Building seed system resilience in protracted crisis situations

Seed system resilience assessment and facilitation tool (SSRA-FT)

Version 1.0

Abishkar Subedi, Gerrit-Jan van Uffelen, Charleen Malkowsky

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This working document is a collaborative effort between the Wageningen Centre for Development Innovation (WCDI) of Wageningen University and Research (WUR), Integrated Seed Sector Development in Africa (ISSD-Africa) and FAO South Sudan under the Food and Nutrition Security Resilience Programme (FNS-REPRO). The proposed methodology and tools will be field tested in Torit and Yambio, South Sudan, and validated by the parties mentioned above, based on which a final document will be produced.

Building seed system resilience in protracted crises is an important goal of Food and Nutrition Security Resilience Programme (REPRO) South Sudan programme. REPRO South Sudan adopts a food and seed systems approach (FNS) to analyse, understand and promote absorptive, adaptive and transformative seed system resilience capacities in the face of shocks and stressors, in order to improve food and nutrition outcomes. This document presents the working document of the seed system resilience assessment and facilitation tool (SSRA-FT). The SSRA as methodology will be employed by Wageningen Centre for Development Innovation (WCDI), in close consultation with FAO, to develop seed system resilience pathways in South Sudan as part of the REPRO Programme. There are three interrelated parts of the seed system resilience assessment: the SSRA conceptual framework; undertaking the SSRA; and the SSRA toolbox. The SSRA-FT will contribute to developing good practice and policy recommendations in two important domains: building seed system resilience in protracted crises, and seed distribution in emergencies.

Keywords: South Sudan, Seed Systems, Resilience, Protracted crisis, Food Systems, Food and Nutrition security

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BUILDING SEED SYSTEM RESILIENCE IN PROTRACTED CRISIS SITUATIONS

List of abbreviations and acronyms

CBSP	Community-based Seed Production
CSB	Community Seed Bank
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FNS	Food and Nutrition Security
FSA	Food System Analysis
HLPE	High Level Panel of Experts on Food Security and Nutrition
IDP	Internally Displaced People
IPC	Integrated Food Security Phase Classification
ISSD	Integrated Seed Sector Development
LSB	Local Seed Business
NGO	Non-Governmental Organization
QDS	Quality Declared Seed
SSRA	Seed System Resilience Assessment
SSRA-FT	Seed System Resilience Assessment Facilitation Tool
UNEP	United Nations Environment Programme
UNISDR	United Nations Office of Disaster Risk Reduction
UNSCR	United Nations Security Council Resolution
WCDI	Wageningen Centre for Development Innovation, Wageningen University & Research
WUR	Wageningen University & Research

Concepts and definitions

Working definitions for the main concepts used in this document.

Protracted crisis
Macrae and Harmer (2004) define protracted crises as '*those environments in which a significant proportion of the population is acutely vulnerable to death, disease, and disruption of their livelihoods over a prolonged period of time*'.

Resilience
The United Nations Office of Disaster Risk Reduction (UNISDR) definition of resilience: *'The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions'*.

In relation to the Rome Based Agencies' focus on agriculture, food security and nutrition, resilience is essentially about the inherent capacities (abilities) of individuals, groups, communities and institutions to withstand, cope, recover, adapt and transform in the face of shocks.

Food systems
According to van Berkum (2018)[1]: Food systems comprise all the processes associated with food production and food utilisation: growing, harvesting, packing, processing, transporting, marketing, consuming and disposing of food remains (including fish). All these activities require inputs and result in products and/or services, income and access to food, as well as environmental impacts. A food system operates in and is influenced by social, political, cultural, technological, economic and natural environments (HLPE, 2014; Global Panel 2016; HLPE, 2017).

Sustainable food systems
A sustainable food system is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised (FAO, 2014[2]). This means that:
- it is profitable throughout (economic sustainability);
- it has broad-based benefits for society (social sustainability); and
- it has a positive or neutral impact on the natural environment (environmental sustainability).

Food system resilience
The concept of food system resilience analyses how system components and their actors (from producer, middleman, traders, consumers etc.), are affected by – and respond to shocks and stressors, accounting for ripple effects across the food system, providing insights into varying existing and required resilience capacities and strategies which enable system actors and components to mitigate, prepare for and recover from negative impacts ensuring desired, (improved) socio-economic, environmental and food and nutrition security outcomes.

Seed systems
Seed systems are sets of activities by different actors that are involved in plan genetic resources management, plant breeding and variety development, seed production, multiplication, dissemination, service provisioning, policy and regulation development, resulting in access, timely availability and use of quality seed of different crops and varieties in demand by farmers.

1 https://library.wur.nl/WebQuery/wurpubs/fulltext/451505
2 http://www.fao.org/3/ca2079en/CA2079EN.pdf

Integrated seed sector development

Seed system actors may include farming households and their communities, public and private bodies, and NGOs. Actors may have different interests, priorities and capacities, resulting in different focuses on areas and interests, resulting in a variety of seed systems. No single intervention, be it public-, private-, community-, or NGO-based, can provide sufficient support to the seed sector for achieving the goal of seed security at community, regional and national levels. Individual farming households use distinct seed systems for different crops. Integrated seed sector development (ISSD) recognizes the unique role played by each of these different seed systems within the overall sector and its specific context, and the need to approach them in a pluralistic manner. These diverse seed systems are clustered into informal, intermediary and formal seed systems.

Seed system types

Informal seed systems

Farm-saved seed: The most prominent source of seed for the majority of farmers in developing countries, and also for many in the developed world, is farmer-saved seed. Farmers obtain seed through both informal and formal channels. Varieties can be both local and improved. The crops are largely for subsistence and food security, but in many cases may also be used for income generating purposes. The role of women farmers in farmer-saved seed is very important.

Social seed network: This system integrates both informal and formal flows of crop varieties in the farming communities. Farmers save the seed for next season and regularly share, exchange or barter or sell the seed to their neighbours and communities. Social relationships, cohesion, trust and reciprocity are the key factors that influence the development of a seed network and determine to what extent these networks are resilient to shocks and stressors. Through this system, farmers as a community maintain a portfolio of crop diversity that is required for their daily livelihoods.

Local (grain) markets: Farmers regularly purchase potential seed from the local grain market to fulfill their seed need for their crop production. It includes the majority of open pollinated crops. Pulses, beans and oil seed crops are the crops often sourced from the local market. Major actors in the local grain market include small, medium and large traders, and local farmers themselves. This system includes both local, improved and mixed varieties. The quality of potential seed in the local gram market is often unknown.

Intermediary seed systems

Community seed bank (CSB): Community level seed-saving initiatives have been around since the end of 1980s, established with the support of international and national non-governmental organizations. Community seed banks have been designed and implemented to conserve, restore, revitalize, adaptation to climate change and strengthen farmer's seed system. The efforts have taken various forms and names: community gene bank, seed hut, seed reserve, seed library, seed-savers group, association or network. Depending on the objectives set by its members, it might focused on conservation of agriculture biodiversity including reviving lost crop and varieties, while others give priority to both conservation and access and availability of diverse types of seed suitable to various agroecological domains, primarily for local farmers. In addition to these main functions, promoting seed and food sovereignty is another core element of some community seed banks.

Community-based seed production (CBSP): Farmers source seed of locally important food and cash crops through this system. Non-governmental organizations (NGOs) are actively involved in supporting communities with the aim of enhancing food security and reducing poverty. This system includes both local and improved varieties, and may involve some aspect of seed quality assurance procedures, such as using certified seed or even foundation seed as source seed; maintaining good pre-harvest and post-harvest management practices; rouging 'off-types' in the field; and storing the different varieties of seed separately. In the country where a quality declared seed (QDS) system is functional, CBSPs benefit from QDS system.

Local seed business (LSB): Farmers multiply and sell quality seed of improved varieties to other farmers in this seed system. Farmers' capacities are strengthened through organizing as seed

producing cooperatives or groups or becoming professional seed producers. Often these groups are legally registered with the district agriculture office. LSBs may include seed quality assurance procedures, such as quality declared seed (QDS) and a formal certification process. This system includes major food crops, as well as vegetables and perennial fruit trees, and mostly uses local or nationally released/registered improved varieties.

Seed relief: In the event of an emergency and in many protracted crisis situations due to human conflicts or natural disasters, seed is freely distributed to farmers as a form of relief in order to support their recovery. Varieties and seed quality standards are usually unknown, which is a concern in terms of the long-term sustainability of the seed sector. However, in recent years local seed sourcing and use of voucher based seed distribution have been started as good practice within seed relief programmes.

Formal seed systems

Government seed companies and/or programmes: There are various (mostly public) operators in the seed value chain in this system, through which seed is certified and varieties are improved. In most developing countries, governments invest their resources in the production and dissemination of crops that are important for food and nutritional security through this system; these include cereals (maize, rice, wheat and several others), legumes and vegetables.

Commercial seed companies (local to multinational): In this seed system, commercial companies are either directly engaged in seed production through contract farming and outgrower schemes, or in importing seed of high value food and cash crops, which are subsequently marketed through their own networks and/or agro-input dealers. Hybrid maize, hybrid rice, exotic vegetables and perennial fruit trees are the main crops for which this system is operational.

Closed value chain: This seed system usually has a short value chain, in which seed (including planting materials) and input packages are directly provided to commercial growers. The system includes crops such as cotton, tea, coffee, tobacco, and sugarcane.

0 Introduction

0.1 Purpose of the document

This document presents the zero draft of the seed system resilience assessment and facilitation tool (SSRA-FT). The SSRA as methodology will be employed by Wageningen Centre for Development Innovation (WCDI), in close consultation with FAO, to develop seed system resilience pathways in South Sudan as part of the Food and Nutrition Security Resilience Programme (FNS-REPRO, hereafter: REPRO). The SSRA-FT is being developed as part of REPRO's output 4: REPRO's learning agenda and knowledge management.

Building seed system resilience in protracted crises is an important goal of REPRO South Sudan. REPRO South Sudan adopts a food and seed systems approach to analyse, understand and promote absorptive, adaptive and transformative seed system resilience capacities in the face of shocks and stressors, in order to improve food and nutrition security (FNS) outcomes.

The SSRA-FT will contribute to developing good practice and policy recommendations in two important domains: building seed system resilience in protracted crises, and seed distribution in emergencies.

The target audience for the SSRA-FT are both policy makers and practitioners interested to promoting food system resilience, and the critical role of seed systems therein, for improved food and nutrition outcomes.

0.2 The REPRO programme: building resilient food systems in protracted crises

The Netherlands has played a key role in the unanimously adopted Security Council resolution 2417[3] on conflict induced food insecurity. UNSCR-2417 was triggered by the fact that hunger was on the rise for the third year in a row, driven by protracted conflict and adverse climate events, threatening to erode and reverse gains made in ending hunger and malnutrition (FAO et al, 2018)[4].

The REPRO programme is an initiative by the Dutch Government to operationalise the United Nations Security Council Resolution 2417. This resolution forbids the creation of food crises and famine as an act or result of war, and calls upon the international community to explore new ways to strengthen food system resilience in times of crises and situations of conflict.

REPRO is a four-year programme (2019-2023) funded by the Dutch Ministry of Foreign Affairs and implemented by FAO under its strategic programme 5, that seeks to increase the resilience of livelihoods to threats and crises that affect agriculture, food and nutrition. The Wageningen Centre for Development Innovation (WCDI) has been subcontracted to implement REPRO's learning agenda and knowledge management.

[3] https://www.un.org/press/en/2018/sc13354.doc.htm

[4] The State of Food Security and Nutrition in the World. http://www.fao.org/3/I9553EN/i9553en.pdf

0.3 REPRO's learning agenda in South Sudan: the seed sector

In South Sudan the REPRO programme focuses on the seed sector. Learning and knowledge management are integrated in REPRO's design, in order to inform adaptive programme management and promote improved policy and practice, engaging at different levels from field-based projects to the Global Network Against Food Crisis.
For South Sudan, WCDI and ISSD-Africa[5], in close consultation with FAO, will focus on the development of resilient seed systems for improved FNS outcomes in the face of shocks and stressors, including the impact of conflict on seed and food system performance.

WCDI and ISSD-Africa will align with each other to develop a learning agenda and knowledge management for the following two pathways:
- seed sector development in fragile states: https://issdafrica.org/seed-sector-development-in-fragile-states/; and
- an effective seed insecurity response: https://issdafrica.org/effective-seed-insecurity-response/.

This initiative will develop integrated seed sector pathways in selected areas of South Sudan (see next paragraph), aiming to:
- reduce the number of people in IPC-3 ('food crisis') through integrated seed sector development; and
- reduce the number of people in IPC-4 ('food emergency') through an effective seed insecurity response.

0.4 Principles for REPRO's seed sector development in South Sudan

The key principles and considerations for REPRO's contribution to seed sector development are as follows (source: REPRO South Sudan programme):
- taking a **farmer-focused and demand-driven approach**, which caters for the diversity of seed demands for improving food and nutrition outcomes;
- taking an **integrated approach**, by strengthening/building formal, intermediary and informal seed systems, depending on local context and different client groups therein;
- taking an **area-based approach**, with geographic areas selected as 'representative' for protracted crisis situations. This will involve piloting the building of resilient seed systems that will contribute to improved FNS outcomes in IPC 3-5 areas;
- building a **resilient food system**; and
- working on **practice and policy development**.

0.5 The Seed System Resilience Assessment

As Figure 1 below presents, there are three interrelated parts of the seed system resilience assessment:
- I. The SSRA conceptual framework (green, left side)
- II. The SRAA field assessment including the SSRA toolbox (blue, right side); and
- III. Learning and Knowledge Management (red, bottom part)

I: The SSRA conceptual framework is made up of three components
- Understanding food systems and their FNS outcomes (component 1);
- Exploring the seed-food system interface in South Sudan and its contribution to FNS outcomes (component 2); and,

[5] ISSD – Integrated Seed Sector Development. For an introductory video, see https://issdafrica.org/about/.

- applying principles and practices to building food system resilience in protracted crises. (component 3).

II. The SSRA field assessment consists of two components:

- applying interactive tools to understand South Sudan's seed system and their behaviour (component 4); with support of a toolbox provided in the appendix (the toolbox consists of two parts: I. training the SSRA data collection team, and II. Tool guides to engage the main actors and stakeholders to co-create an understanding of food systems)
- developing seed system resilience pathways in support of food systems resilience and improved FNS outcomes (component 5); and

III. Learning and knowledge management section consists of:

- validating pathways through questioning (component 6); and
- documenting good practices, developing policy recommendations and strengthening concepts (component 7).

Figure 1 provides an overview of the SSRA.

The structure of the document follows the SSRA-FT starting with the conceptual framework and its three components (part I), the SSRA field assessment (part II) and Learning and Knowledge Management (part III). Each chapter represents its respectively numbered component.

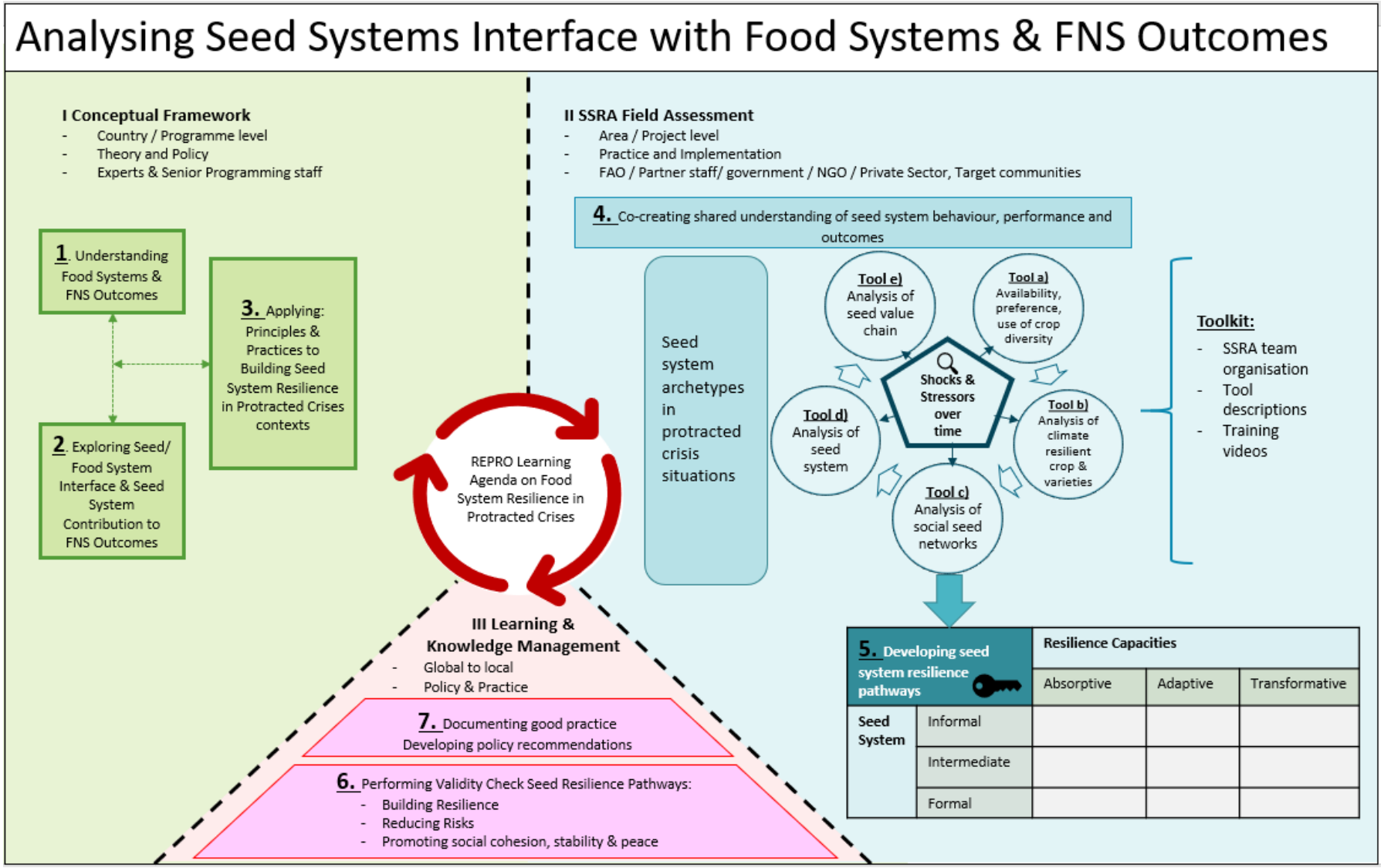
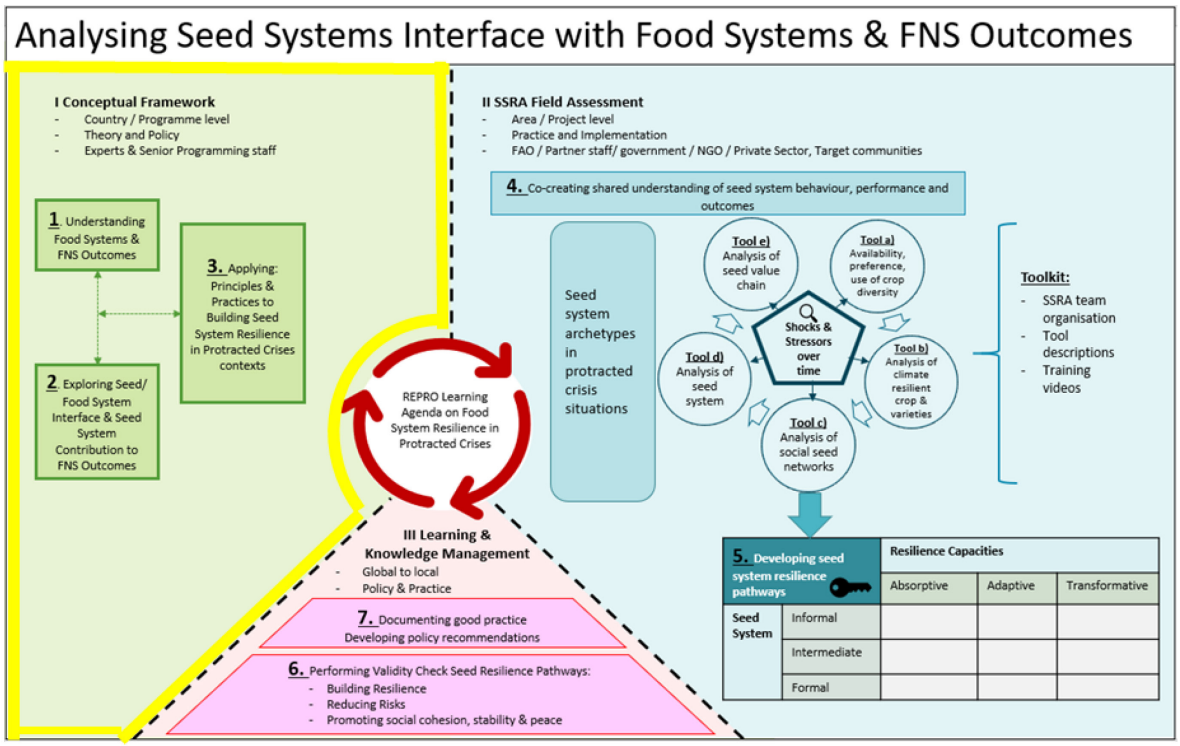


Figure 1 *Seed system resilience assessment.*

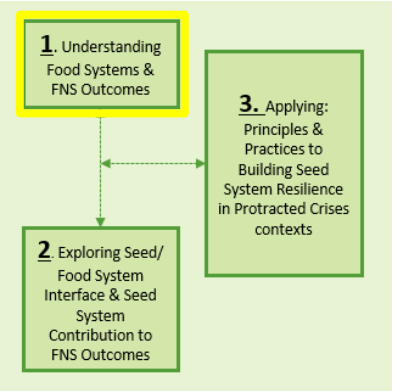
PART I - CONCEPTUAL FRAMEWORK



Part I creates the conceptual framework for the SSRA assessment. It explains how a food system is analysed, how to make sense of the food-seed system interface and how guiding principles are applied.

1 Component: Understanding food systems and their food and nutrition security (FNS) outcomes

Output: Gaining a general understanding of food systems and their food and nutrition security (FNS) outcomes. This generated overall understanding of food systems and the resulting FNS outcomes builds the background to exploring the intersection with seed systems (component 2).



1.1 Food system framework

The food system framework developed by van Berkum (2018) is adopted to:
- provide a structured checklist of topics;
- draw attention to the potential vulnerabilities of the food system; and
- identify the most limiting factor(s) to achieving FNS.

Information is collected on food system activities (food provisioning activities and processes), the socio-economic and environmental drivers impacting food system activities, and food system outcomes. A stakeholder analysis of the key actors involved in food systems is part of the analysis.

Data on major shocks and their impact on food systems and food system outcomes is part of the analysis as they are important drives of food system outcomes.

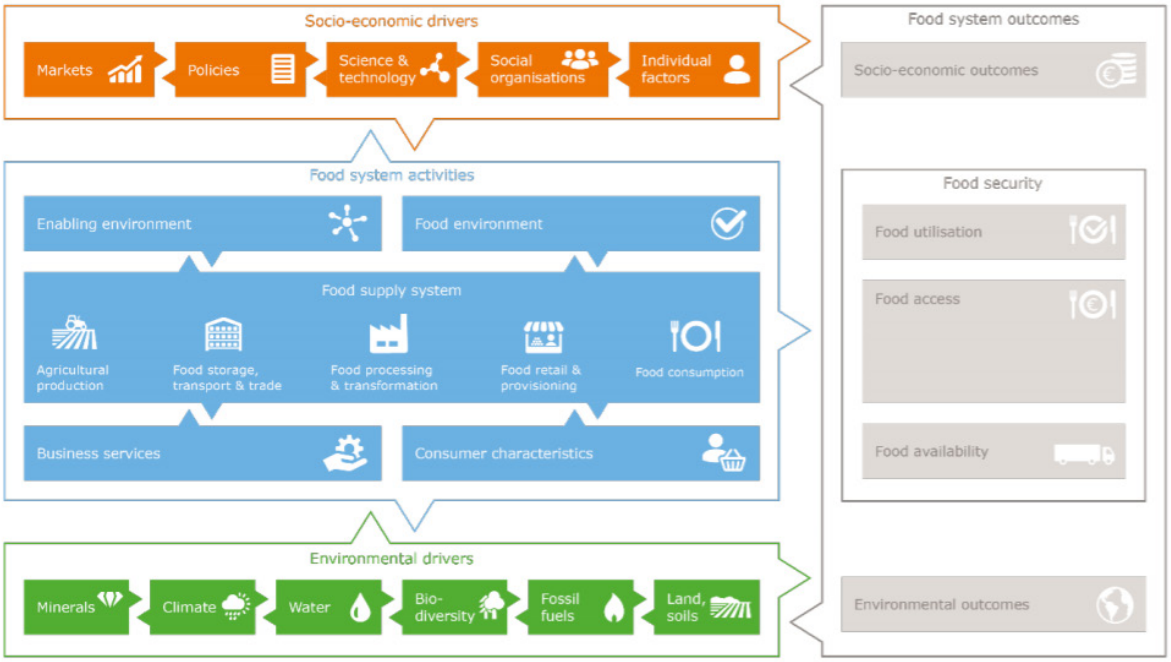


Figure 2 *Mapping the food system and its relationship with drivers (Berkum et al, 2018).*

The FNS outcomes are well documented and can be accessed through the Global Report on Food Crises 20206, the Integrated Food Insecurity Phase Classification7, the Global Report on IPC levels/numbers and FNS outcomes/and forecasts8, and other assessments (for example, Crop and Food Security Assessment Mission reports).

1.1.1 How to collect data: desk review and expert consultation

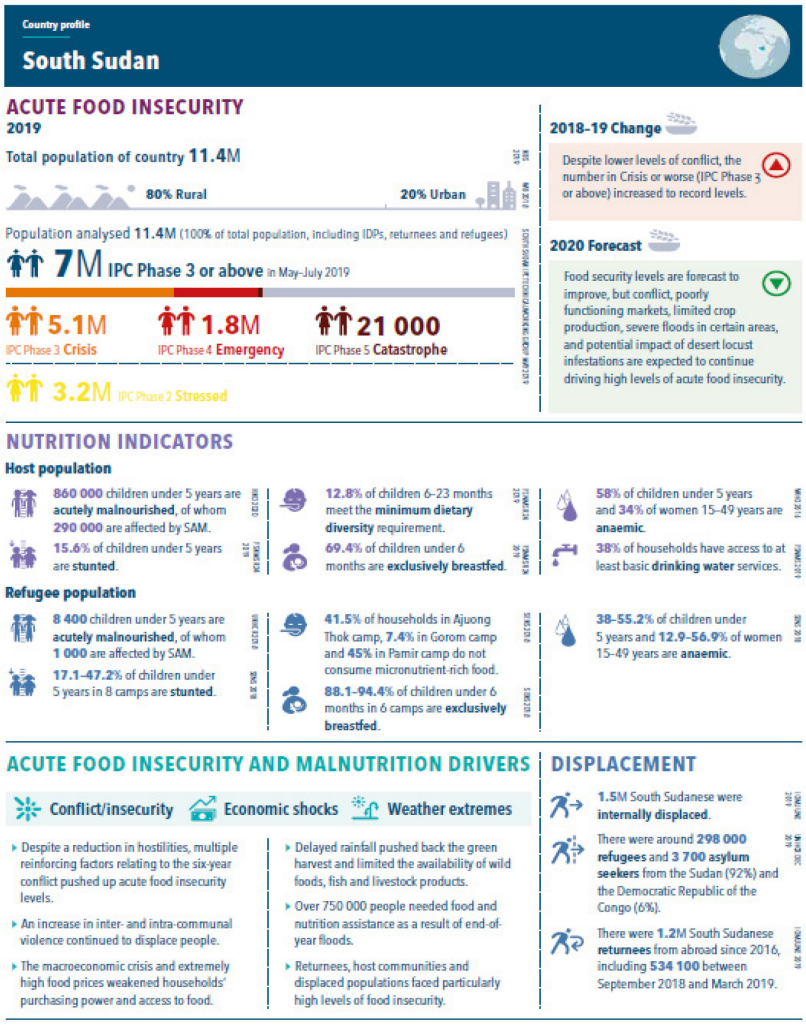
Information and data can be collected on the basis of a **desk review** and **consultations** of available national and local data, using any, or a combination, of the following ways:

- a literature research;
- documentation available through relevant institutions, such as IPC and food security clusters; and
- use of expert knowledge (thematic/geography).

Data Sources

Some general sources of relevant information are presented below.

- FNS South Sudan country profile and description: https://www.fsinplatform.org/global-report-food-crises-2020

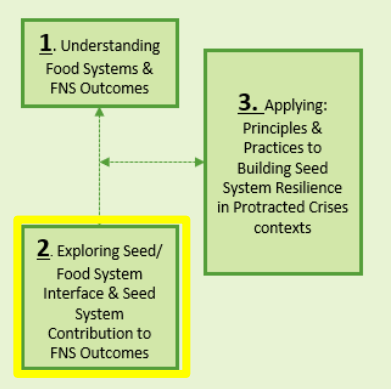


- IPC country updates: http://www.ipcinfo.org/ipcinfo-website/where-what/east-and-central-africa/south-sudan/en/

- Agro-ecology of South Sudan: https://fews.net/east-africa/south-sudan/livelihood-description/november-2018; https://fews.net/sites/default/files/documents/reports/Livelihoods%20Zone%20Map%20and%20Descriptions%20for%20South%20Sudan.pdf

2 Component: Exploring the food/seed system interface and FNS

Output: Understanding the critical role of seed systems in underpinning food systems and the contribution of seed systems to FNS outcomes.



2.1 Seed Systems Framework

Subedi and Vernooy (2019) developed a framework of resilient seed systems for health food systems by adapting Van Berkum's food system model. The model explores seed systems (as the interaction between seed systems actors and activities, environmental drivers and socio-economic drivers) and the interaction between seed system outcomes and food systems.

The model therefore allows the exploring of seed systems, their outcomes and their interactions with food systems and food system outcomes. By doing so critical challenges and gaps can be identified to strengthen seed systems and their contribution to food system outcomes.

The model does not explicitly mention the impact of shocks and stressors on seed systems and their interaction with seed system/food system outcomes. It is clear that shocks and stressors shape socio-economic (as well as socio-politico-economic) and environmental drivers that impact on seed system actors and activities.

See the Figure 3 below for the framework.

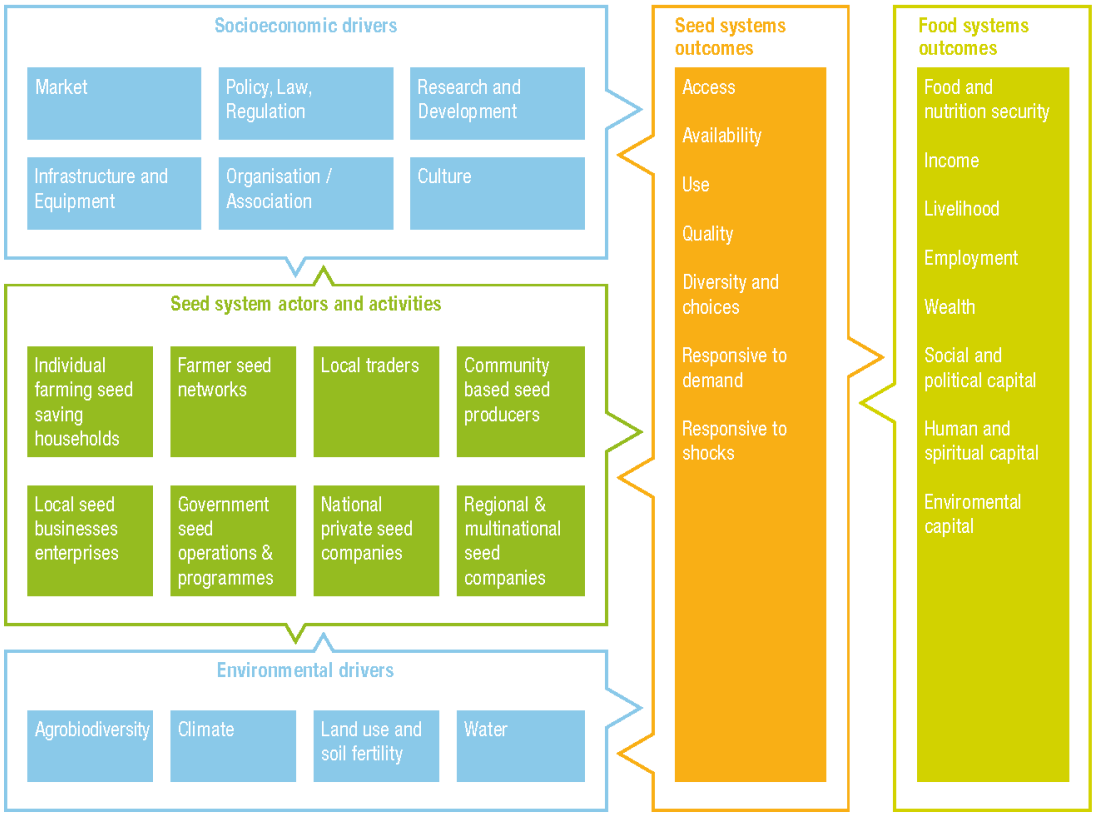


Figure 3 *Framework for resilient seed systems for healthy food systems (Subedi and Vernooy, 2019).*

Resilient seed systems underpin health food systems

According to Subedi and Vernooy[6] (2019), healthy food systems require resilient seed systems:

- Farmers obtain seeds from diverse sources through different mechanisms. There are many actors involved in producing and distributing seeds, and they face many constraints, from climate change to poor quality seed and inefficient delivery systems.
- Resilient seed systems contribute to greater food availability throughout the year, the production of more nutritious and healthy crops, income generation and a sustainable resource base. These outcomes together contribute to greater resilience of food systems.
- Core elements of a comprehensive strategy for resilient seed systems include: smarter ways of addressing climate change, identifying best-bet portfolios, novel and efficient distribution, innovative business models and value chains, empowerment of farmers, and local implementation of international and national policy.

2.2 South Sudan: seed systems, food systems and FNS outcomes

2.2.1 Developing a general understanding of the seed/food system interface and FNS outcomes

This step develops an understanding of the causal interrelationship (key processes and feedback loops) between food and seed systems and how this affects FNS outcomes.

Information and data can be collected on the basis of a **desk review** of available national and local data complemented or enriched by **consultations**. Data can be collected using any of the following ways:

- literature research;

[6] https://www.bioversityinternational.org/index-report/

- documentation available through relevant institutions and fora such as FAO, specialised agencies, and professional bodies for example Food Security Clusters;
- consultations with knowledge experts (thematic/geography); and
- national level consultations with key stakeholders in food/seed systems.

Potential data sources:
- The South Sudan Seed systems Security Assessment[7]: https://fscluster.org/south-sudan-rep/document/seed-system-security-assessment-south

A potential tool to be used in consultation workshops is the causal diagram, which can be used to depict which factors influence what, and whether a change in one factor affects a change in another factor in a similar or opposite way. Attention is given to feedback loops and whether these result in reinforcing, balancing or eroding food and seed system dynamics and their contribution to FNS outcomes.

2.2.2 Exploring the impact of the risk landscape on seed and food systems

This step identifies the main hazards (shocks and stressors), the exposure to hazards and the likelihood of suffering harm (susceptibility).

Exploring the risk landscape includes objective measures on shocks/stressors (i.e., intensity, scope and frequency) and subjective measures (i.e., the perceived effect of shocks/and stressors on seed systems and FNS outcomes).

How to collect data: desk review and expert consultation
Information and data can be collected on the basis of a **desk review** of available national and local data. Data can be collected using any of the following ways:
- literature research;
- documentation available through relevant institutions and fora such as FAO, specialised agencies, and professional bodies for example Food Security Clusters; and
- use of expert knowledge (thematic/geography).

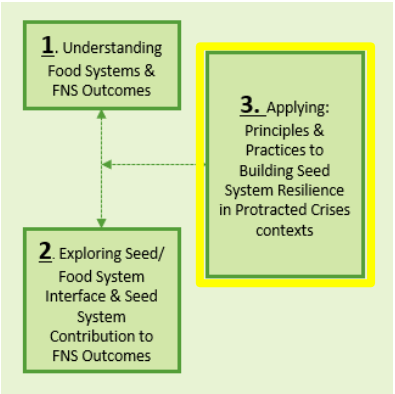
Data sources
Some general sources of relevant information are presented below.
- The South Sudan Seed systems Security Assessment[8]: https://fscluster.org/south-sudan-rep/document/seed-system-security-assessment-south

[7] There is also an e-Learning course on the Seed System Security Assessment (SSSA) consisting of eight interactive modules taking participants through the SSSA process (drawing on field insights from real SSSAs) and then focusing on targeted responses, depending on the key constraints that have been identified. https://learning.elucidat.com/course/5a31128fa4d93-5db85083a74a7

[8] There is also an e-Learning course on the Seed System Security Assessment (SSSA) consisting of eight interactive modules taking participants through the Seed System Security Assessment process (drawing on field insights from real SSSAs) and then focusing on targeted responses, depending on the key constraints identified. https://learning.elucidat.com/course/5a31128fa4d93-5db85083a74a7

3 Component: Building seed system resilience in protracted crises: applying principles & practices

Output: Understanding the challenges and applying principles and practices to building seed system resilience for improved FNS outcomes in protracted crises.



Building seed system resilience in protracted crises requires:

- understanding the characteristics, limitations and constraints of operating in protracted crisis contexts;
- adopting approaches to building resilience for food and nutrition security; and
- applying the principles for promoting integrated seed system development.

3.1 Protracted Crises Situations: Characteristics, Limitations and Constraints

In identifying seed system resilience goals, it is important to consider the constraints on addressing FNS in protracted crises, and the implications of these.

Protracted crises are heterogeneous but are nevertheless defined by several characteristics (Maxwell et al., 2011) which also apply to the case of South Sudan [9]:

- **Protracted crises are defined by both time duration and magnitude.** Many have lasted for 30 years or more and are characterized by extreme levels of food insecurity.
- **Few protracted crises are traceable to a single, acute shock**. Conflict is often one cause, but climatic, environmental, or economic factors may also be causes. Unsustainable livelihoods are both a consequence and cause of protracted crises.
- **Intervention mechanisms are often weak.** Development donors are often not willing to make significant investments in protracted crisis contexts, and private-sector engagement in protracted crises is often lacking or dominated by informal or illegal economic activities that extract wealth but do little to invest in sustainable improvements. Hence, market-led or technology-driven development is extremely difficult to sustain in protracted crises.
- **Protracted crises remain on the humanitarian agenda** in part because of poor food security or nutritional outcomes, and in part because humanitarian agencies are often the only available vehicle for intervention under the prevailing architecture of international assistance.
- Protracted crises often occur in contexts in which **states are incapable or unwilling to provide basic services or infrastructure** or are downright predatory toward the population. In short, protracted crises, and the populations caught in them, fall between standard categories of intervention and are often forgotten.

There are conceptual limitations and institutional constraints to working in protracted crises, limited growth potential from private sector investment, various constraints to public-sector or international programmatic interventions, and no consensus on operating principles or priorities. In general, three types of limitations exist (Maxwell et al, 2011):

[9] Maxwell, D., L. Russo and Luca Alinovi, 2011. Constraints to addressing food insecurity in protracted crises. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3411957/

- **Conceptual limitations**: external interventions are organized on the normative assumption that humanitarian assistance is to save lives in disaster/crises context and that with recovery the trajectory returns to improvement and development.
- **Institutional constraints**: external institutional factors constraining livelihood change in protracted crises include the bifurcation of donor funding (between relief and development).
- **Programming constraints**: several programming constraints limit external interventions. One is the limitation of the dominant programmatic framework; another includes practical elements of programme management; a third is normative (humanitarianism as a principled approach addresses individual needs and development, with a focus on state/government building.)

3.2 Principles and practices for strengthening resilience for FNS in protracted crises

The Rome-based Agencies' *Conceptual Framework for Strengthening Resilience for Food Security and Nutrition in Protracted Crises Contexts*[10] presents key principles and practices to support the resilience of individuals, households and communities. These are:

- **Local and national ownership and leadership**: people, communities and governments must lead resilience-building for improved food security and nutrition.
- **A multi-stakeholder approach**: assisting vulnerable people to build their resilience is beyond the capacity of any single institution.
- **Combining humanitarian relief and development**: planning frameworks should combine immediate relief requirements with long-term development objectives.
- **Focus on the most vulnerable people**: ensuring protection of the most vulnerable people is crucial for sustaining development efforts.
- **Mainstreaming risk-sensitive approaches**: effective risk management requires an explicit focus on the decision making of national governments, as well as enhanced monitoring and analysis.
- **Aiming for sustained impact**: interventions must be evidence-based and focused on results.

3.3 Guiding principles of integrated seed sector development

FAO and WCDI work in close consultation and coordination. WCDI and ISSD-Africa[11] work closely as partners in learning and knowledge development. ISSD Africa is a community of practice facilitating learning about effective seed sector intervention, management and policies in Africa, and providing the structure to co-create, experiment, learn and exchange how to address complex seed sector challenges, with a focus on seed sector innovation in Africa.

ISSD's eight guiding principles of integrated seed sector development are[12]:

1. Foster pluralism and build programmes on diversity of seed systems.
2. Work according to the structure of the seed value chain.
3. Promote entrepreneurship and market orientation.
4. Recognize the relevance of informal seed systems.
5. Facilitate interactions between informal and formal seed systems.
6. Recognize the complementary roles of the public and private sector.
7. Support enabling and evolving policies for a dynamic sector.
8. Promote evidence-based seed sector innovation.

[10] https://docs.wfp.org/api/documents/WFP-0000062320/download/

[11] https://issdafrica.org/

[12] For a short video please visit https://issdafrica.org/guiding-principles/

3.4 South Sudan: building local seed system resilience

3.4.1 Step 1: Define seed system resilience as instrumental capacity

Gain/build key actors'/stakeholders' understanding of seed system resilience as a functional capacity:
- Resilience of what?
- Resilience to what?
- Resilience for whom?
- Resilience 'through what'?

This will provide the basic rationale for guiding the field-based seed system resilience assessment, and clarify for local actors and stakeholders in the SSRA the why and how of the SSRA as the foundation to building resilient seed systems.

How to collect data: desk review and expert consultation
Information and data can be collected on the basis of a d**esk review** of available national and local data and expert **consultations**. Data can be collected using any of the following ways:
- literature research, including policy docs and initiatives on promoting resilience;
- documentation available through relevant institutions and fora such as FAO, specialised agencies, and professional bodies for example food security clusters; and
- use of expert knowledge (thematic/geography).

Data sources
Some general sources of relevant information are presented below.
- FSIN series on promoting FNS resilience[13].

3.4.2 Step 2: Define seed system boundaries: archetypes in protracted crises

In order to make a meaningful contribution to promoting integrated seed sector development in protracted crisis situations, REPRO-South Sudan works in areas that show different food/seed system archetypes, all of which are typical for protracted crisis contexts.

Archetypes represent different patterns of food/seed system behaviour, offering unique leverage points for enabling changes that build more resilient seed systems, thus also improving FNS outcomes.

Seed system archetypes in protracted crisis contexts are characterised, and informed, by a combination of factors; in particular, agro-ecology, conflict and insecurity, and climate change.

Agro-ecology
Agro-ecology informs food/seed systems orientation: agriculture, agri-pastoralism and pastoralism. In South Sudan there are seven main agro-ecological livelihood systems with different rainy seasons, amounts of rainfall and sets of commonly grown crops.

The SSRA will be employed and validated in two different areas in South Sudan, Torit and Yambio, that are characterised by two main livelihood zones, the Equatorial maize and cassava zone and the highland forest and sorghum zone, as Figure 4 illustrates.

[13] https://www.fsinplatform.org/resilience-measurement

: Torit (SS01 and SS03) and Yambio (SS01):

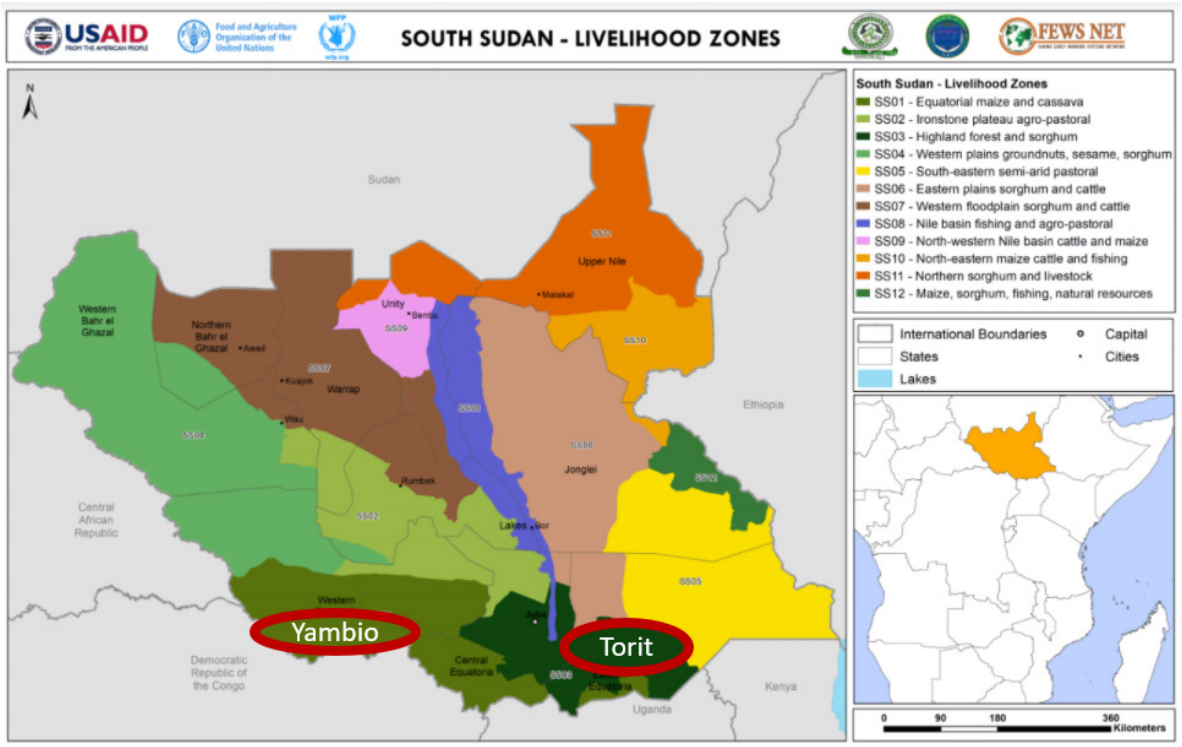


Figure 4 *South Sudan's livelihood zones, highlighting Torit and Yambio (adapted from: FEWS NET, 2018).*

These two livelihood zones can be characterised as follows:

- **Equatorial maize and cassava zone (SS01):** This zone is characterized by equatorial rain forest, concentrated particularly on the Uganda, Democratic Republic of Congo (DRC) and Central African Republic (CAR) borders. This is the only part of South Sudan with a typical bimodal rainfall pattern and two reliable seasons. Precipitation is about 1 100 mm to 1 500 mm per annum in both rainy seasons. The first rains normally commence around March, with a break in late June, and restart a second time in July through November. *Major crops include maize, beans, sorghum, groundnut, cassava and sweet potato.*
- **Highland forest and sorghum zone (SS03):** This zone cuts across CES and Eastern Equatoria State (EES) but is located along the mountain ranges of the Greater Equatorial region and the border with Ethiopia and Uganda. Its topography is characterized by highlands and foothills with a mixture of forest, bush shrubs and grasslands. The zone has a unimodal rainfall pattern with average precipitation of about 1 100 mm to 1 300 mm per annum. There are two distinct seasons; a rainy season from April to November and a short dry season from December to March. The *main crops are sorghum and maize,* with the latter growing mainly in the eastern parts of the zone. Other crops cultivated in this zone include *millet, sesame, cowpeas/green grams, sweet potatoes, cassava and groundnut.*

Conflict and instability

Conflict and instability interrupt food production, deplete food stocks and seed reserves, disrupt markets, deepen hunger and exacerbate malnutrition, contributing to the displacement of people (SOFI, 2018).

Conflict and food insecurity are interlinked, with conflict contributing to food insecurity, and food insecurity often being a cause for conflict.

For Yambio and in particular Torit the following crisis typologies are relevant:

- Hubs of stability/islands of peace: areas characterised by relative calm and stability in particular major towns and centres under government control – such areas are often characterised by the presence of established NGOs and the private sector.

- Areas of instability: areas characterised by recurrent (armed) conflict and instability – such areas are often 'outlying' rural areas, with the presence of local NGOs.
- Areas characterised by armed conflict: areas characterised by (repeated) armed conflict and displacement within borders (internally displaced persons and host communities) and across international borders (refugee camps and return dynamics).

Climate change
Climate change is known to have considerable impact on food/seed systems, particularly in Torit. The assessment will include areas affected by climate change.

Seed system grouping indicators
For each of the archetypes, agro-ecology, conflict and climate change grouping indicators will be defined, based on consultation with local stakeholders.

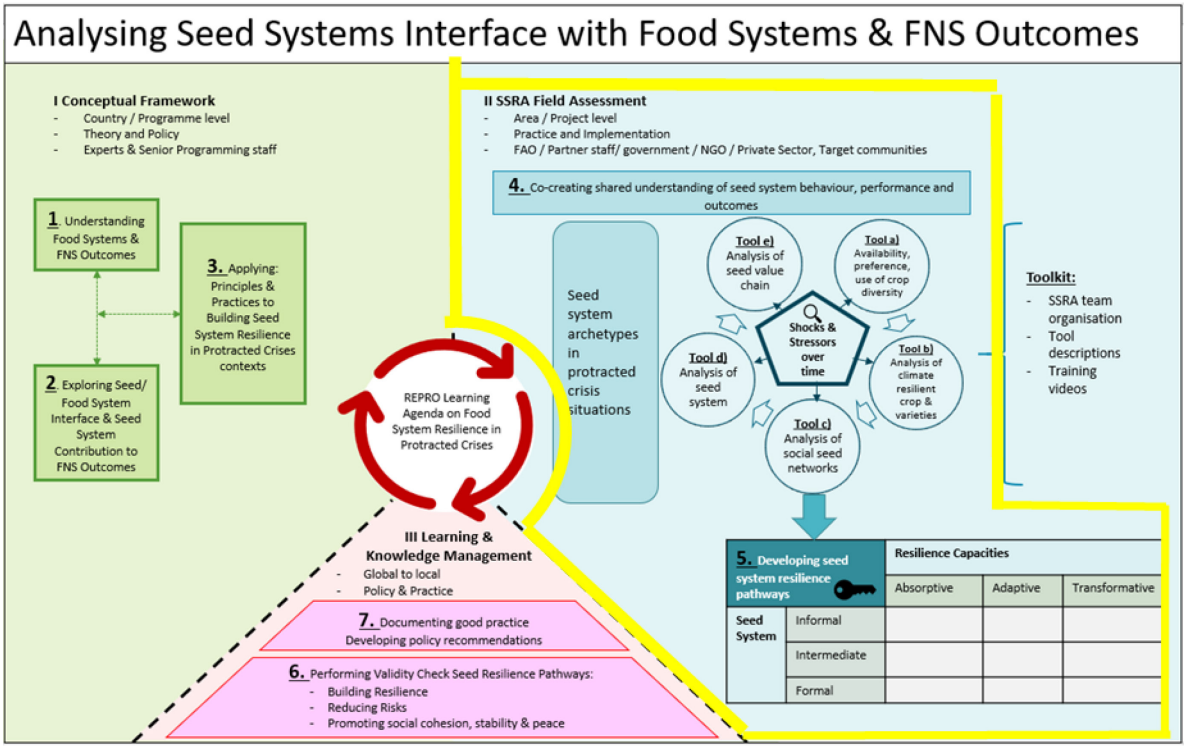
Grouping indicators are, for example, the specific location of a target population (a cluster of villages) or the type of livelihood that affects both the probability of being exposed to a shock and/or stressor, and the capacities of that target population to absorb, adapt, or transform in the face of shocks and/or stressors.

The grouping indicators should be defined in such a way that they represent the seed system archetypes, in order to develop appropriate seed system pathways.

How to collect data: desk review and expert consultation
Information and data can be collected on the basis of a d**esk review** of available national and local data and expert **consultations**. Data can be collected using any of the following ways:
- literature research including policy documents and initiatives on promoting resilience;
- documentation available through relevant institutions and fora such as FAO, specialised agencies, and professional bodies, for example food security clusters; and
- use of expert knowledge (thematic/geographical).

Data sources
Some general sources of relevant information (to be accessed geographically disaggregated) are presented below:
- FNS South Sudan country profile and description: https://www.fsinplatform.org/global-report-food-crises-2020;
- IPC country updates: http://www.ipcinfo.org/ipcinfo-website/where-what/east-and-central-africa/south-sudan/en/, and
- Agro-ecology of South Sudan: https://fews.net/east-africa/south-sudan/livelihood-description/november-2018

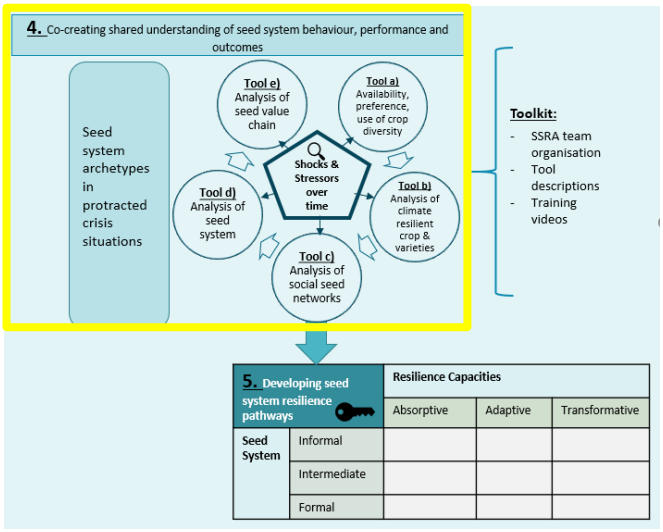
PART II – SEED SYSTEM RESILIENCE ASSESSMENT



Part II explains the field-based elements of the SSRA assessment, looking at the definition of seed system boundaries and archetypes, and explaining the relevance of comprehending system behaviour and dynamics in the face of shocks and stressors. The concept of resilience is clarified and the interactive tools to gather this data are integrated and can be explored. Finally, the seed system resilience pathway matrix is introduced which supports the sense-making process of all gathered information from the field.

4 Component: Understanding Seed Systems' Behaviour, Performance and Outcomes

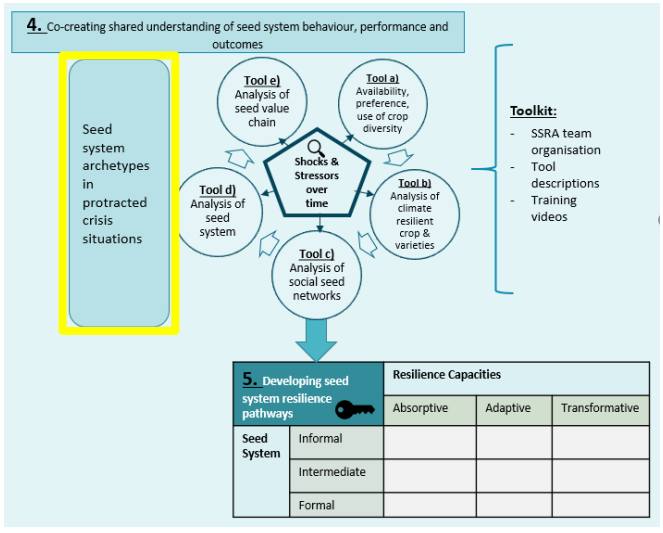
Output: Co-creating a shared understanding of local seed systems, their behaviour in the face of shocks and stressors and resulting outcomes.



4.1 Define seed system resilience as instrumental capacity

Validate the findings and insights from the national level (see component 3).

4.2 Set seed system boundaries: archetypes in protracted crises

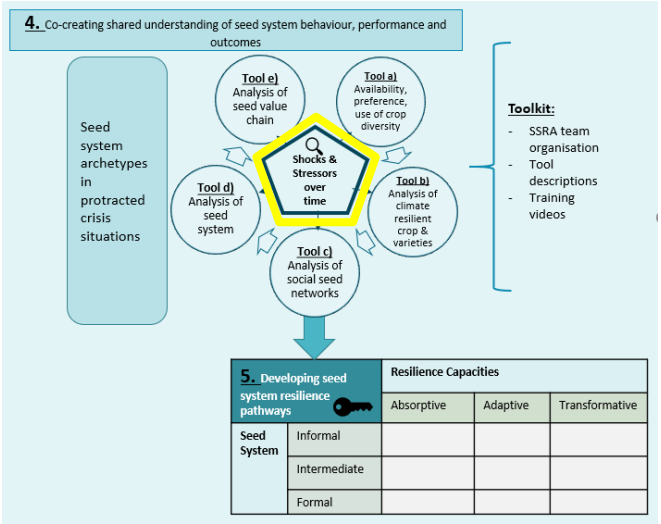


Develop with local actors and stakeholders the geographical boundaries of the main seed system archetypes in the locality. In the case of South Sudan, the main seed system boundary is typically around the main state centre and surrounding areas (often referred to as a hub of stability); this archetype is hereafter referred to as the main seed system.

When it comes to conflict, instability, displacement and return, two subsidiary seed systems are typically identified. The boundaries of the first are around in-country areas having a high number of IDPs; those of the second, around cross-border areas with refugee and returnee dynamics.

In the case of South Sudan, another subsidiary seed system is in areas seeing a serious impact of climate change.

4.3 Document major shocks and stressors impacting seed systems



It is important to establish what the major shocks and stressors are in a particular area and how they have, in general, impacted seed system developments.

Particular attention should be given to typical shocks/drivers impacting seed systems, driving poor FNS outcomes in protracted crisis contexts; conflict/insecurity, economic shocks, and climate shocks.

Major shocks and stressors impacting food/seed systems will be identified by local stakeholders and target communities, focusing on their impact on seed systems and how these seed systems have changed as a result.

In FGD the most important shocks and stressors over the last 10-15 years should be identified and the impact on seed systems discussed.

Typical questions to be asked include:
- What are the most important shocks or stressors that impact on seed systems?
- What has changed as a result of that shock/stressor (separate for each shock/stressor on seed systems, and why?
- What have been the implications of these changes in dealing with future shocks and stressors?
- What resilience capacities in seed systems have been instrumental for recovery of these systems for maintaining or improving FNS outcomes?

With regard to conflict and displacement it is important to mention that these often result in changes in land use. For example, conflict-affected communities may no longer grow maize on brown forest soils a two to three hour walk away from their village; rather, they start producing this on the banks of streams and rivers prone to flooding. Another example is that of displaced communities opening up new land close to their dwelling places.

So, an important question may be:
- Have shocks and stressors resulted in different land use patterns?
- And if so, have farmers had access to appropriate seeds that match soil/land types?

4.4 Identify resilience capacities and dynamics in seed systems

From an analytical perspective, resilience in seed systems focuses attention on the relationship between seed systems (in particular their ability to avail good quality and appropriate seeds in a timely manner at affordable costs), the impact of shocks and stressors, and the seed systems' capacity to preserve and improve on FNS outcomes.

Building seed system resilience involves strengthening its absorptive, adaptive and transformative capacities, to cope with and recover from specific shocks and stressors. Understanding how different types of shocks and stressors affect local seed systems (formal, intermediary and informal) is fundamental to designing interventions that strengthen seed system resilience.

The SSRA adopts the 3-D resilience framework (Béné et al., 2012) to promote seed system resilience capacities in the form of context-specific seed system pathways that strengthen absorptive, adaptive and/or transformational capacities as required for the local context and set of circumstances.

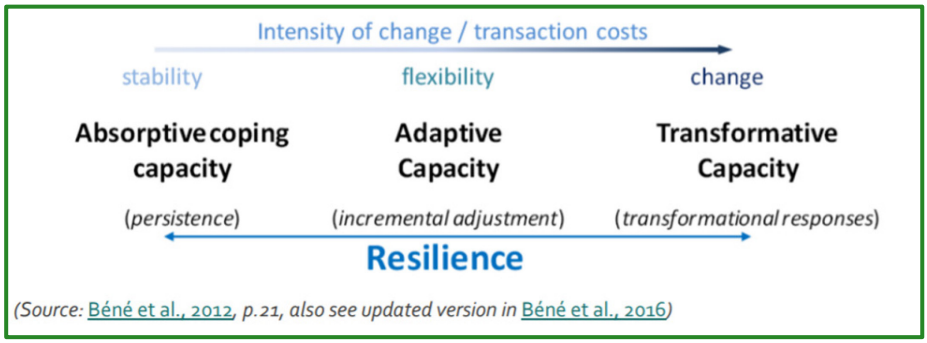


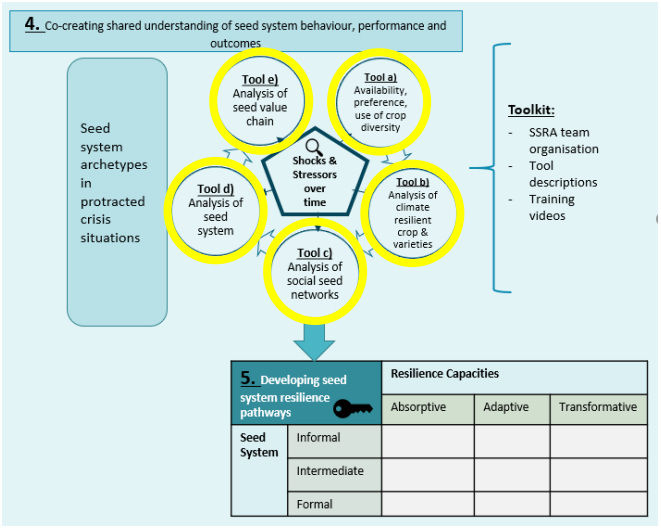
Figure 5 *The 3D resilience framework (FAO, 2015).*

How to collect data

- use of expert knowledge (thematic/geography); and
- interactive/participatory work with local stakeholders and community groups (KII, FGDs).

4.5 Analysing seed systems

To analyse seed systems in protracted crisis contexts five tools have been developed. These analytical tools will identify and analyse data at household and local community level.



The tools map out and facilitate understanding of specific local systems; how protracted crises affect them; and what actions are being taken, or could be taken, to improve resilience. They involve facilitators working with local farmers and/or stakeholders with surveys and workshops to analyse the following:

- Which crops are available and which are preferred (tool a);
- Which best withstand climate change (tool b);
- Farmers' social networks and their dynamics (tool c);
- The sourcing of seeds (tool d); and
- The processes by which seed is produced, distributed and used (tool e).

The tools are further explored in the following section and the tool kit is provided in the Appendix.

4.6 Exploring the Seed System Field Assessment Tools

This component provides an in-depth explanation of the different steps and the recommended tools to undertake the SSRA.

The tools are organized along the above-mentioned five steps that in combination analyse local and regional seed systems and give insights for designing appropriate and effective context specific interventions to strengthen seed system resilience:

- Tool a: Analysis of availability, preference and use of crop diversity;
- Tool b: Analysis of climate resilient crops and varieties;
- Tool c: Analysis of the social seed network;
- Tool d: Analysis of seed systems; and
- Tool e: Analysis of the seed value chain.

Each step results in a report, produced by the facilitators, that synthesises the information gained from all the workshops and outlines possible actions. This is a strong basis for the next component of the assessment; developing pathways that enable farmers in protracted crises to increase resilience in seed systems, thus underpinning food system performance and improved FNS outcomes.

4.6.1 Tool a: Analysis of availability, preference and use of crop diversity

Farmers' preferences and choices are driven by diverse needs and specific conditions. During protracted crises, specific crops/varieties help to deal with shocks and stressors; but at these times crop diversity and availability is severely affected, and can be lost altogether.

The analysis consists of three specific but integrated tools, which trained facilitators use in workshops with mixed groups of 15-20 farmers from three to four study areas, using focus group discussions (FGDs). The study areas, and farmers, are carefully chosen for their diversity, in order to learn and understand how all categories of farmers in different areas experience crop and variety availability and use crop diversity, and to learn and understand their preferences. The workshops develop the following: a historical timeline, a diversity wheel and a crop and variety preference ranking.

Sub-Tool a.1: Historical timeline
This visual timeline, developed by groups that also include senior farmers, shows when specific shocks and stressors occurred, and what impact these had on livelihoods, crop diversity and seed systems.

Sub-Tool a.2: Diversity wheel to map the availability and use of crop diversity
This maps out on flip charts the specific crop diversities that are currently being used; the effects of crises and humanitarian interventions on availability and use of crop diversity; crops, varieties and seed systems that are important to the group in dealing with future/expected shocks and stressors; and recommendations for an intervention plan.

Sub-Tool a.3: Crop and variety preference ranking
Using male-only and female-only focus discussion groups, this maps out preferences for specific crop traits, crops and varieties. This information is particularly useful for designing seed system intervention pathways that target according to gender.

The information from all three tools is synthesised into an overall report by the facilitators, which includes ways that have been identified to increase resilience in seed systems.

A further explanation of tool a. and a detailed facilitation guide can be reviewed here. **(click here to be taken to the respective toolkit section)**

4.6.2 Tool b: Analysis of climate resilient crops and varieties

Seed systems that offer choices for growing climate resilient crops are a priority in building agricultural resilience; it is an effective strategy for adapting to climate change, as it enables farmers to make

choices of crops that are best suited to changing circumstances. This is particularly important in protracted crisis situations, when conflict and instability interact with climate hazards to severely impact seed/food systems and people's livelihoods.

This analysis contributes to a better understanding of how local communities perceive the impact of climate change; how climate change is affecting seed systems and livelihoods; adaptation mechanisms; and the effect of the interaction of conflict and instability with climate change.

Sub-tool b.1: Crops perceived as climate resilient
This tool is used, as with step 1, in workshops with carefully chosen mixed groups of 15-20 farmers from three to four study areas, using focus group discussions (FGDs). At least two facilitators are needed, and NGO staff or local extension staff with whom the communities are familiar must be present; they will introduce the topic and objectives, and facilitate quick rapport with the farming communities.

The analysis is carried out in several steps, which identify the following; the key drivers of climate change; areas and communities affected by climate hazards, especially those also affected by conflict and instability; crops most affected by climate hazards, and by the interaction of conflict and instability with climate hazards; the impact of climate change, especially when it interacts with conflict and instability; crops and varieties perceived as resilient to climate change; and community based measures to develop resilient seed systems pathways.

The information from the workshops is synthesised into an overall report by the facilitators, which includes ways that have been identified to increase resilience in seed systems.

A further explanation of tool b. and a detailed facilitation guide can be reviewed here. **(click here to be taken to the respective toolkit section)**

4.6.3 Tool c: Analysis of the social seed network

The social seed network is the dynamics of the flow of crops, seeds, varieties and information between farmers, other groups competing for natural resources, and organisations linked with farmers. It is one of the main systems by which seed and related information flows among farmers; most depend mainly on seed that they have saved, but they also get seeds from neighbours, relatives and marketplaces.

The continuity of this network builds trust, social cohesion and reciprocity. In protracted crises, vitally, the network often extends into IDP/returnee/refugee areas. However, at these times farmers often receive seed for free or with vouchers from humanitarian organisations. This provides immediate relief, but if it occurs long-term, it creates dependency and weakens the social seed network.

This analysis contributes to a better understanding of the following: the types of network that exist in specific areas/farming communities; the key farmers that help in building and connecting these networks; how networks vary with different categories of farmer (male, female, refugees, and so on); degrees of connection and isolation, and the reasons for this; and how the networks are affected during protracted crises.

Sub-tool c.1: Analysing the social seed network
This is carried out through a number of consecutive activities by a multidisciplinary team experienced in social studies and crop agronomy. It involves the following:

- Selecting a pair of study sites where seed system interventions are being planned, one in a hub of stability and the other in an IDP/refugee/returnee community.
- Selecting one to three strategic crops for each study site, and developing a short questionnaire for each about why specific variety was chosen, how it was sourced, and to whom it was given.
- Using the snowball sampling method to conduct a survey among local farmers. This method involves using three sets of participants, carefully choosing the first set to ensure a representative diversity of old and young, male and female farmers from different areas, climates, and farming categories.

Their survey responses, about who receives their seed, are used to select the next set of participants).
- Using computer software to analyse the information from the survey, focusing on seed/variety flows, mechanisms, social relationships, network types, and factors affecting network stability.
- Organising a local workshop/FGD for each site for farmers selected from the survey results to deepen understanding of key factors; why some farmer networks are isolated and fragmented or complex and connected; why some farmers are highly motivated and play key roles; what lessons we can learn from them; and which factors contribute to seed system resilience or vulnerability.

A final report is written by the team, with a synthesis of all the information gained and outlines of possible actions. This report provides a strong basis for developing pathways of building seed system resilience in protracted crisis contexts, because the steps outlined above, altogether yield information on the following; an understanding of the social cohesion, relationships, and reciprocities of farming communities; key farmers, who play an important role in the development of seed systems of specific areas/communities (extending into IDP, refugee and returnee communities and interlinking with hosting communities); practical and sustainable guidance on where to establish new variety demonstration plots and community seed banks; how to select farmers for seed quality management/professional seed production; and other actions suggested to improve resilience in seed systems.

A further explanation of tool c. and a detailed facilitation guide can be reviewed here. **(click here to be taken to the respective toolkit section)**

4.6.4 Tool d: Analysis of seed systems

Individual farmers use different systems for different crops, according to their environment and needs; and each system involves a diversity of stakeholders at all levels, who can play different roles in different systems. This means a complex reality of informal, intermediary and formal seed systems, even at the household level, which need to be approached in a pluralistic manner.

This is particularly the case during protracted crises, when previous sources of seed may be eroded, collapsed or no longer exist. For instance, formal government systems may have been integrated into humanitarian aid. No single intervention (whether public, private, community or NGO based), can provide sufficient support to achieve seed security (whether at the community, regional, or national level).

The analysis contributes to identifying and better understanding the following:
- local seed systems that are an important consideration in the national food system;
- the unique role, key issues and challenges of each seed system;
- the characteristics of seed system behaviours, and how they develop, adapt and recover in the face of recurrent shocks and stressors and in protracted crisis contexts; and
- strategic actions that can solve issues and improve resilience.

Tool d.1: Mapping farmers' major seed sources (seed systems)
This analysis is carried out through FGD workshops at a village level, with mixed groups of 15-20 local farmers, and workshops at a regional level, with groups of key seed sector stakeholders. Both workshops map out and characterising the seed systems that they use; identify challenges that the systems face; and identify opportunities for improving resilience in seed systems. A final report by the study team synthesises the results of the two previous steps and provides specific recommendations for intervention pathways.

A further explanation of tool d. and a detailed facilitation guide can be reviewed here. **(click here to be taken to the respective toolkit section)**

4.6.5 Tool e: Analysis of the seed value chain

A seed value chain is the process of activities from management of genetic resources to marketing/dissemination of specific varieties; monetary, social, and/or resilience value is added at

each point. Analysis identifies and maps stakeholders (operators who own the seed and service providers supporting the operators); the enabling environment (regulations and other contexts such as agricultural extension services); shocks and stressors; and ways to improve resilience.

Analysis at state level is particularly important because in protracted crises the seed value chain can play a vital role by extending into IDP communities and refugee hosting areas, but can also be severely affected. For instance, farmers can come under a lot of pressure from free seed distribution and agency-preferred seed, and services can disappear altogether.

Tool e.1: Seed value chains at state level
This analysis is facilitated by a team that includes a social economist with knowledge of the seed sector. It is carried out in several steps in a half day workshop, with stakeholders carefully chosen from the full range of the chain, including representatives from IDP/refugee/returnee populations. It does the following:

- characterizes the different seed systems;
- identifies key indicator crops for each system (those that are strategic and resilient in protracted crisis contexts);
- develops a seed value chain map for each crop within the specific seed system; and
- outlines challenges and possible actions for development and building resilience.

An overall report by the facilitators includes ways that have been identified to increase resilience in seed value chains.

A further explanation of tool e. and a detailed facilitation guide can be reviewed here. **(click here to be taken to the respective toolkit section)**

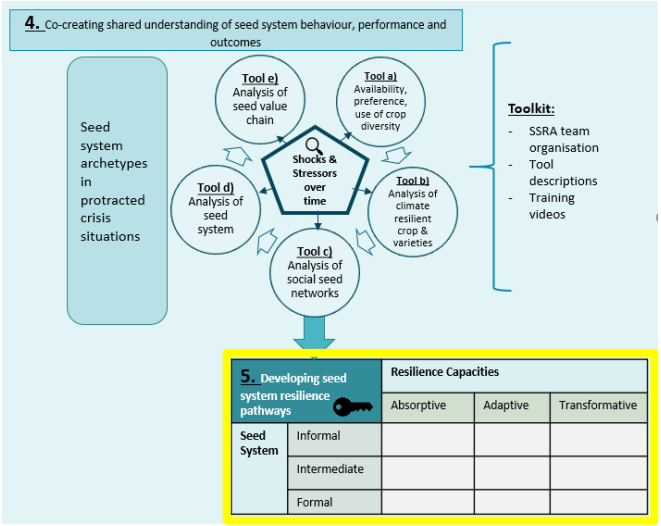
4.6.6 Conclusion

Together, the five steps and tools therein described above provide a thorough and effective method of analysing seed systems at a local and state level, and form a robust basis for developing intervention pathways that will contribute to seed system resilience.

Moreover, the analysis itself increases resilience as local farmers and other stakeholders by taking part in a process to co-create understanding of seed systems and seed system behaviour create a foundation to implementing commonly agreed upon seed system pathways.

5 Component: Develop local seed system resilience pathways

Output: Development of local seed system pathways, that address critical gaps in seed system resilience and engage relevant actors.



This final step is the matchmaking process whereby policy goals, leverage points, spheres of influence, and policy instruments are brought together to inform seed system resilience pathways that are relevant to local contexts and dynamics.

Seed system pathways are formulated based on the most promising leverage points that are within, or in reach of, policy goals as well as the spheres of influence of the policy maker, implementor and local communities.

Prioritisation can be done based on a qualitative assessment of costs versus expected systemic change, increased seed system resilience capacities, and projected FNS outcomes (based on scenario planning).

5.1 Identify leverage points

Once key challenges in seed systems have been defined, leverage points are identified to strengthen the resilience of seed systems. A leverage point is a place/characteristic in a system where a small shift in one factor or process can contribute significantly to building seed system resilience.

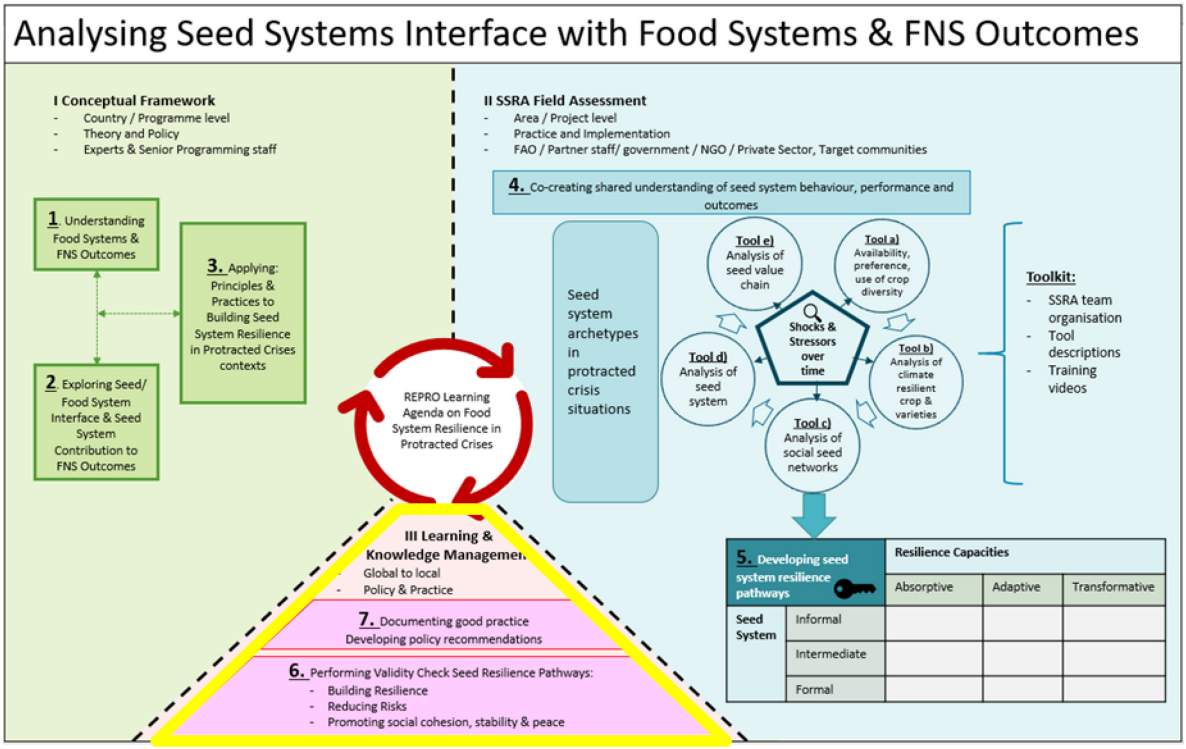
How to collect data
- Deskwork; and
- interactive/participatory work with local stakeholders and community groups (KII, FGDs).

5.2 Define spheres of influence

Understanding the seed systems, seed systems dynamics and resilience capacities is not sufficient to define actions. Understanding the dynamics of power and influence of actors is equally required for developing effective pathways to strengthening seed system resilience.
Understanding the stakeholders' arena, and identifying those that an activate leverage points, is a key element in the design of effective seed systems pathways.

How to collect data
- deskwork; and
- interactive/participatory work with local stakeholders and community groups (KII, FGDs).

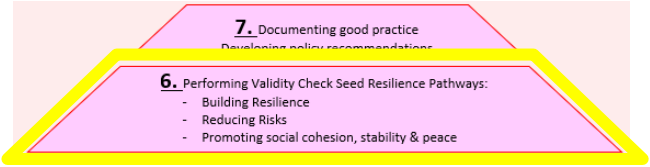
PART III – LEARNING & KNOWLEDGE MANAGEMENT



Part III now presents how all levels can be combined in a final validation, learning and knowledge management step. Hereby, the validation through resilience principles and nexus thinking is introduced, followed by an explanation that looks at policy and practice, aiming to document good practices and to provide policy recommendations. It is explained, how the result of the assessment has multiple values: it can support learning at a global level, for example through the Global Network Against Food Criss or its connection to UNSCR-2417, while simultaneously informing the local programming in the target area in an evidence-based, adaptive manner.

6 Component: Validate seed system resilience pathways

Output: Validate seed system pathways to ensure that they contribute to sustainable and resilient FNS outcomes.



6.1 Criteria for resilience in seed systems

A proposed seed system pathway must meet a number of criteria, based on research and experience, in order to be resilient. According to Subedi and Vernooy (2019), a resilient seed system:

- relies on the ability of seed system actors to absorb disturbances, regroup or reorganize, and adapt to shocks and stressors;
- results from multiple seed and knowledge interactions and continuous learning among seed system actors and related institutions;
- is demand driven and responsive to differentiated needs and interests, supporting all users and farming systems; and
- recognizes, respects and supports the key roles played by women farmers as seed custodians, managers, networkers and entrepreneurs.

6.2 Criteria for reduced vulnerability in seed systems

The following criteria will be applied (Subedi and Vernooy, 2019):

- ensuring access to seeds in terms of preference, affordable price and availability when needed;
- ensuring availability in terms of production and distribution;
- guaranteeing seed quality in terms of adaptability, safety and longevity;
- guaranteeing seed choice and diversity;
- producing crops which underpin a healthy diet; and
- recognizing and respecting seed as social and spiritual capital.

6.3 Seed systems' contribution to social cohesion, peace and stability

Farmers' seed systems are essential for the management and conservation of agricultural biodiversity. This diversity contributes to the socio-ecological resilience of global and local food and agriculture systems, and plays an important part in the livelihoods of rural communities.

Developing local seed system pathways in fragile and conflict affected contexts requires strengthening the role of farmers' seed systems in sustaining peace (FAO, 2018)[14]. In practice this means a focus on social cohesion as a pathway to positive local collective action, for example through providing equitable access to diverse quality seed.

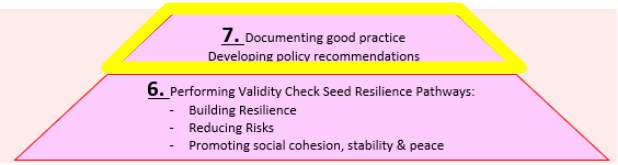
[14] http://www.fao.org/3/ca1793en/CA1793EN.pdf

In promoting the contribution of seed systems to peace and stability, FAO (2018) recommends the following:

- Invest in better understanding of the local context and sequence interventions, such as designing peacebuilding and agricultural development strategies in a complementary manner; that is, beyond conflict sensitivity, into active analysis and collaboration.
- The focus should be on locally owned action rather than external actors. Peacebuilding in this context involves the restoration of a network of relationships or new arrangements for inclusive and participatory governance.
- Set examples that demonstrate a shift in approach; that is, away from focusing on risks, to one highlighting opportunities.

7 Component: Policy and Practice

Output: Capturing of good practice, formulation of policy recommendations for all suitable levels and insights for adaptive REPRO programming.



This step brings together the insights of the assessment, the local level actions and the global.

Policy recommendations can cover all suitable levels, from regional / national governments to the Global Network Against Food Crises.

The same applies for documenting good practices, contributing to the creation of an evidence-base of approaches that worked in specific protracted crisis contexts (such as South Sudan) for specific target systems (such a the seed system) and their interface with the overall local food system. Good practices can relate to food system resilience in general, or to specific systems such as good practices of seed systems and its interface with food system resilience.

Questions that can help in this step are:

- What were the most insightful learnings of the assessment/ action?
- How should these learnings be documented to create a reliable evidence base for future programmes and governance decisions?
- Are policies and practices logically aligned or support each other?
- Are there gaols between policy and desirable practice?
- How can policies adapted to reinforce good practices?
- How can these insights be useful in other contexts in the region or even globally?

Insights can further be used to inform the design and strategy of programmes that aim to build resilient seed and food systems.

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APPENDICES

A1 Building local capacity for undertaking the SSRA

Prior to Covid-19, the idea was for a small team of WCDI and ISSD programme team to train around 20 SSRA facilitators in South Sudan coming from different organisations (including FAO, MoA staff, NGOs, private sector and educational and research institutions) and professions (such as seed experts, plant breeders, agronomists, and NGO FNS programme staff).

Due to travel restrictions because of Covid-19, it was decided that WCDI and ISSD programme team would develop a training package to train a small team of around 7 people to undertake SSRA in Torit and Yambio in September 2020. Towards this aim, training and instruction materials were developed and provided online with guidance on how to implement the SSRA.

Data collected will be shared with WCDI, ISSD programme and FAO to be jointly analysed and reported.

A2 Toolbox

SSRA Tool a: Analysis of Crop Diversity Availability and Preference

WHY analyse crop diversity availability and preference?

Farmers' access to a broad portfolio of crop diversity with enhanced availability of quality seed, contributes to building household seed security and resilience. Crop diversity choices, preferences and selections are driven by the diverse needs and specific conditions of farming households, such as food, nutrition, income, livestock, suitability of the soil, the local climate, and the production environment. In the context of a protracted crisis, crop diversity choices may include considerations of strategic food crops to cope with hardship. Crop diversity choices, preferences and variety selection further vary between male and female farmers.

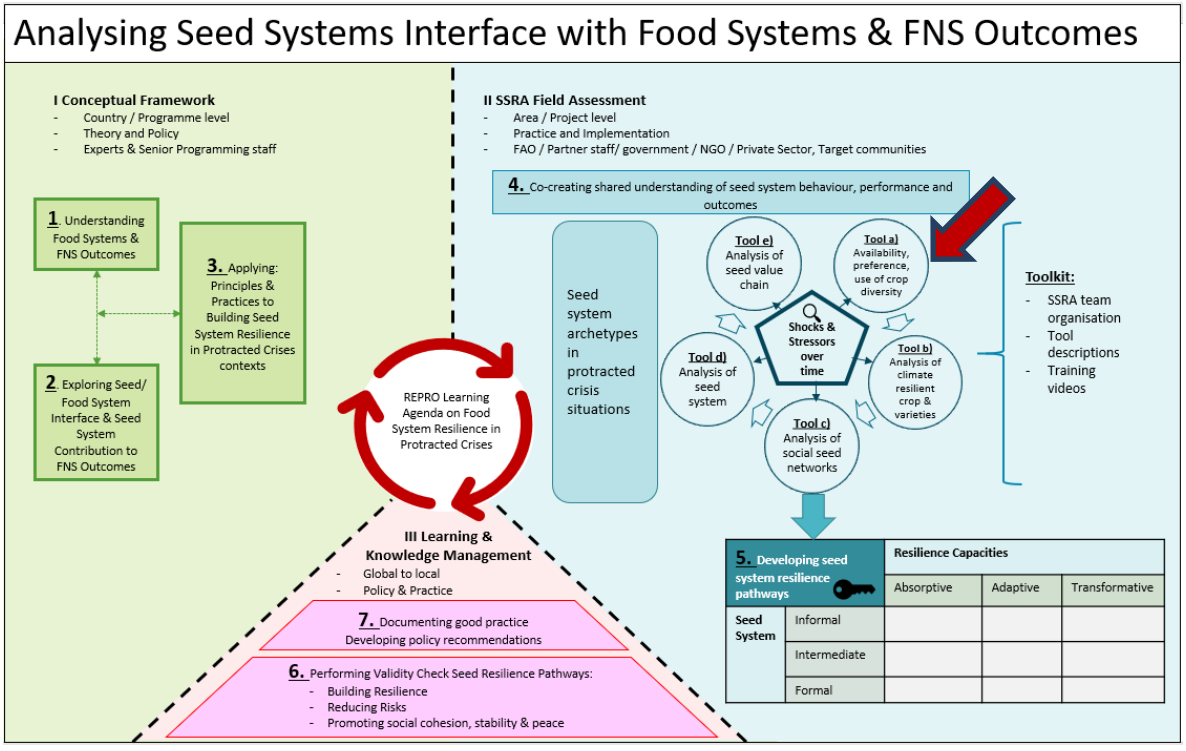

Figure 1 *Showing the position of the crop diversity and preference analysis tool in the context of the SSRA framework.*

To meet these diverse demands, farmers need a portfolio of crops and varieties and diverse seed systems that caters to their needs and improves risk management strategies for dealing with shocks and stressors. Crop diversity may include local, improved and exotic varieties. Seed sourcing may include seed saving by farmers and neighbours, free seed, community seed production and purchase in the market.

During times of food crisis - for example, conflict, war, displacement and return, and climate change - crop diversity, seed systems and stakeholder support mechanisms are severely affected. In protracted crises, crop diversity and associated seed systems are eroded, marginalized or lost altogether. This has a significant impact on farmers' livelihoods and food security at household and community level.

In this context, this SSRA tool will enable research and development practitioners to improve their understanding of the following critical seed system elements/factors:

- how crop diversity has changed over time, with a historical timeline showing how this crop diversity has been affected by war, conflict and climate change;
- how undocumented variety/seed introduction by humanitarian actors has contributed to (potential) loss of plant genetic resources and gene erosion;
- the crop diversity currently available and how useful it is to farming communities; and,
- which crop diversities are important to specific farming communities (host communities, refugees and the internally displaced, returnees; male/female, elderly and youth.

This analysis of crop diversity availability and preference will also provide critical insights for designing types of seed systems interventions:

- which portfolio of crop diversity, and which diversity of seed systems, optimizes seed choices for improved risk management and FNS outcomes;
- how to promote this;
- which (new) crop diversities have potential for solving specific challenges; and
- what specific roles seed sector stakeholders can play.

In summary, this tool will provide a strong basis for developing the pathways to building seed systems resilience by maintaining and promoting preferred crop diversity and seed systems of choice.

How should an analysis of crop diversity availability and preferences be conducted?

General guidance

The analysis consists of three specific but integrated tools: a historical timeline; a diversity wheel; and a preference ranking of crops and varieties. This is always done with key informants in a focus group discussion (FGD) setting. Participants of FGD are farmers from the study areas which may include old and young, males and females, refugees, hosts of internally displaced/refugees, and returnees. The historical timeline work must include senior age farmers; the diversity wheel is done in mixed groups; preference ranking is done with female and male farmers separately.

Depending upon the study/project area of choice, farming population size, agro-ecology, conflict context and climate change impact, this exercise can be done in three to four villages in order to understand the existing situation sufficiently. Depending upon the situation and the availability of resources, these three activities can be done during one full day of meeting, or over three separate meetings on different occasions, focusing on one specific activity each time. It is important to note that all the three activities should be done in each village/community.

At least two facilitators are needed to do the analysis. One of them should be a female facilitator. NGO or local extension staff who are familiar with the communities must be present during the analysis. They will introduce the topic and the objectives; this will help to develop a quick rapport with farming communities.

A] Historical timeline

Estimated time: 1.5 hours

Focus group discussion participants: Approximately 20 farmers: they should be a mixed group of older and younger, male and female farmers.

Required kit: Flip charts, marker pens (different colours), notebooks, mobile phones to take photos of steps or outputs.

Objective: To understand up to 30 years of historical events, focusing on key hazards, shocks and stressors that have affected the livelihood, crop diversity and seed systems of the local farming communities.

Step 1: Draw a timeline matrix

Draw an outline of the table/matrix on a flip chart, with headings as in Table 1. Make sure that the chart is visible to all the participants. Explain clearly what each heading means, asking participants to give examples, and explain how the matrix will be filled out. Explain that you will start with a first draft, using just a black marker pen, but that at the end coloured pens can be used to show what people want to focus on with the final output.

Step 2: Facilitate discussion and fill out the matrix

This step deepens discussion, and records the historical context of the community, by using the following guiding questions and filling in the matrix according to the discussion outcomes.

- In which specific years, what specific hazards/shocks/stressors occurred in the community?
- How did these impact the livelihoods of those in the community?
- How did they impact crop diversity and seed systems?

Table 3 shows examples of what might be put into the matrix.

Table 1 *Historical timeline documenting the major hazards affecting livelihoods, crop diversity and seed systems.*

Year (from now up to 30 years ago)	Major hazards (shocks, stressors) in the community	Major impact on livelihoods	Major impact on crops diversity and seed systems
Year 1990 Year 2000	Examples: drought, floods, war, conflict, extreme heat, disease/pest attack	Examples: increase of famine; forced to abandon the village; forced to abandon the country as refugees; loss of cattle; loss of household assets and income	Examples: loss of specific crops and varieties (give list of crops and varieties); reduced crop yield; increased dependency on others for seed; started to receive free seed from NGOs; introduction of new crops and varieties (give list of crop and variety names)

Step 3: Develop a synthesis of the discussion

There are two options for developing a synthesis of the discussion. It can be done by the group as a development of the first draft matrix. Once the first draft is finished, and everyone has been given a chance to respond, make a final draft of the matrix, using coloured pens to show the most important hazards and impacts. Discussion of how to summarize the matrix will help participants to fully process the information and to remember the analysis afterwards.

Alternatively, if it is done by the facilitators, bringing together discussions from the different villages, they summarize Table 3 outputs from the different villages in the format of a report.

B] Diversity Wheel

Estimated time: 3 hours

Focus group discussion participants: Approximately 20 farmers: a mixed group of male and female, older and younger farmers.

Required kit: Flip charts, marker pens (different colours), notebooks. If possible, ask farmers to bring seed samples of the different crops. This will help to make the discussion livelier. Use a mobile phone to take photos of step outputs.

Objectives:

- To inventory and understand the dynamics of crop diversity that are being currently or in the past used by the farming communities.
- To understand how crises (conflict, climate and other various factors) have affected crop diversity availability.
- To understand how humanitarian efforts have affected crop diversity availability (including the most significant changes through collecting representative stories of change).
- To identify a portfolio of crops, varieties and seed systems, that are important to the farmers, and that can also inform the development of a seed system intervention plan.

Step 1: Inventory of crop diversity

Make a list of the crops being grown in specific communities that are being used for their livelihoods. List the crop names on a flip chart, as shown in Table 2. Make sure that this is visible to all participants. Make crop groupings as field crops, pulses, oil seed crops, vegetables, fruits and so on, according to their local situation (Table 2).

Table 2 *List of crops being used for livelihoods.*

Field crops	Pulses and beans	Oil seed crops	Vegetables	Fruits	Fodder	Strategic crops in times of crisis	Others (wild food crops, ...)

Step 2: Mapping the crop diversity

Draw a diversity wheel circle on the ground or on flip charts as shown in Figure 2.

Figure 2 *Diversity wheel*

Explain to the participants that making a diversity wheel gives a visual understanding of crop diversity and helps participants to see how crop diversity works in their community.

First, explain clearly what each cell describes and how mapping will be done. Use Table 3 guidelines to describe the different cells of the diversity wheel. In all cases, communities understand what is mean by large area or small area based on their experiences of the specific crop grown in their locality.

After this, start with the *large area and many households* mapping first. Ask the farmers to select the crops from the inventory list (Step 1) that fit in this cell. If farmers have seed samples, ask them to put the seeds on that specific cell. Follow the same process for the next three cell areas. At the end ask the names of the lost crops, which goes in the centre of the diversity wheel.

Table 3 *Mapping the crop diversity in the diversity wheel.*

Many households and large areas	Many households and small areas	Few households and large areas	Few households and small areas	Lost crops

Step 3: Identification of crop diversity, challenges and strategies

Ask *why* and *what* questions for each different cell of the diversity wheel, as shown in Table 4. List the responses from farmers.

Table 4 *Recording sheet for diversity wheel analysis: crop level.*

Many households and large areas	Many households and small areas	Few households and large areas	Few households and small areas	Lost varieties
Why are these crops grown by many farmers over large areas?	Why are these crops grown by many farmers but over small areas?	Why are these crops grown by few farmers but over large areas?	Why are these crops grown by few farmers over small areas?	Why were these crops lost from your village/community?
What are the reasons/challenges behind this?	What are the reasons/challenges behind this?	What are the reasons/challenges behind this?	What are the reasons/challenges behind this?	What were the reasons/challenges behind this?
Have there been dramatic shifts in the type of crops grown by many HHs in large areas as a result of shocks and stressors?	Have there been dramatic shifts in the type of crops grown by many HHs in small areas as a result of shocks and stressors?	Have there been dramatic shifts in the type of crops grown by few HHs in large areas as a result of shocks and stressors?	Have there been dramatic shifts in the type of crops grown by few HHs in small areas as a result of shocks and stressors?	
Why and how has this impacted ability to manage future shocks and stressors?	Why and how has this impacted ability to manage future shocks and stressors?	Why and how has this impacted ability to manage future shocks and stressors?	Why and how has this impacted ability to manage future shocks and stressors?	
How has the humanitarian effort impacted the type of crops grown by many households in large areas?	How has the humanitarian effort impacted the type of crops grown by many households in small areas?	How has the humanitarian effort impacted the type of crops grown by few households in large areas?	How has the humanitarian effort impacted the type of crops grown by few households in small areas?	How has the humanitarian effort impacted the type of crops grown in the past?
Why and how has this impacted the ability to manage future shocks and stressors?	Why and how has this impacted the ability to manage future shocks and stressors?	Why and how has this impacted the ability to manage future shocks and stressors?	Why and how has this impacted the ability to manage future shocks and stressors?	Why and how has this impacted the ability to manage future shocks and stressors?

Many households and large areas	Many households and small areas	Few households and large areas	Few households and small areas	Lost varieties
What could be done further to overcome these challenges?	What could be done further to overcome these challenges?	What could be done further to overcome these challenges?	What could be done further to overcome these challenges?	What could be done further to overcome these challenges?
Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?

After the analysis of above table, the following questions should be asked about making humanitarian efforts more effective in promoting crop diversity. See Table 5.

Table 5 *Analysis of humanitarian efforts on crop diversity.*

What could be done by the humanitarian/development aid effort to improve it further and provide more benefits to you?
Which stakeholders should be involved and what roles should they take?
What could be done to increase the ability to promote/build stability/peace across different groups in the area?
Which stakeholders should be involved and what roles should they take?

Step 4: Prioritization of crops

Prioritize a set of ten priority crops that are most important for food, nutrition, income, livestock and climate adaptation. This should be a collaborative and joint decision among all the FGD participants. Indicate which crop is used for what purpose or multiple purposes.

Step 5: Mapping the varietal diversity for each priority crop

This is only done with the ten priority crops identified in Step 4. Taking each crop one by one, repeat the exact same process from Step 1 to Step 4. Here, however, the focus is on the varieties of the specific crop. This step will be completed quickly since the participants will be already familiar with the process.

Step 5.1: Inventory of varieties of selected crop

Make an inventory of the varieties of the crop in Table 6. Each variety is then placed in the cells of the diversity wheel, following the questions in Table 7.

Table 6 *Inventory of varieties of crop.*

Many households and large areas	Many households and small areas	Few households and large areas	Few households and small areas	Lost crops

Step 5.2: Identification of crop varieties, challenges and potential solutions

Ask *why* and *what* questions for each of the varieties that are distributed in the different cells of the diversity wheel. Follow questions as in Table 6. List down the responses from farmers in Table 7.

Table 7 *Recording sheet of diversity wheel analysis: varieties level*

Many households and large areas	Many households and small areas	Few households and large areas	Few households and few areas	Lost varieties
Why are these varieties grown by many farmers over large areas?	Why are these varieties grown by many farmers over small areas?	Why are these varieties grown by few farmers over large areas?	Why are these varieties grown by few farmers over small areas?	Why were these varieties lost from your village?
What are the reasons for it?	What are the reasons for it?	What are the reasons for it?	What are the reasons for it?	
What are the challenges for it?	What are the reasons/challenges for it?	What are the reasons/challenges for it?	What are the reasons/challenges for it?	What were the reasons/challenges for it?
What could be done further, that would provide more benefits to you?	What could be done further, that would provide more benefits to you?	What could be done further, that would provide more benefits to you?	What could be done further, that would provide more benefits to you?	What could be done further to get back these varieties, if this would provide more benefits to you?
Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?	Which stakeholders should be involved and what roles should they take?

Step 5.3: Prioritization of varieties

Prioritize a set of varieties that are most important for food, nutrition, income, livestock and climate adaptation. This should be a collaborative and joint decision among the FGD participants. Indicate the purpose or purposes of each variety.

Step 6: Synthesis and development of pathways of interventions

This is a general synthesis of the diversity wheel output that will include information on the following: the crop diversities that are being currently used by the farming communities; how crises (conflict, climate) and other factors have affected crop diversity availability; identification of a portfolio of crops and varieties and their seed systems that are important to the farmers; and recommendations for a seed systems intervention plan. The data recorded in Table 4, Table 5 and Table 7 should be included as the report.

C] Preference ranking

Estimated time: two hours

Focus group discussion participants: Approximately 20 total participants, divided into two separate groups (male farmers and female farmers).

Facilitators: two (note: female facilitators should join the female farmers FGD).

Required kits: Flip charts, marker pens (different colours), notebooks. Farmers should bring the seed of their crops if it is possible, as this will help to make the discussion livelier. Use a mobile phone to take photos of various step outputs.

Objectives: To identify which crops and varieties are preferred by male and female farmers. To understand which specific traits of different crops are preferred by male and female farmers.

Preparation note: This tool is focused on the ten priority crops which have been selected during the diversity wheel activity.

Step 1: Identification of the preferred traits of crops

First identify the traits/criteria that farmers consider most important for selecting the best crop in their situation. This may include good yield, drought tolerance and so on. Develop a matrix following Table 8.

Table 8 *Preference ranking of different crops (this analysis is at crops level).*

Crops/important criteria	Sorghum	Maize	Cassava	Common bean	Sweet potato
Examples: Good yield					
Drought tolerant					
Flood tolerant					
Good eating quality					
High market demand					
Less damage by birds					
Total score					

Step 2: Crop preference ranking

Ask farmers to rank the crops, comparing for each the traits in Table 9. Agree which is the best (10) and worst (1). Total the scores for each crop. This shows the most preferred crops.

Step 3: Variety preference ranking

Once the preferred crops have been identified in step 2, preference ranking is done only for the five crops that are most preferred by farmers. Further preference ranking is done for the varieties of each crop. This means there will be five different tables (as shown in Table 9). The important traits/criteria will remain the same as those that have been already agreed upon in the crop preference ranking. The process is similar to the crop preference ranking.

Table 9 *Preference ranking of different varieties of a single crop (this analysis is at the variety level).*

	Sorghum variety 1	Sorghum variety 2	Sorghum variety 3
Example: Good yield			
Drought tolerant			
Flood tolerant			
Good eating quality			
High market demand			
Less damage by birds			
Total score			

Step 4: Synthesis of preference ranking

The facilitator prepares a report synthesising the male farmer and female farmer preference rankings. Highlight the different observations made in their selections of crops and varieties, following two guiding questions. A detail tables of preference ranking tables done in male and female farmers group discussion should be documented. The output of this analysis will provide the following: the preference criteria that are considered as important by male and female farmers; and the crops and varieties most preferred by male and female farmers. This information is very useful for designing seed system intervention pathways that target male or female farmers.

SSRA Tool b: Analysis of Climate Resilient Crops and Varieties

WHY analyse climate resilient crops and varieties?

Given the challenges that agriculture faces as a result of climate change, building resilience is a priority. Crop adaptation has been suggested by a number of studies as an effective strategy for adapting to climate change. Crop adaptation requires farmers to make decisions on which crops and varieties to grow that are suited to their environments.

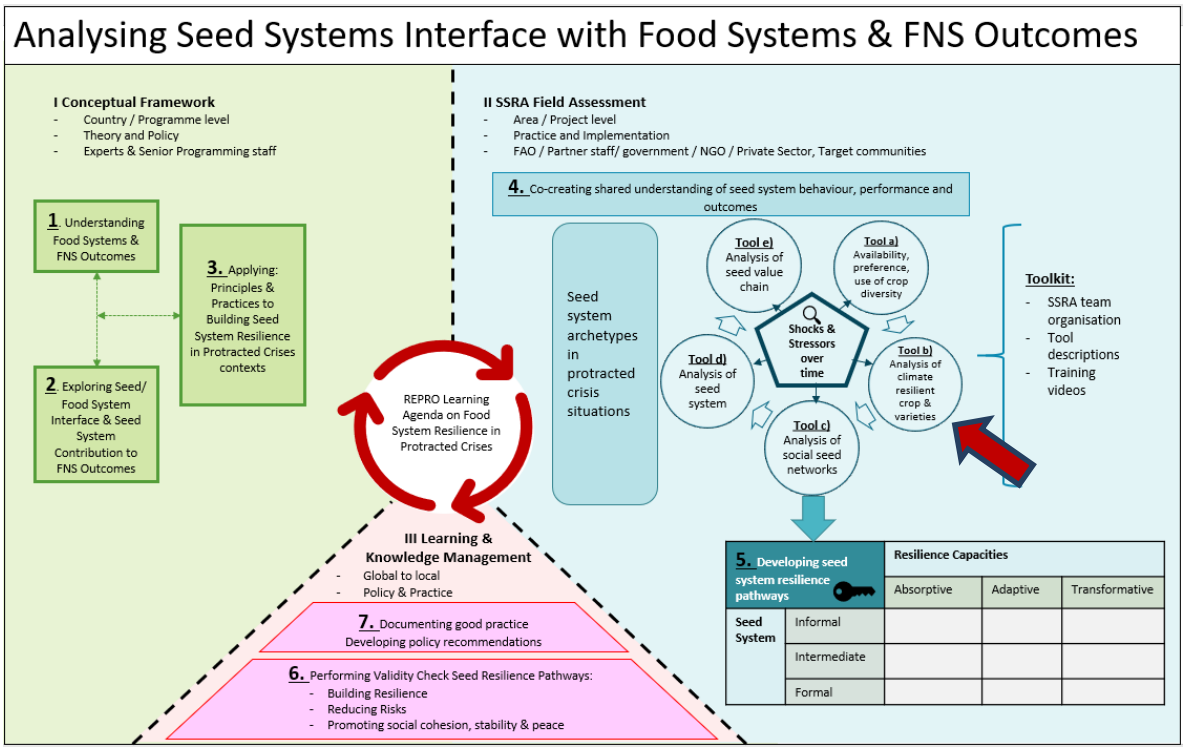

Figure 1 *Showing the position of the analysis of climate resilient crops and varieties in the context of the SSRA framework.*

Seed systems play a crucial role as a basis for crop and variety selection, and subsequent adaptation to climate change. In the context of climate change, it is important for seed systems to offer choices to farmers in support of climate change adaptation. The fifth assessment report of the intergovernmental panel on climate change (IPCC) recognizes the importance of strategies based on the use, conservation and management of genetic resources for climate change adaptation. In protracted crisis situations, conflict and instability interact with climate hazards, which require appropriate attention as this may severely impact seed and food systems and people's livelihoods in general.

In this context, this SSRA tool will facilitate research and development practitioners' improved understanding of the following: how local communities perceive the impact of climate change; how climate change is affecting seed systems and livelihoods; adaptation mechanisms; and the effect of the interaction of conflict and instability with climate change.

This tool can be used to address the following questions:

- What are the perceived common drivers of climate change at local level such as drought, erratic rainfall, flood, disease/pest incidences and other resulting social and economic pressures?
- How are these above factors impacting local crop production and seed systems?
- Which crops and varieties are most affected by various factors governing climate change?
- Which areas/communities/production landscape of the study sites are most affected by severe impact of climate change?
- What are the existing crops and varieties (both local and improved) that have climate resilient characteristics for adapting to changes, as perceived by farmers?
- In which seed system do these crops and varieties best fit?
- How could such climate resilient crops/varieties be part of a seed sector development programme?
- What types of support and capacity building programmes are needed for local farming communities and seed producers to fully utilize climate resilient crops and varieties? What are the community measures towards developing resilient seed systems?

In summary, this tool will provide a strong basis for developing pathways to building seed system resilience by identifying and promoting climate resilient crops and varieties in various seed systems and possible community based adaptation measures.

How should an analysis of climate resilient crops and varieties in protracted crises contexts be conducted?

General guidance

The analysis of climate resilient crops and varieties is done with key informants in a focus group discussion (FGD) setting. Participants of FGD are farmers from the study areas who may include seniors, youth, males, females, refugees, hosts of internally displaced/refugees, returnees, and so on. Depending upon the study/project area of choice, size of farming population, agro-ecology, and climate change impact context, this exercise can be done in three to four villages in order to understand the existing situation sufficiently. At least two facilitators are needed to do this analysis. NGO staff or local extension staff with whom the communities are familiar must be present during the analysis. They will introduce the topic and objectives, and facilitate quick rapport with the farming communities.

Estimated time: 4 hours

Focus group discussion participants: Approx. 20 farmers; mixed group of senior age farmers, youth, male and female farmers.

Required kits: Flip charts, marker pens (different colours), notebook, mobile phone to take photos of various step outputs.

Step 1: Identify the key drivers (hazards) of climate change

During the focus group discussion, identify a list of climate change hazards that are affecting the livelihoods of the communities (crop production, livestock management and so on). Examples of these climate hazards include droughts, variation in precipitation (less rain, more rain, early onset of rain or delayed rain), floods, increased heat (temperature), severe sandstorms, increases in crop disease/pest incidences, and new diseases among animals and livestock.

Identify the severity (highest to lowest level) of these hazards impacting the livelihoods of communities. Use the format of Table 1 for mapping. This will lead to the identification of a set of key climate change hazards that are affecting the community in general as well as specific livelihoods.

Table 1 *Key drivers (hazards) of climate change impacting community livelihoods.*

Climate hazards	Impact on livelihood	Severity of impact (Highest to Lowest) [+++, ++, +)

Step 2: Identify the areas and communities affected by climate hazards

Develop a resource map of the village or community where the FGD is taking place. Indicate the geographical areas and communities in the area affected by climate hazards, and areas of interaction of conflict and instability with climate hazards. This will show where and which communities are most affected by which specific climate hazards.

Step 3: Identify the crops that are most affected by climate hazards

Map the crops that are most affected by different climate hazards in accordance with Table 2. Identify the major sources of seed for the crops that are affected by specific climate hazards. This will indicate which crops and seed systems are affected by which specific climate hazards.

Table 2 *List of crops that are most affected by climate hazards.*

Crops that are most affected	Climate hazards	Major sources of seed to the community

Step 4: Identify the crops that are most affected by the interaction of conflict and instability with climate hazards

The interaction of conflict and instability with climate hazards may create particular challenges that impact crop and seed systems. This could be a different result from Table 2. Data should be recorded according to the Table 3 format.

Table 3 *List of crops that are affected due to the interaction of conflict and instability with climate hazards.*

Crops that are most affected	Rationale/explanation	Major sources of seed to the community

Step 5: The effect that the interaction of conflict and instability with climate change has on seed systems

Use the Table 2 and Table 3 results to identify major sources of seed for the farmers. Facilitate discussion on how these seed systems are affected by climate change, using the Table 4 format. Examples of effects on the seed systems could be failure to meet the household seed demand due to the loss of crop production, constraints on access and availability of seed, poor quality of seed, increase of pests in seed storage, poor germination of crops, varieties not performing well, and so on. Always relate this discussion to specific seed systems. Information from Table 4 provides evidence of how seed systems are under stress in the context of climate change, conflict and instability.

Table 4 *Impact of climate change and interaction of conflict and instability with seed systems.*

Farmer seed sources (seed systems)	Type of climate hazards	Effect of climate hazards	Effect due to the interaction of conflict and instability with climate hazards
Farm seed saving			
Seed network			
Local market			
Free seed from NGOs			

Step 6: Identify the crops that are perceived as resilient to climate change

Conduct a matrix analysis of crops that are perceived by communities as resilient to climate change. Use the ranking method to identify the most or least resilient crops as perceived by communities. Use Table 5 to conduct this analysis.

Table 5 *Analysis of climate resilient crops based on farmer perceptions.*

Crops	Climate hazards (rank 1=Least resilient, rank n= Most resilient)					Resilient crop (Total rank)
	Drought	Floods	Delayed rain	Disease/pest	Other	
Crop 1						
Crop 2						
Crop n						

Step 7: Identify the varieties that are perceived as resilient to climate change

Conduct a matrix analysis of varieties that are perceived by communities as resilient to climate change. Use the ranking method to identify the most or least resilient varieties. Use Table 6 to conduct this analysis.

Table 6 *Analysis of climate resilient varieties based on farmers perceptions.*

Crops	Varieties	Types of varieties (local, improved, do not know)	Variety characteristics	Climate hazards (rank 1= Least resilient = rank n=most resilient)					Resilient variety
				Drought	Floods	Delayed rain	Disease/pest	Other	
Crop 1	Var 1								
	Var 2								
Crop 2									
Crop n									
Total									

Step 8: Synthesis: community based measures to develop resilient seed systems pathways

The final step of this exercise is to facilitate discussion. What are the community based efforts that contribute towards building the resilience of seed systems? What further actions could be taken? Which stakeholders should be involved? Facilitate the discussion based on Table 7 and summarise the results.

Table 7 *Community-based measures towards developing resilient seed systems.*

Major crops	Key indicator crops	Seed systems	Effect of climate hazards	Effect of the interaction of conflict and instability with climate hazards	Community based adaptation measures	Key stakeholders
Farm seed saving						
Seed network						
Local market						
Free seed from NGOs						
Others						

SSRA Tool c: Social Seed Network Analysis

Why analyze social seed networks ?

Social seed network (SSN) analysis is the mapping and measuring of relationships and flows of crops, varieties, seeds and information, between farmers, various groups competing for natural resources, land and water, and organizations that are linked with farmers. The social seed network is one of the major seed systems through which seed and related information flow among farming community members. The majority of farmers depend on farm saved seed as their primary seed source, but they also exchange, borrow, and purchase seeds from neighbours, relatives and marketplaces. The continuity of a social seed network builds trust, social cohesion and reciprocity between farmers, their communities, and different stakeholder groups.

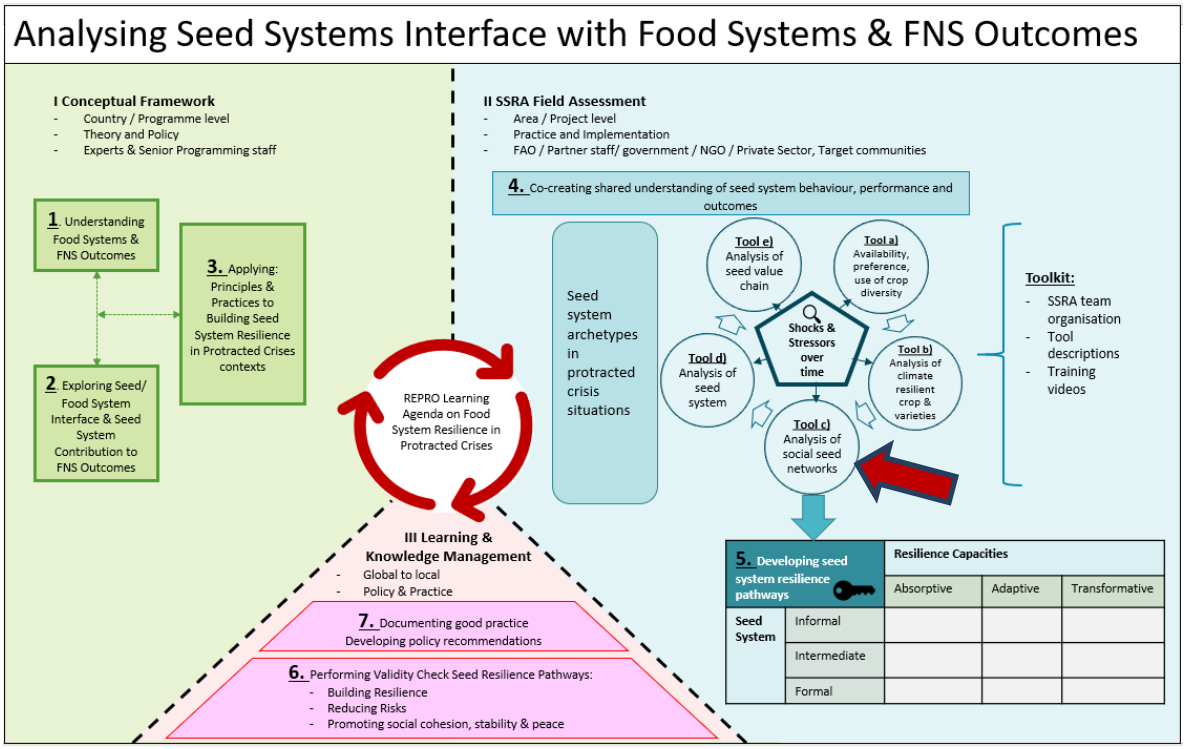

Figure 1 *Showing the position of the social seed network analysis tool in the context of the SSRA framework.*

In conflict and protracted crisis contexts, farmers also receive seed freely or as vouchers from development and humanitarian organizations. This provides immediate relief to continue agriculture, but longer practising of this relief creates dependency and negatively impacts the development of a social seed network.

A social seed network in farming communities always exists, whether stronger/robust or weaker/fragmented; it is dynamic and changes over time due to various factors that influence the social structure of a community. In many protracted crisis situations, social seed networks also extend into communities of internally displaced people, refugee camps, and refugee hosting areas. It is important to include this in the social seed network analysis, as this is part of how seed systems are networked across different settings and realities.

In this context, this specific tool will help research and development practitioners to understand the following:

- How the seed network is evolving over time and what factors are playing key roles in building social networks, social cohesion and reciprocity.
- The types of social seed network (absorptive, adaptive, transformative) that exist in specific areas/farming communities; the key farmers that help in building the seed network (nodal farmers); which farmers connect different sub-networks (for instance, bridging farmers and agro-pastoralists); how networks vary between/with different categories of farmers (male, female, refugees, and so on); and whether these networks are connected or isolated.
- How the social seed network is affected during times of crisis, for example war, conflict, famine and climate change.
- How the social seed network extends into IDP and refugee communities and how this is networked by hosts and the internally displaced/refugee/returnee communities.

In summary, this tool provides a strong basis for developing pathways of building seed system resilience in protracted crisis contexts, by giving an understanding of the social cohesion, relationships, and reciprocities of farming communities, and by identifying key farmers, who play an important role in the development of seed systems of specific areas/communities (extending into IDP, refugee and returnee communities and interlinking with hosting communities). See Figure 2 for examples of visual representations of social seed networks. The analysis also provides practical guidance on where to establish new variety demonstration plots and a community seed bank; how to select farmers for seed quality management; and how to select farmers for professional seed production.

How to conduct a social seed network analysis

General guidance

Two analyses are done, each in an area that represents a different category of farmers' groups: the first, where regular farming practices are operational, for instance in hubs of stability; and the second, where IDP/refugee/returnee communities are living. This will help understanding of how seed networks function in the protracted crisis context of South Sudan. The general methodology is the same for both cases, except that more samples are taken in the area where IDPs/refugees/returnee communities are living. This means that two parallel studies will be conducted in the same state, for instance in Torit.

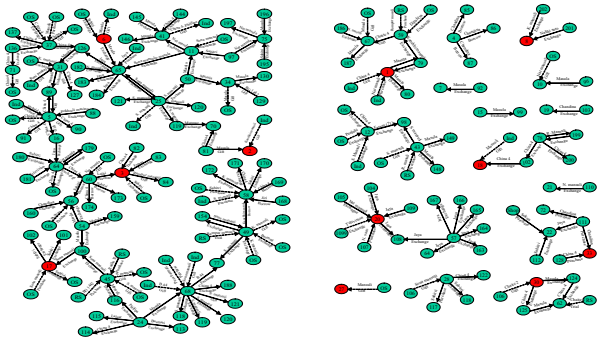

Figure 2 *Examples of types of social seed network: green circles represent male farmers, red circles represent female farmers, and arrows represent flows of seed/information.*

Seed network analysis will be done in two stages. Firstly, a field survey, followed by data analysis and development of a report. Secondly, based on the results of the survey, local workshops or focus group discussions among farmers in the selected areas will be held, which will deepen understanding of the key drivers that affect the social cohesion, reciprocity and vulnerability of the social seed network.

The study team should be a small multidisciplinary team with experience in social studies and crop agronomy. Survey enumerators can be hired to conduct the field survey with guidance from the study team. Field survey data will be analyzed with UCINET and Netdraw software. The study team will require one day of training on use of the software and interpretation of results.

Estimated time: Approximately three to four days for the field survey. An interview with one farmer will last for a maximum of ten minutes.

Interview participants: Approximately 40 hub stability farmers; approximately 120 farmers in IDP/refugee/returnee community areas.

Required kits: Printed questionnaires or use of a tablet for the survey online; UCINET and Netdraw software or other network analysis tools for data analysis and visualization.

Objectives: To understand which types of social seed network exist in specific areas/farming communities. Who are the key farmers that help in building the seed network (nodal farmers) and connect the seed network with IDPs/refugees/returnees? Who are the farmers that connect different sub-networks (bridging farmers)? How do networks vary with different categories of farmers (male, female, refugees, and so on)? Are these networks connected or isolated? How are the social seed networks affected during times of crisis such as war, conflict, famine and climate change?

Step 1: Selection of study sites

In the context of an ongoing project, the study sites will be existing project locations where seed system interventions are being planned. They will consist of two different areas; firstly, the areas where regular farming practices are being conducted (areas located in the hubs of stability); and secondly, the areas where internally displaced/refugee/returnee communities are living.

Step 2: Selection of crop

The project team, together with agriculture extension team or a local NGO, should select one strategic and staple crop for each of the cases on which the study is focusing (i.e. hubs of stability and IDP/refugee/returnee communities). Analysis of the main and strategic crop will give sufficient information on the dynamics of the social seed network. SSN can also be carried out on two to three main crops that represent the main crop of cereals, roots/tubers, or food legumes. If the decision is to select two or more crops, an SSN study should be conducted for each crop separately to avoid data mix-up and difficulties in administering the survey in the field.

Step 3: Development of a survey questionnaire

Survey questions should be focused on one main crop that was selected in Step 2 for each case. An example of a survey questionnaire is given in Appendix 6. The survey questionnaire should be short and contain the following questions:

For the local farming community:

- During the last growing season, from whom did you obtain seed or planting materials of the study crop? Responses are recorded by names and addresses of the seed providers.
- What was the name of the variety?
- How did you obtain the seed ? This question records the seed receiving mechanism such as purchase, free, exchange/barter, and so on.
- What were the major reasons for receiving the seed? Key reasons of farmers to choose another variety.
- During the last growing season, to whom did you give seed? Record the name and address of the seed receiving farmer.
- What was the name of the variety?
- How did you give the seeds? Record the seed giving mechanism (sell, free, exchange/barter and so on).
- Why did you give the seed to other farmers? Key reasons of farmers to give the seed to other farmers.

For IDP, refugee, returnee farmers

- During the last growing season, from whom did you obtain seed or planting materials of the study crop? Responses are recorded by the names and addresses of the seed providers.
- What was the name of the variety?
- How did you obtain the seed ? This question records the seed receiving mechanism such as free, exchange/barter, vouchers, purchase and so on.
- What were the major reasons for receiving the seed? Key reasons of IDPs/refugees/returnees to choose another variety.
- During the last growing season, to whom did you give seed? Response are recorded the name and address of the seed receiving IDPs/refugees/returnees.
- What was the name of the variety?
- How did you give the seeds? Record the seed giving mechanism (free, exchange/barter, sell and so on).
- Why did you give the seed to other IDPs/refugees/returnees? Key reasons to give the seed to others.

Step 4: Selection of farmers, using the snowball sampling method

The local farming community

The survey will use follow the snowball sampling method. A first set of approximately 40 farmers who are more knowledgeable about crop management practices are selected from the project site. The first set of farmers is called the starter set, or the first stage respondents. It includes both male and female farmers and represents the heterogeneity of the study sites (for example: representation of farmers from different hamlets/clusters, different agro-ecology/climates, and different categories of farmer). It is a purposive selection; this step is carefully done together with staff from the local agriculture extension team or a local NGO.

The project team conducts the survey with the first stage of respondents (starter set). Their responses about where they have received the seed, and to whom they have provided the seed, will form a new list of the second stage of respondents. The same questions are repeated with the second stage of respondents. Their responses will form the list for the third stage of respondents. The survey ends after the third stage respondent interviews.

IDP, refugee, returnee farmers

This survey should follow the same snowball sampling method. A first set of approximately 120 IDPs/refugees/returnees/hosts of the refugees are selected (male and female). After this step, the same process is repeated as for the set of the local farming community.

Step 5: Data analysis and first results

Data entry should be done in Microsoft Excel. Data analysis and visualization of data should be done separately for the two separate cases, using UCINET and Netdraw software. The project team will require one day of training on how to analyze the data using the UCINET and Netdraw software. Data analysis should include flows of varieties and seed, mechanisms, social relationships, types of network, factors affecting network stability, and visualizations of various types of network that link with different categories of farmers. Based on this, the first results of the study should be prepared by the study team. However, the results will need to be supplemented by further inputs from farmers, as described in Step 5.

Step 6: Organizing a local workshop or focus group discussion

The local farming community

A half day workshop should be organized with farmers who are selected from the field survey results. The key purpose of the local workshop will be to discuss selected areas in the survey results to deepen understanding of what factors play key roles in building social cohesion and reciprocity. Why are some farmer networks isolated and fragmented, while others have very complex and connected networks? Why are some of the farmers highly motivated and playing key roles in building social cohesion? What

lessons can we learn from them? Which factors contribute to seed system resilience or contribute to increase vulnerability?

The IDP, refugee and returnee farmers
A half day workshop should be organized with IDPs/refugees/returnees/hosts of the refugees, who are selected from the field survey results. The key purpose of the local workshop will be to discuss selected areas in the survey results in order to deepen understanding of what factors play a key role in building social cohesion and reciprocity. Why are some IDP/refugee/returnee networks isolated and fragmented, while others have complex and connected networks? Why are some of the IDPs/refugees/returnee farmers highly motivated and playing key roles in building social cohesion?

Step 7: Synthesis and development of an intervention pathway
Step 5 and step 6 outputs should be summarized in a final report that will contribute to the development of a seed systems resilience pathway. It should include the following information on which types of social seed networks exist in specific areas/farming communities/IDPs/refugee/returnee areas: the key farmers or groups that help in building the seed networks (nodes); the farmers or groups that connect different sub-networks (bridging farmers or IDP/refugee/returnee farmers); how networks vary with different categories of farmers (male, female, refugees, and so on), and whether these networks are connected or isolated; how the social seed networks are affected during crises, for example war, conflict, famine and/or climate change; what could be done by the humanitarian/development aid effort to improve the social seed networks that promote/build stability and peace across different groups; and what lessons we can learn from the networks.

Annex 1: Example of survey questionnaire to conduct a social seed network analysis

Name of interviewer: ……Date of interview: ……/……../……...

Name of State: ……..Name of study area (payam):……

Name of study crop:……

Respondent profile

Q1. Name of respondent:.....

Q2 Sex:.....(code: 0=male, 1=female) Q3. Age:…… Q4. Education:…….....(highest level)

Q5: Category of responder: .....(0=local farmer, 1=IDPs, 2=refugees, 3=returnee, 4=host of refugees)

Q5 During the last growing season, from whom did you obtain seed or planting materials of ……crop? (fill in Table 1, using response code and response details)

Q6. What were the names of the varieties that you obtained? (fill in Table 1)

Table 1 *(for question 6 and 7)*

Variety name	Response (Code)	Response (details)	Code	Note for response details
			1=family/friends/relatives within payam	Code 1 and 2=list the full names of the person (family/friends/relatives), address and if possible phone number
			2=family/friends/relatives outside payam	
			3=district extension office or similar government sources	
			4=NGO projects	Code 4=ask the name of NGO/project
			5=local informal markets	Code 5=list the name and address of market
			6=agrodealer shop	
			7=community based seed production scheme	Code 9/10/11=ask the name and address
			8=seed companies	
			9=IDPs	
			10=refugees	
			11= returnees	
			12=others (specify)	
			13=do not know	

Q7. How did you receive the seed of these varieties? (fill in Table 2)

Table 2 *(for question 7)*

Variety name	Response (code)	Response (details)	Code	Note for response details
			1=free 2=exchange/barter with same variety seed 3=exchange/barter with another other variety of same crop 4=exchange/barter with different crop (mention the crop) 5=exchange/barter with labour 6=exchange/barter with other methods (specify) Cash purchase 7=vouchers/coupons 8=seed on credit/loan 9=others (clearly specify) 10=do not know	Code 3=list down the name of variety Code 6=list the specific exchange/barter system Code 9=others (specify what)

Q8. What were the major reasons for receiving the seed?

a……..

b…….

c……

Q9. To whom do you usually provide seed and information?

Full name: ……Address:……..

Full name: ……Address:……..

Full name: ……Address:……..

Q 10. During the last growing season, to whom did you give seeds and information? (fill in Table 3 with response codes and response details)

Q11. What were the names of the varieties that you gave to other farmers? (fill in Table 3)

Table 3 *(for questions 10 and 11)*

Variety name	Response (Code)	Response (details)	Code	Note for response details
			1=family/friends/relatives within payam .... 2=family/friends/relatives outside payam 3=district extension office or similar government sources 4=NGO projects 5=local informal markets 6=agro-dealer shop 7=community based seed production scheme 8=seed companies 9=IDPs 10=refugees 11=returnees 12=others (specify) 13=do not know	Code 1 and 2=list the full names of person (family/friends/relatives), address and if possible phone number Code 4=ask the name of NGO/project Code 5=List the name and address of market Code 9/10/11=ask the name and address

Q12. How did you give the seeds? (fill in Table 4)

Table 4 *(for question 12)*

Variety name	Response (Code)	Response (details)	Code	Note for response details
			1=free 2=exchange/barter with same variety seed 3=exchange/barter with another other variety of same crop 4=exchange/barter with different crop (mention the crop) 5=exchange/barter with labour 6=exchange/barter with other methods (specify) cash purchase 7=vouchers/coupons 8=seed on credit/loan 9=others (clearly specify) 10=do not know	Code 3=list down the name of variety Code 6=list the specific exchange/barter system Code 9=others (specify what)

Q13. Why did you give the seed to others (farmers, IDPs/refugees/returnees)?

a……..

b……

c……

Q14.Who usually comes to you to ask for seed and information?
Full name: ……..……Address:……..

Full name: ……..……Address:……..

Full name: ……..……Address:……..

Q 15. Do you have any questions to ask us?

…….

Thanks for your time and contribution!

SSRA Tool d: Seed Systems Analysis

WHY analyse seed systems?

A diversity of systems supply seeds of different crops and varieties to cater to the equally diverse demands of farmers in normal situations but also in protracted crisis contexts. Their farming can be subsistence, fully commercial, pastoral or agri-pastoral. Their production environments varies from marginal areas with poor soil to irrigated areas with fertile soil.

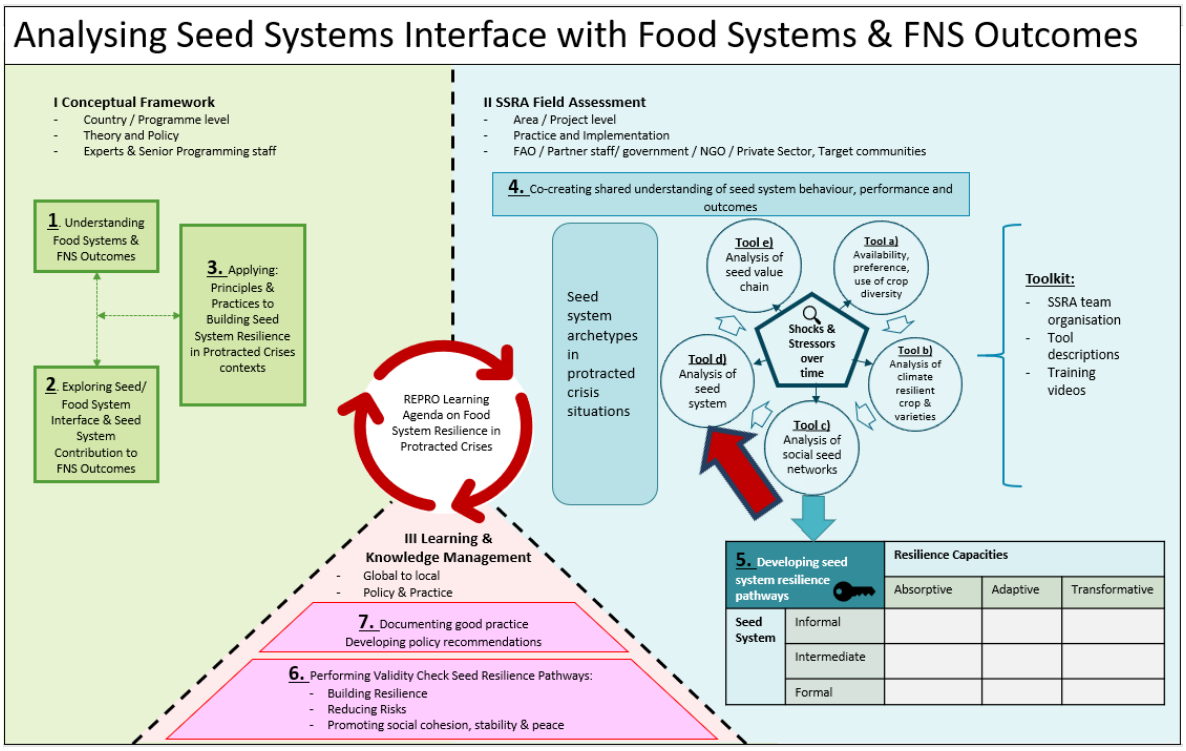

Figure 1 *Showing the position of the seed systems analysis tool in the context of the SSRA framework.*

Individual farming households use distinct seed systems for different crops. Crops for household consumption, like sorghum, rice, finger millet and beans, are cultivated using farmer-saved seed. Local cash crops, such as groundnut and common beans, are grown with seed from semi-commercial sources or purchased from local markets. Major cereals such as maize seed are often obtained from national public research institutions, either through government extension services or free seed distribution through humanitarian programmes. Seeds of exotic vegetables developed by international seed companies are marketed by local agro-dealer shops. No single intervention, be it public, private, community, or NGO based, can provide sufficient support to the seed sector for achieving the goal of seed security at community, regional or national levels.

This demonstrates that the seed sector hosts a complex reality of different seed systems, even at the household level and in situations of protracted crisis, which need to be approached in a pluralistic manner. Integrated seed sector development (ISSD) recognizes the unique role played by each of these different seed systems within the overall sector and their specific contexts, and the need to approach them individually.

Each system involves a diversity of stakeholders, such as farming households, communities, local seed producer groups, public genetic resource and research entities, universities, private seed companies (local, regional, national and international), UN agencies, NGOs and agro-input dealers. Each of these stakeholders assumes specific responsibilities, which can be different according to different seed systems and each plays a specific role.

The diversity of seed systems that may coexist within the subnational (regional) and national seed sector is described in Box 1.

Box 1. Most common seed systems within the seed sector

A] Informal seed systems

Farm-saved seed: The most prominent source of seed for the majority of farmers in developing countries, and many in the developed world, is farmer-saved seed. Farmers obtain seed through both informal and formal channels. Varieties can be both local and improved. The crops are largely for subsistence and food security, but in many cases may also be used for income generating purposes. The role of women farmers in farmer-saved seed is very important.

Social seed networks: These systems integrate both informal and formal flows of crop varieties in the farming communities. Famers save the seed for next season and regularly share, exchange or barter or sell the seed with their neighbours and communities. Social relationship, cohesion, trust and reciprocity are the key factors that influence the development of seed networks and determine to what extent these networks are resilient to shocks and stressors. Through these systems, farmers as a community maintain a portfolio of crop diversity that meets their requirements for their daily livelihoods.

Local (grain) markets: Farmers regularly purchase 'potential seed' from the local grain market to fulfil their seed needs for their crop production. This includes the majority of open pollinated crops. Pulses, beans and oil seed crops are the crops often sourced from the local market. Major actors in the local grain market can be local farmers themselves, or small, medium or big grain traders. These systems includes local, improved, and mixed varieties. The quality of 'potential seed' in the local gram market is often unknown.

B] Intermediary seed systems

Community seed bank (CSB): Community level seed-saving initiatives have been around since the end of 1980s, established with the support of international and national non-governmental organizations. Community seed banks have been designed and implemented to conserve, restore, revitalize, adaptation to climate change, strengthen and farmer's seed system. The efforts have taken various forms and names: community gene bank, seed hut, seed reserve, seed library, seed-savers group, association or network. Depending on the objectives set by its members, it might focused on conservation of agriculture biodiversity including reviving lost crop and varieties, while others give priority to both conservation and access and availability of diverse types of seed suitable to various agroecological domains, primarily for local farmers. In addition to these main functions, promoting seed and food sovereignty is another core element of some community seed banks.

Community-based seed production (CBSP): Farmers source the seed of locally important food and cash crops through this system. Non-governmental organizations (NGOs) are actively involved in supporting communities with the aim of enhancing food security and reducing poverty. These systems include both local and improved varieties, and may involve some aspect of seed quality assurance procedures, such as using certified seed or even foundation seed as source seed, maintaining good pre-harvest and post-harvest management practices, rouging off-types in the field and storing the different varieties of seed separately. In countries where a quality declared seed system (QDS) is functional, CBSPs benefit from QDS systems.

Local seed businesses (LSBs): Farmers multiply and sell quality seed of improved varieties to other farmers in these seed systems. Farmers' capacities are strengthened if they become professional seed producers and organize as seed producing cooperatives or groups. Often these groups are legally registered with the district agriculture office. LSBs may include seed quality assurance procedures, such as quality declared seed (QDS) and a formal certification process. These systems include major food crops, as well as vegetables and perennial fruit trees, and mostly use local or nationally released/registered improved varieties.

Seed relief: In the event of an emergency and in many protracted crisis situations due to human conflict or natural disasters, seed is freely distributed to farmers as a form of relief in order to support their recovery. The varieties and seed quality standards are usually unknown, which is a concern in terms of the long-term sustainability of the seed sector. However, in recent years both local seed sourcing and voucher based seed distributing have been started as good practice within seed relief programmes.

C] Formal seed systems

Government seed companies and/or programmes: There are various (mostly public) operators in the seed value chain in these systems, through which seed is certified and varieties are improved. In most developing countries, governments invest their resources in the production and dissemination of crops that are important for food and nutritional security through these systems; these include cereals (maize, rice, wheat and several others), legumes and vegetables.

Commercial seed companies (local to multinational): In this seed system, commercial companies are either directly engaged in seed production through contract farming and outgrower schemes, or in importing seed of high value food and cash crops, which are subsequently marketed through their own networks and/or agro-input dealers. Hybrid maize, hybrid rice, exotic vegetables and perennial fruit trees are the main crops for which this system is operational.

Closed value chain: This seed system usually has a short value chain, in which seed (including planting materials) and input packages are directly provided to commercial growers. The system includes crops such as cotton, tea, coffee, tobacco, and sugarcane.

These diverse seed systems are clustered into informal, intermediary and formal seed systems. This distinctions or groupings are merely an artificial construction from a farmer's point of view, but it matters to the government and donor policies and programming. The informal and formal seed systems are mainly distinguished by two key factors: whether seed production activities are legally registered and approved according to the seed laws and regulations of the country; and whether seed production/dissemination is done following official seed certification guidelines and procedures. If these two criteria are fully met, the activities are referred to as a formal seed system. Any activities which fall between the informal and formal are considered as intermediary. Due to the nature of agriculture and the pluralistic demands of farmers, the evolution of informal seed systems to formal seed systems through an intermediary stage does not exist in many cases, particularly not in protracted crisis contexts where pre-existing formal seed systems may have been eroded, collapsed or integrated within the architecture of humanitarian aid. Multiple seed systems always coexist, even in protracted crisis situations.

In this context, this specific SSRA tool will help research and development practitioners to understand six important aspects:

- What are the seed systems play an important role?
- What is the unique role of each seed system?
- What are the key issues and challenges for each seed system?
- Critical seed system behaviours - What are their characteristics? How do they develop, adapt and recover in the face of recurrent shocks and stressors and in protracted crisis contexts?
- What strategic actions can solve issues and build resilient seed systems in protracted crises?
- What are the contexts of emergency seed distributions?

How should an analysis of seed systems be conducted?

General guidance

Seed systems analysis is done at a local, regional (subnational) or national level. For the REPRO South Sudan context, this tool is suggested for the local level, for example at Torit and Yambio level. Seed systems analysis consists of a two stage process: collating and synthesis of field survey data from the project sites; and characterization and validation of seed systems in a multi-stakeholder workshop at a regional (subnational) level. Field survey results provide a strong basis for understanding realities and challenges when organizing discussions at the regional level. Seed systems analysis takes a half day (3-4 hour) discussion in a multi-stakeholders workshop. Smaller groups based on the seed systems can be grouped to deeper the discussion.

In the context of REPRO South Sudan, for example in Torit, a detailed focus group discussion will be conducted with local communities where farming practices are carried out on a more or less normal basis (for example in the area of hubs of stability). A separate but quick focus group discussion will be organized in the areas where the following categories of groups are living: IDPs, refugees and returnees, and agropastoralists.

Step 1: Focus group discussion with farmers

A rapid scan should be done at village level to understand the different seed systems that farmers are using to access the different crop and variety seeds, and what specific seed issues and challenges they are facing. This should be done in the focus group discussion (FGD) setting by inviting 15-20 farmers (male and female). Table 1 should be used to structure and facilitate the discussion. The key consideration is that at least three of the most important crops in each crop group category should be selected in order to understand the different seed systems and challenges. The Table 1 crop group (cereals, pulses and so on) is an exhaustive list. This crop group list can be shorter or adjusted depending upon the agriculture in the specific villages/communities where the discussion is being organized. The FGDs are organized in multiple locations if the project sites are very diverse so that they capture the existing seed systems that farmers are using to source the crops, varieties and seed. In those areas where there are large numbers of internally displaced peoples or returnees, a similar process should be followed. The result of this exercise will lead to developing three or more tables like Table 1, that are specific to the communities where the FGD was conducted.

Table 1 *Seed systems characterization at village/community level.*

Crop groups	Major crops	Major varieties (name)	Farmers seed sources	Key seed issues and challenges
Cereals	Crop 1	Var 1 Var 2 Var 3		
	Crop 2	Var 1 Var 2 Var 3		
	Crop 3	Var 1 Var 2 Var 3		
Pulses, beans and oil seed crops	Crop 1			
	Crop 2			
	Crop 3			
Root and tuber crops	Crop 1			
	Crop 2			
	Crop 3			
Horticulture crops	Crop 1			
	Crop 2			
	Crop 3			
Industrial crops	Crop 1, crop 2, crop 3			
Others (fodder crops)	Crop 1, crop 2, crop 3			

Step 2: Organizing a multi-stakeholder workshop

A multi-stakeholder workshop is organized with key representatives of seed sector stakeholders in the region. This includes agriculture ministries, public research, agriculture universities or faculties, associations of private seed companies, agro-input dealers, development partners, civil society organizations, and farmers' organizations.

The study team prepares and present the result of field studies (Step 1) as the basis for the workshop discussions. This will complement the existing experiences of stakeholders in developing seed system characterization and in developing seed intervention pathways at regional level.

Step 3: Characterization of the seed systems at regional level

This is the first entry point to understanding an overview of different types of seed systems within a regional (subnational) level. Each seed system is distinctly characterized with the help of the following key guiding questions:

- Domain: what is the key domain of the specific seed system (public, private, informal, mixed, other)? Who are the stakeholders?

- Crops: what crop type does the specific seed system involve (food, cash, feed, export)? What are the major crops covered (rice, sorghum, maize, indigenous or exotic vegetables, root and tuber crops and so on)?
- Varieties: what type of varieties are included (landraces, local varieties, modern varieties, exotic or foreign varieties)?
- Reproduction system: what are the dominant reproduction systems used (selling, outcrossing, vegetatively propagated, perennial trees)?
- Seed quality assurance system: Which types of seed quality assurance mechanisms are used (informal, quality declared, certified)?
- Seed distribution: what types of distribution and marketing mechanisms are used? Who is involved?
- Seed supply: what is the estimated percentage of seed supply by the system within the entire sector?
- Strength and opportunities: what are the current strengths, gaps and opportunities of the different seed systems?
- How do the seed systems link in and expand into IDP/refugee and returnee communities?

The responses to the questions are incorporated into a summarized matrix that includes the seed systems (in the columns) and questions (in the rows). The multi-stakeholder team consolidates this preliminary analysis of the seed system.

Table 2 *Seed system characterization at regional level.*

Seed system/ Characteristics	Farm-saved seed	Community-based seed production	Seed relief	National companies	International companies
Key stakeholders (name)	Farmers	Farmers group, seed producer groups	Organisation involved	Public or private seed companies	Seed companies
Type of crop(s)	Local food crops	Food and cash crops	Food crops (roots and tubers)	Food and cash crops	Cash crops
Major crops (name)	Sorghum, cassava	Beans, groundnut	Maize, rice	Maize, beans, soybean and groundnut	Tomato, cauliflower, ...
Type of varieties	Landraces, improved	Local and improved	Improved	Improved (open-pollinated varieties and hybrid)	Improved (hybrid)
Seed quality	Farm-saved	Quality declared seed (QDS) and certified	Unknown	Certified	Certified or truthfully labelled
Dissemination system	Informal exchange	Exchange, local marketing	Free distribution or vouchers	Marketing through agro-dealers and government dissemination	Export, marketing, agro-dealer networks
Estimated % of seed supply	70%	5%	10%	5%	10%
Key strengths	Locally adapted, seed is free or very cheap,				
Key challenges/opportunities	Seed storage, lack of recognition by policy and programme				

Step 4: Consolidation and strategic actions

The study team synthesizes the step 1 and step 2 outputs and provides recommendations on seed system intervention pathways for the specific region. The team can use the following guiding questions to structure their report:

- What are the different seed systems within the regional (subnational) seed sector?
- What are the role of different stakeholders?
- What are the unique roles of each seed system?
- What are the key issues and challenges in various seed systems?
- How do local seed systems expand/link into IDP/refugee/returnee hosting areas?
- What strategic actions could solve the issues?

SSRA Tool e: Seed Value Chain Analysis

WHY analyse a seed value chain?

A value chain is the chain of activities that are undertaken in the production, processing, marketing and sale of a product of any kind; it is the process by which raw materials are transformed into a finished product that is sold or distributed and utilised. The term value chain reflects the fact that value is added at each point in the chain.

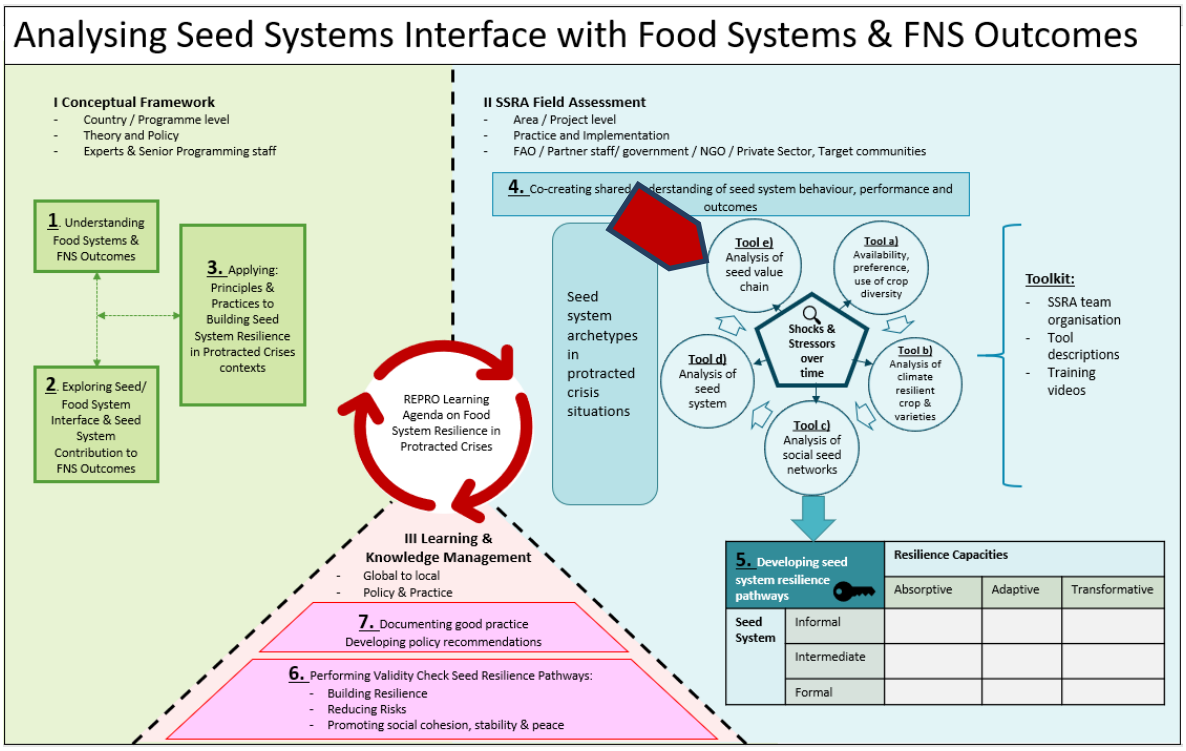

Figure 1 *Showing the position of the seed value chain analysis tool in the context of the SSRA framework.*

A seed value chain is the management of crop genetic resources, to the marketing or dissemination of seed of a specific variety and a certain type of quality to farmers.

The key terminology used in seed value chain analysis is set out below. It is important to note that 'value' does not need to be the equivalent to monetary value *per se*. Seed value chains can contribute to social cohesion and build reciprocal relationships to dealing with crisis related shocks. There can also be value in maintaining and developing local varieties well suited to agro-ecology impacted by climate change.

Seed operators actually own the seed as 'product' at some stage in the chain. They are usually the farmers (on-farm genetic diversity), gene banks, crop breeders, seed processors, seed traders (formal and informal), wholesalers, retailers and users (farmers).

Seed service providers support the operators in their activities with knowledge, inputs, finance, certification, research and extension. These service providers include both public and private

organisations. It should also be recognised that farmers and their local structures are able to become effective service providers.

Seed enabling environment: this relates to the context in which operators and service providers perform their functions, and includes governance, legislative and regulative frameworks and the economic environment. In protracted crises we know that the seed enabling environment can be particularly challenging because of, for example, the absence of effective government and the poor functioning of agricultural extension services. It is also known that humanitarian enterprises may not encourage a seed enabling environment.

Major shocks and stressors: in protracted crises, the impact of major shocks and stressors on the function of seed value chain operators and service providers is a critical aspect in developing resilience capacity.

A seed value chain covers the process of activities from the use of plant genetic resources to the marketing or distribution/sharing of seed of a specific variety and a certain type of quality to farmers or by farmers to fellow farmers. This also includes when farmers develop a set of crops and varieties tested over time to fit into their agro-ecological conditions. Seed value chain analysis identifies the operators and service providers and their activities in the seed chain in formal, intermediary, and informal seed systems. Linkages between operators on the one hand, and between operators and service providers at the other hand, are guided by the enabling environment in the seed value chain. This is related to seed related policies, regulations and guidelines, and also to government land policies, credit conditions and so on. In protracted crisis situations, (informal) seed value chains may extend into internally displaced communities/camps and into refugee hosting areas, so that the chains include a cross-border seed value chain component. Box 1 explains the basic activities of the operators.

Box 1: Activities of operators in seed value chains

- **Plant genetic resources management**: management of the genetic resources maintained as the basis of crop diversity management and variety development. This is largely crop diversity maintained in the farmers' fields, stored in gene banks and community seed banks.
- **Variety development**: the process of breeding and selection of new varieties, including the testing of varieties within different agro-ecologies for different user groups. This is not only formal plant breeding, but also farmers' own breeding and selection over a period of time to develop suitable varieties.
- **Early generation seed (EGS) production:** in the context of formal seed systems and to some extent intermediary seed systems, EGS production means maintenance of breeders' seed, and the production and dissemination of pre-basic and basic seed. In the context of informal seed systems, this explanation of EGS production does not fully fit. However, the concept of maintaining a mother plant exists among nodal farmers and custodian farmers; they provide special care such as selection of healthy panicles/cobs/heads from the centre of grain plots, which is an example of seed multiplication.
- **Seed multiplication:** the multiplication of early generation seed into certified, quality declared, or other quality classes of seed, to be used for crop production.
- **Seed marketing and dissemination:** the collection, distribution, exchange/bartering and sales of seed.

The analysis of linkages between value chain operators allows for a better understanding of the functioning of seed chains, including seed chains that link hosts, internally displaced and refugee communities and returnees.

For each component in the chain, different services are provided by a variety of stakeholders; see the examples of services elaborated in box 2. One stakeholder may provide different services to different components in the seed value chain. For example in the community-based seed system, the extension service may support farmers in the management of their genetic resources, but may also support them in the marketing/sharing of seed into neighbouring communities. The identification and analysis

of services provided to the different operators allows for a better understanding of the performance of the seed chain.

Box 2: Types of services provided within seed value chains

- **Rural seed extension:** promoting variety management and seed quality at farmer and community levels; strengthening of informal seed systems through community seed banks, seed fairs, organization of farmers in community-based seed production schemes, and so on.
- **Variety testing and release**: identification of varieties matching specific agro-ecologies and demands of farmers; the subsequent release of these varieties for seed production.
- **Quality assurance in seed production**: different quality assurance mechanisms, varying from those in seed informal systems (seed of confidence), to quality declared and certified seed, and accreditation of seed producers and companies.
- **Quality assurance in seed commercialization**: quality management mechanisms ensuring that the commercialization of seed and varieties follows agreed standards in terms of quantity, quality, price and time.
- **Business management services**: development of business plans for entrepreneurs, and support in associated investments.
- **Financial services and management**: specific financial products for financing seed production (basic seed and input purchase) and seed marketing (promotion); facilitating investment through loans for the purchase of processing equipment, transport and storage facilities.
- **Marketing information and promotion**: rural extension work promoting the use of quality seed and providing vital marketing information back to operators in the seed value chain (plant breeders, early generation and quality seed producers, and agro-dealers).

Applying value chain analysis to seed systems has the advantage that it emphasizes the importance of the farmers, (that is, seed consumers) as main drivers of the value chain (sometimes under a lot of pressure in a protracted crisis, with the humanitarian system promoting free seed distributions or pushing particular types of agency preferred seed). Farmers who buy or access the seed as input for their crop production may be the first operators in a larger product value chain. The commercial seed connects the seed value chain and the product value chain. Well established product value chains often request quality seed, and are very powerful in pulling seed value chains. The enabling environment may also be important in promoting a product value chain and pulling associated seed value chains. However, it is known that in protracted crises the enabling environment is complex and under stress.

Seed value chain analysis is a powerful tool, providing ample insights for the development of programmes and policies that match a diversity of realities.

HOW should seed value chains be conducted?

General guidance

Seed value chain analysis is carried out on seed systems that have been already identified at the Torit and Yambio level (output of SSRA tool no 4). The seed value chain analysis is facilitated by a' social economist with knowledge and background in the agricultural and seed sector. This analysis is done in multi-stakeholder workshops or focus group discussions with key informants. Participatory mapping of the seed value chain can be conducted with participants drawing, and thereby characterizing and analysing, the seed value chain that their organizations are involved in. Since different stakeholders in the seed value chain have often very different perspectives on bottlenecks, opportunities, and the potential of different interventions, seed value chain analysis demands participation of a full range of stakeholders involved in the seed value chain. Therefore, the workshop in which a seed system analysis is being discussed can be further used to conduct a seed value chain analysis. In such workshops, it is important to include representatives from IDP/refugee and returnee populations, to establish the extent to which they are or should be linked into the seed value chain.

The seed value chain analysis of major seed systems requires half days in multi-stakeholder workshop settings, where different stakeholder groups can work in parallel smaller groups.

Step 1: Characterisation of seed systems of the specific region

This is the output of SSRA tool no 4. The study team should present the seed systems analysis of a specific region such as Torit and Yambio level. An example is shown in Table 1.

Table 1 *An example of a seed systems analysis for a specific region.*

Seed system/ Characteristics	Informal	Intermediary		Formal	
	Farm-saved seed	Community-based seed production	Seed relief	National companies	International companies
Key stakeholders (name)	farmers	farmers' group, seed producer groups	organisation involved	public or private seed companies	seed companies
Type of crop(s)	local food crops	food and cash crops	food crops	food and cash crops	cash crops
Major crops (name)	sorghum, cassava	beans, groundnut	maize, rice	maize, beans, soybean and groundnut	tomato, cauliflower, ...
Type of varieties	landraces, improved	local and improved	improved	improved (open-pollinated varieties and hybrid)	improved (hybrid)
Seed quality	farm-saved	quality declared seed (QDS) and certified	unknown,	certified	certified or truthfully labelled
Dissemination system	informal exchange	exchange, local marketing	free distribution or vouchers	marketing through agro-dealers and government dissemination	export, marketing, agro-dealer networks

Step 2: Choosing key indicator crops for each seed system

Participants in the multi-stakeholder workshop choose a maximum of three key indicator crops for each seed system, as shown in Table 1. Indicator crops in a protracted crisis context should be those crops central to a farmer's ability to maintain or improve food production in the face of local shocks and stressors.

Table 2 *Selection of three indicator crops for each seed system (example).*

Seed system/ Characteristics	Informal	Intermediary		Formal	
	Farm-saved seed	Community-based seed production	Seed relief	National companies	International companies
Indicator crops	sorghum millet am	bean cassava sweet potato	maize (OPV) maize (hybrid) rice	maize (OPV)	hybrid maize, tomato

Step 3: Development of a seed value chain map

A representative seed value chain map is developed for each system, based on the indicator crops (an example is shown in annexe 1). This map is helpful for facilitating group discussion in subsequent steps. The seed value chain map can be developed by considering the following questions.

- How are operators linked?
- Which services are private and which services are public?
- What are the links between operators and service providers?
- How does seed move between operators?

- What are the conditions under which seed moves? (contractual arrangements, credit)?
- How do financial resources (or other capital, including social capital contributing to stability/social cohesion, flow between stakeholders?
- How does information flow between stakeholders?
- How do stakeholders communicate?
- Which policy and regulatory frameworks affect which functions of the operators and service providers?
- How do stakeholders communicate with/between/among host/IDP/refugee/returnee communities?

Step 4: Seed value chain steps analysis

A seed value chain steps analysis is done for each seed system, following the information and guiding questions as given in Table 3. This step is repeated for all the seed systems identified in step 1.

Table 3 *Example - seed value chain steps analysis of maize and rice crops in formal (public) seed system.*

Value chain steps	What is the current status?	Which stakeholders are involved?	What are the challenges (risks)?	How have things changed in the face of major shocks and stressors?	How it can be sustainable?	What are the opportunities for building resilience? (absorptive/ adaptive/ transformative)
Varieties						
Source of early generation seed						
Seed quality assurance						
Seed processing and storage						
Seed distribution and marketing						
Seed extension						
Seed policy and regulatory framework						

Step 5: Synthesis of seed value chain steps analyses

The study team consolidates the step 3 outputs in a report format for each seed system of the region, that outlines the current status and pathways of addressing the challenges that hamper the performance of seed operators and service providers; gives an analysis of the policy and regulatory framework and outlines the actions that contribute to, and/or could contribute to, the sustainability and resilience of the seed systems.

Annex 1: seed value chain map of maize in a formal seed system (an example from public seed enterprise in Ethiopia)

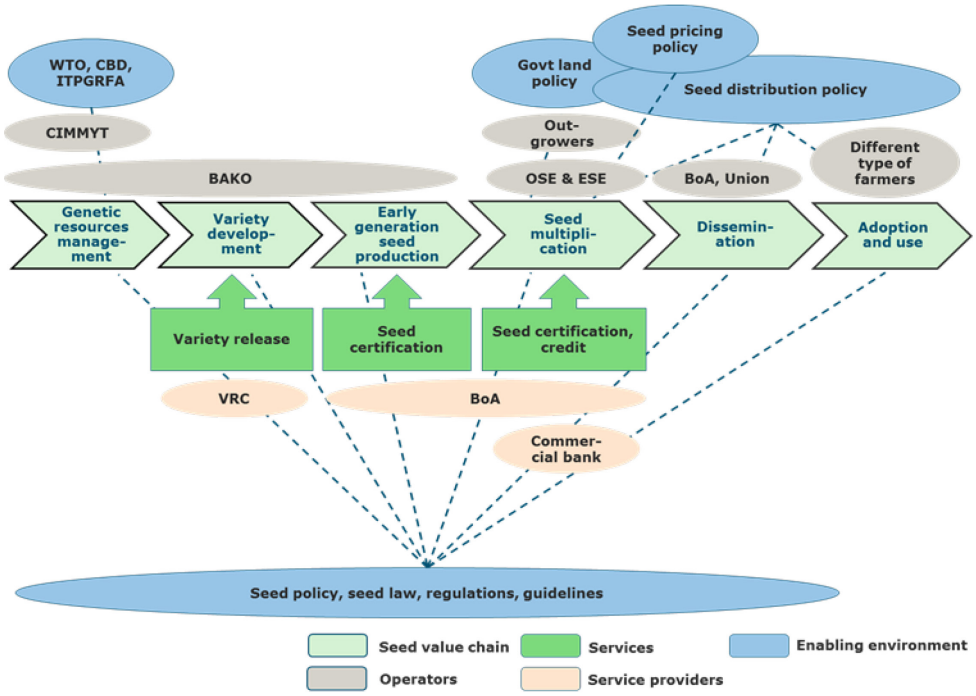

Figure 1 *Seed value chain of maize in the public seed enterprises system in Ethiopia.*

Operators: International Maize and Wheat Improvement Center (CIMMYT); Bako Agricultural Research Center (BAKO); Ethiopian Seed Enterprise (ESE); Oromia Seed Enterprise (OSE); outgrowers of public seed enterprises (Outgrowers); Bureau of Agriculture (BoA); farmer unions (Unions); different types of farmers.

Service providers: variety release committee (VCR); Bureau of Agriculture (BoA); commercial banks.

Enabling environment: World Trade Organization (WTO); Convention on Biological Diversity (CBD); ITPGRFA: International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA); government land policy; seed pricing policy; seed distribution policy; seed policy, seed law, regulations, and guidelines.

A3 The major livelihood zones and agro-ecologies of South Sudan

The major agro-ecologies[15] within which the REPRO South Sudan project will focus are:

i. *Equatoria maize and cassava zone (SS01):* This zone is characterized by equatorial rain forest concentrated particularly on the Uganda, Democratic Republic of Congo (DRC) and Central African Republic (CAR) borders. This is the only part of South Sudan with typical bimodal rainfall pattern and two reliable seasons. Precipitation is about 1 100 mm to 1 500 mm per annum in both rainy seasons. First rains normally commence around March with a break in late June and restart a second time in July through November. **Major crops include maize, beans, sorghum, groundnut, cassava and sweet potato**.
The identified project catchment area for this zone is **Yambio and Torit**, although Torit catchment extends to zone SS03 as well.

ii. *Ironstone plateau agro-pastoral livelihood zone (SS02):* this zone cuts across the former Central Equatoria State (CES), Western Equatoria State (WES) Lakes, and Warrap and Western Bahr El Ghazal (WBEG) State. Predominantly cultivated crops are **sorghum, groundnut and sesame**. Other crops are maize, cowpea, green gram (Lakes), cassava and sweet potato. More than 80 percent of the households in this zone keep livestock.
This zone will be represented by the **Wau** catchment area in WBEG.

iii. *Highland forest and sorghum zone (SS03):* This zone cuts across CES and Eastern Equatoria State (EES) but is located along the mountain ranges of the Greater Equatorial region and the border with Ethiopia and Uganda. Its topography is characterized by highlands and foothills with a mixture of forest, bush shrubs and grasslands. The zone has a unimodal rainfall pattern with average precipitation of about 1 100 mm to 1 300 mm per annum. There are two distinct seasons; a rainy season from April to November and a short dry season from December to March**. The main crops are sorghum and maize**, with the latter growing mainly in the eastern parts of the zone. Other crops cultivated in this zone include millet, sesame, cowpeas/green grams, sweet potatoes, cassava and groundnut.
This zone will be represented partly by the **Torit** in EES and **Akobo** in Jonglei catchment areas.

iv. *Western plains groundnut, sesame and sorghum (SS04):* This zone is mainly located in WBEG and some parts of WES and Northern Bahr El Ghazal (NBEG) state. It is characterized by highlands, foothills and parts of the Ironstone plateau. Vegetation in the area is a mixture of forest and grasslands with mahogany and bamboo trees. The zone has a unimodal rainfall pattern, with average precipitation of about 900 mm to 1 100 mm. There are two main seasons; the rainy season, which starts in April to October, and the dry season from November to March. Soils are mainly relatively fertile sandy clays. The main crops cultivated include **sorghum, cassava, groundnut, sesame**, cowpeas, sweet potatoes and assorted vegetables.
This zone will be represented by the **Wau** catchment area, with River Jur and Wau counties being potential areas for project implementation.

[15] https://fews.net/sites/default/files/documents/reports/Livelihoods%20Zone%20Map%20and%20Descriptions%20for%20South%20Sudan.pdf

v. *Eastern plains sorghum and cattle zone (SS06*). This livelihood zone is located in eastern flood plains in the former Jonglei state. It can be described as zone of short unimodal rainfall with annual precipitation ranging from 600 mm to 900 mm. The rainy season is normally between June and mid-October, and dry season from Mid-October to May, respectively. The major crops grown include **sorghum and groundnut** and some maize in addition to **cowpeas** and groundnuts.
The catchment area for this zone is **Bor**, with Bor, Twic East and Bor South counties being potential areas for project implementation.

vi. *Western flood plain sorghum and cattle zone (SS07).* This is predominantly agro-pastoral zone covering the former Warrap state, parts of Lakes and Northern Bahr El Ghazal (NBEG) states. It has a very short rainy season that often starts in June and ends in September, with annual precipitation being between 500 mm to 700 mm. The most commonly grown crops being **sorghum and groundnut,** and millet. **Cowpeas**, green grams and sesame are also grown on a limited scale.
The catchment area for this zone is **Aweil**, with Aweil East, Aweil South and Aweil West counties being potential project implementation areas.

vii. *Northern sorghum, sesame and livestock (SS011).* This livelihood zone is located mainly in the former Upper Nile state and has very short rainy season of about 2.5 to 3 months starting from July with annual precipitation of about 300mm. It is an agro-pastoralist zone where farmers **grow sorghum and sesame** in large acreages (Renk Mechanized Agriculture) ranging from 100 to 1 000 feddans[16]. Other crops grown by farmers are **maize, groundnuts and cowpeas**.
The catchment area for this zone is **Renk**, with Renk and Melut counties being potential project areas.

[16] A feddan = 4200 m^2, approximately one acre

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