfully identified areas ripe for innovation to ensure sustainable seed system security in the local context.

Given the magnitude of convergent conflict and climate crises, the IRC cannot act alone. We call upon governments, multi-lateral bodies, peer organizations and funders to support replication of our existing solutions, as well as the generation of complementary solutions to address the complexity of seed system needs in Niger, Pakistan, South Sudan, and Syria. A range of breakthrough seed security solutions and effective delivery models is needed to match the urgency and gravity of the problem; our design research has highlighted opportunity areas across all four regions. ▶



A farmer plows farmland in South Sudan. Through direct, conflict-sensitive investments in farmers, we can build climate resilience in the most fragile situations.

- ▶ **Strengthen Local Seed Production:** Encourage and support local seed multiplication efforts tailored to the region's climate and agricultural needs.
- ▶ **Promote Climate-Resilient Varieties:** Support the identification of climate-smart agriculture and the use of climate-resilient seed varieties across all regions.
- ▶ **Empower Women in Agriculture:** Promote the active participation of women in seed testing, multiplication, and decision-making processes and support female farmers with access to land, technology, information and financing.
  - 🔍 **Northeast Syria:** Encourage agriculturally qualified women to establish and operate stores, and make seed multiplication training and related activities more accessible to women, to encourage the emergence of female farmer leaders within the community. For additional examples of how these recommendations apply in the northeast Syria context, see dedicated case study.
- ▶ **Capacity Building for Farmers and Agro-Dealers:** Build the capacity of farmers and agro-dealers in various aspects of the agricultural value chain, including seed quality characteristics, sustainable farming techniques, and pest management.
- ▶ **Enhance Information Dissemination:** Utilize various communication channels, including social media and community networks, to disseminate farming-related information, weather forecasts and market updates.
- ▶ **Public-Private Partnerships:** Foster collaboration between public and private sectors to facilitate sustainable seed production and equitable benefits for farmers.
  - 🔍 **Pakistan:** Develop private-public partnerships to facilitate the multiplication of sustainable and indigenous open-pollinated varieties (OPVs), ensure farmers' access to markets, and ensure fair pricing for certified seed. For additional examples of how these recommendations apply in the Pakistan context, see dedicated case study.



Nyapar Kujiek received support from the IRC's Women's Empowerment Center in South Sudan to build her farming business.

▶ **Community-Based Seed Initiatives:** Build on extant social networks to encourage the establishment of community seed banks and seed multiplication initiatives to improve local seed storage and access.

▶ **Support Farmer Training Programs:** Provide training and education to farmers and extension workers on sustainable farming practices and improved seed utilization.

🔍 **Niger:** Promote the uptake of improved seed varieties and farming practices through demonstration plot trainings that focus on the use of improved seeds (from agro-dealers), proprietary seed production, selection, and saving, and climate-smart agricultural practices. For additional examples of how these recommendations apply in the Niger context, see dedicated case study.

▶ **Seed Quality Assurance:** Strengthen seed testing, certification, and quality improvement processes to ensure farmers have reliable access to high-quality seeds.

▶ **Promote Financial Inclusion:** Improve the financial capacity of farmers and agro-dealers through initiatives such as Village Savings and Loan Associations (VSLAs) and dedicated farmer credit facilities.

🔍 **South Sudan:** Improve the financial capacity of both farmers and agro-dealers by introducing seed trials, fostering farmer and agro-dealer/supplier linkages, expanding Village Savings and Loan Association (VSLA) initiatives, and establishing dedicated farmer credit facilities. For additional examples of how these recommendations apply in the South Sudan context, see dedicated case study.

These cross-cutting recommendations have emerged as relevant to all four contexts and can contribute to enhancing seed system security in fragile environments. They emphasize the importance of local capacity building, gender inclusion and collaboration between stakeholders to improve resilience in the most fragile and climate-vulnerable contexts.



Women who work in a sorghum field near the village of Sabon Machi in Niger.

## A NECESSARY SHIFT TO THE GLOBAL PARADIGM

To effectively design, test and scale solutions within these opportunity areas, several shifts in current approaches to climate action are needed. We must disrupt the paradigm wherein the most vulnerable populations are systematically left out of climate action and prioritize conflict-affected states, focusing on contexts that are experiencing extreme and co-occurring climate vulnerability and fragility. Within these countries, we must unlock funding to specifically support adaptation and climate resilience and shift from a “government-first” to “people-first” model of financing by coordinating with non-sovereign and sub-national delivery partners, who are already key actors in local systems and often have the greatest access to communities in need<sup>9</sup>. Finally, we must invest in innovation to develop context-appropriate and conflict-sensitive interventions that are designed for and tested in fragile environments, where current delivery mechanisms for climate-adaptive interventions are absent or non-functioning. The “people-first” approach is critical to conflict-sensitive and contextually appropriate innovation, as it reduces the vulnerability of investments to conflict or political shocks; this approach may be instrumental in ensuring the sustainability of solutions even in instances where rapidly changing political or security circumstances may render government coordination infeasible.

Only by acting upon these recommendations can we truly address the climate crisis, particularly in areas that suffer the dual burdens of climate change and conflict, fostering a future of greater security, well-being and resilience for all.

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<sup>9</sup> Presently, the total climate financing supporting small-scale agriculture amounts to some 10 billion USD, representing only 1.7% of total climate finance tracked and addressing only a small fraction of the needs of small-scale agricultural producers (Chiriac et al).

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Cover Photo: The IRC is exploring how to support farmers in Pakistan to multiply climate-resilient varieties of mung beans.