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Seed security in theory and practice: a comparative study of seed security frameworks and their use

By Sarah Paule Dalle and Ola Tveitereid Westengen



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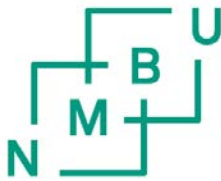
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**Department of International Environment and Development Studies,
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FOREWORD

Seeds and planting material are fundamental assets in all crop production and thus at the heart of food system resilience. The ongoing Covid-19 pandemic and the health policies meant to break chains of virus transmission are also affecting the chains of seed transmission around the world. The humanitarian sector as well as the commercial seed sector have called on policymakers and other actors to take measures to allow seed flows to continue in the various social networks and value chains farmers rely on. In this context, the concept of seed security and its practical operationalizations in humanitarian and development interventions is more relevant than ever.

In 2018, Noragric carried out a study commissioned by the Norwegian Agency for Development Cooperation (Norad) entitled *Seed security in theory and practice: contributions in the Norwegian aid sector*. The current publication is an adapted and updated version of that study. We believe the historical and comparative focus in this report is of value to a broader readership, especially given the current surge in interest in seed security. The [SeedSystem.org website](#) is a tremendous source of information, statements, guidelines and tools for seed security assessments and interventions and we highly recommend this source to everyone interested in the latest updates on seed security development under the global pandemic. From the breadth of actors involved and the content of the [joint organizational statements](#) and [guidance](#) it seems the current crisis is about to lead to the much needed expansion of the seed security concept from the humanitarian sphere into long-term seed system development work called for in this report.

More than two decades of research and experience in seed security work has yielded salient lessons for how seed matters are handled in the current crisis. Warning against seeing the crisis as an opportunity to roll out universal and standardized seed development interventions, the scholars and practitioners in the field rather urge all development actors to base all actions on evidence and to first and foremost focus on strengthening the existing seed systems farmers use.

We hope this report will be useful for practitioners, policymakers and scholars interested in understanding and discussing the perspectives and frameworks used to gauge farmers' seed systems and seed security situation. The diversity of approaches compared in this report is itself a healthy sign for a literature and practice field that must remain able to constantly adapt to new realities on the ground.

LIST OF ABBREVIATIONS

CARE	Cooperative for Assistance and Relief Everywhere
CGIAR	Consortium of International Agricultural Research Centers
CIAT	International Center for Tropical Agriculture
CRS	Catholic Relief Services
DCG	Drylands Coordination Group
FAO	Food and Agriculture Organization of the United Nations
MFA	Norwegian Ministry of Foreign Affairs
NGO	non-governmental organization
NMBU	Norwegian University of Life Sciences
NORAGRIC	Department of International Environment and Development Studies, NMBU
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OFDA	Office of United States Foreign Disaster Assistance
PGRFA	plant genetic resources for food and agriculture
RTB	Roots, Tubers and Bananas Programme
SSA	seed security assessment
UN	United Nations
UNHCR	United Nations Refugee Agency
USAID	United States Agency for International Development
USC Canada	Unitarian Service Committee of Canada
WFP	World Food Programme

EXECUTIVE SUMMARY

In general terms, seed security is achieved when farmers have access to enough seeds of the right type. Seed security has direct influence on agricultural production, diversity and resilience, and contributes to food and livelihood security for households who depend on agricultural production.

As a concept, seed security helps to understand what constrains farmers' access to good quality seed of appropriate varieties. Frameworks based on the seed security concept unpack the complexity of seed systems by disentangling key dimensions such as availability, access, quality, varietal suitability and diversity – and to some extent provide measurable indicators of these dimensions. The analytical frameworks also serve as frameworks for designing interventions to strengthen seed security. In this regard, seed security is an extremely relevant concept for the development sector.

This report has two major parts. In the first part we provide an historical account of the origin and evolution of the concept within the humanitarian sector and discuss usefulness and potential of seed security frameworks for long-term seed system development. In the second part we present a case study of the use of the frameworks in the Norwegian development sector.

History and current potential

The origin of the concept stems from analyses of seed relief experiences in the 1990s. These studies found that needs assessments were not carried out in the majority of seed relief efforts and instead the need for seeds was inferred indirectly from food security/crop harvest data or simply assumed. However, more in-depth analyses found that seed systems were often quite resilient, and seed continued to be available through other channels especially local markets, but also through exchange or gift. Based on these analyses, it was argued that specific seed security assessments were needed that could, for example, distinguish between problems of access and availability, as well as identify the underlying causes of seed security problems. More targeted responses were advocated, building on the existing seed systems and farmers' coping strategies.

The seed security concept was used as a basis for the development of assessment tools to diagnose the specific nature of seed security problems and identify appropriate programming responses. A comprehensive guide for seed system security assessment, *When Disaster Strikes: A Guide to Assessing Seed System Security*, was published in 2008 by the International Center for Tropical Agriculture (CIAT) – the core reference for Seed System Security Assessments up to this date. Most recently, seed security is being adapted for use in response to the COVID-19 pandemic.

While the seed security concept is still mainly used in the humanitarian sector it is also beginning to be used in longer-term seed system development efforts and by a broader set

of actors. We highlight the contributions from FAO, the CGIAR Research Program on Roots, Tubers and Bananas (RTB), and the Canadian non-governmental organization (NGO) SeedChange (formerly USC Canada) in the evolution and diversification of the concept and related tools. While the existing tools can be used in non-emergency contexts, the CGIAR/RTB and SeedChange examples show that considering seed security in a long-term perspective can bring new elements to the forefront, such as the policy context governing seeds and seed systems.

Seed security assessments (SSA) have been integrated into USAID's Office of Foreign Disaster Assistance guidelines for proposals and the Sphere Project's *Humanitarian Charter and Minimum Standards in Humanitarian Response*. Some NGOs, as well as the FAO, are routinely conducting or commissioning field assessments. The more widespread use of seed security assessments and related tools represents a professionalization of seed relief and has the potential to do the same for long-term seed system development.

In spite of the increased awareness and institutionalization of seed security frameworks, the use of the frameworks remains limited. In a systematic review, FAO estimated that between 2003-2013, only 10% of post-disaster seed related interventions carried out in eight countries of the Sahel and in the Horn of Africa had been based on seed security assessments. Furthermore, they found that the quality of assessments carried out varied both in terms of their methodology as well as the extent to which appropriate responses had been identified from the analysis. The effective use of the evidence is impeded by factors such as norms or vested interests, prior experience of the assessment teams, and implementation capacity. Wider usage entails increasing the profile and capacity of seed issues in general and acceptance for use of frameworks and tools that are more tailored to the specific intervention context.

A significant challenge to wider usage is linked to the fact that conventional formal seed system development dominates among governments and international development actors. This approach to seed system development focuses on substituting informal seed systems with formal systems in a linear fashion and is rarely based on local seed system security assessments. There is not necessarily a conflict between efforts to formalize seed systems and efforts emphasizing building on what works within farmers' seed systems today. Indeed, the Integrated Seed System Development promoted by several actors involved in long-term development emphasizes the complementarity of strengthening several types of seed supply chains. However, seed policy development that mainly aims at supporting formal seed system development can sometimes lead to the establishment of legal provisions (particularly seed laws) that inhibit or ban practices that are important for the functioning of farmers' seed systems. The seed security concept can hopefully help bring forth seed system analyses that inform policymakers and development actors of potential harmful side effects of formal seed system development and promote more integrated approaches.

Seed security in Norwegian development cooperation work

Our historical analysis shows that Norway played an important role in the early phase of the development of the seed security framework and related tools; and has integrated some key learnings in white papers on humanitarian aid.

Norway is today an important donor and policy actor on genetic resources, while its contribution to seed work is done primarily through the interventions of Norwegian NGOs. Although more in-depth knowledge may exist at the level of local partners and country offices, in general the awareness of seed security concepts and tools among Norwegian NGOs appears to be relatively limited. Of the eight organizations reporting to be involved with seed-related activities, only three stated that they used seed security concepts or tools in their work. Two of the NGOs identified seed security as a goal they work towards and stated they used indicators to monitor seed security, while one of these also used seed security conceptual frameworks and conducted seed security assessments in one of their country programmes. The third organization used seed security as a way to describe their seed-related work in narrative texts. The core dimensions of availability, access, quality and varietal suitability are generally recognized by the interviewed staff in these three organizations. In addition, some important additional dimensions were mentioned by one or more: capacity to produce seed locally; meeting future needs; presence of reserves; and favourable policies that recognize farmers' rights and seed systems.

Given Norway's involvement in the seed security approach at an early stage of its development, as well as its strong track record in supporting international efforts on plant genetic resources, the country has a good basis/rationale for re-engaging with the operationalization of seed security both in humanitarian and longer-term development contexts. There are several opportunities for this.

Capacity building within the Norwegian aid sector on seed system and seed security approaches is one potential area of engagement. In addition to building greater awareness and technical capacity, it may be relevant to support the development of simpler tools that are better adapted to the programming contexts and capacities of organizations who are less specialized in seeds. The development of Norwegian guidelines for seed relief could also be considered and incorporated into proposal guidelines, as USAID/OFDA has done.

Norway has consistently identified the area of disaster risk reduction, and linking humanitarian response with long-term development, as a priority for its development policy. This is an area of seed security where Norway could potentially make a significant contribution. Norwegian support for the further development and implementation of seed security concepts and tools within longer-term development contexts would complement efforts of FAO and other actors whose support is by and large focused on post-disaster seed aid. This could be done with an eye to informing disaster risk reduction strategies and action plans, seed policy, as well as to link efforts within conservation and sustainable use of genetic resources to both the short- and long-term development agendas for food and livelihood security.

1. INTRODUCTION

Norway is a significant contributor to international efforts promoting conservation and sustainable use of crop diversity. The rationale for investing in conservation and sustainable management of plant genetic resources for food and agriculture (PGRFA) is commonly framed in terms of the fundamental importance these resources have for global food security. A theory of change linking availability of crop diversity with food security must involve the farmers putting the diversity to work. Arguably, farmers need to be *seed secure* before they can be *food secure*. This study explores the current and potential contribution of seed security as a unifying concept for short- and long-term development efforts in the seed sector.

Over the last 15 years, the concept of seed security has been developed by several institutions (including CIAT, CRS, and FAO) to design conceptual frameworks and assessment methods that can be used to strategically guide interventions for strengthening farmer seed systems. Initially, seed security was described by the three components of “availability, access and quality”, mirroring similar constructs for food security (Remington et al., 2002; Sperling, 2008). More recently, “resilience” and “varietal suitability” were added to FAO’s Seed Security Conceptual framework and assessment guidelines (FAO, 2015, 2016).

These methods have been primarily developed for use in the humanitarian sector, to improve efforts to deliver seed aid, i.e., short term interventions to help farmers rebuild their seed systems affected by conflict, drought, or disasters. Though less well explored, the seed security approach also holds relevance for medium- to long-term development efforts aiming to strengthen farmers’ seed systems. For example, Sperling and McGuire (2012) review how to apply the seed security framework to design initiatives aimed at enhancing resilience, nutrition, or income generation.

Despite the active promotion of seed security frameworks and tools by FAO and other actors, the extent to which this approach has informed development practice has not been extensively researched to date. The questions this report focuses on are:

1. What are the current or potential contributions of the Seed Security framework for humanitarian and development-oriented seed system work?; and
2. To what extent has Seed Security been adopted as a framework informing the seed system work of humanitarian and/or development actors in the Norwegian aid sector?

This study provides an up-to-date review of the evolution and contributions of the seed security framework and its influence on humanitarian and development practice, using the Norwegian aid sector as a case study. It is based on a review of the international literature, interviews with key informants (Annex 1) and a survey of Norwegian NGOs (Annex 2). The report should be useful for organizations supporting or implementing seed system work both in Norway and internationally. In addition, by analyzing how seed security is used within both humanitarian and development contexts, the study contributes to improving

understanding of the relationships between humanitarian and long-term seed system development efforts.

2. SEED SECURITY: ORIGIN AND DEVELOPMENT OF THE CONCEPT

a. ORIGIN

Although possibly used earlier, seed security as a concept began appearing in the scientific and grey literatures in the 1990s (Figure 1), particularly within the context of several workshops organized by FAO to examine seed aid in humanitarian relief efforts (FAO Seed and Plant Genetic Resources Service, 1998; FAO, 1999).

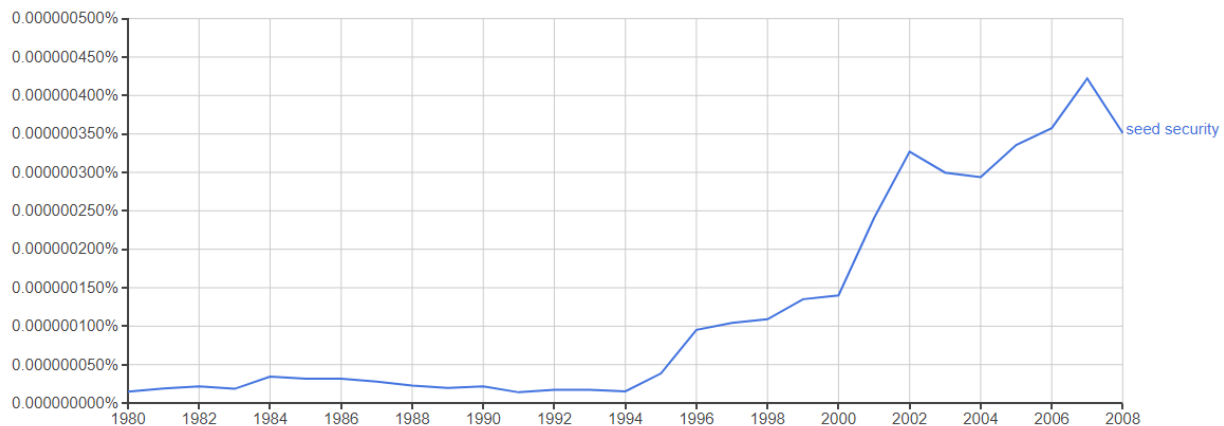


Figure 1. Occurrence of “seed security” in the Google Books database, corrected for number of books published annually. Source: Google Ngram Viewer.

These workshops were organized as part of the implementation of the first Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (PGRFA) (FAO, 1996). Adopted by 150 countries, the Global Plan of Action identified 20 priority actions to guide national strategies. Activity 3, "Assisting farmers in disaster situations to restore agricultural systems", was one of the actions identified under the theme "In Situ Conservation and Development". The plan noted that PGRFA could be lost as a result of disasters/emergency situations and thereby threaten the resilience of agricultural systems. It recommended that:

Governments with cooperation of relevant farmers' organizations and communities and UN bodies and regional, intergovernmental and non-governmental organizations should establish necessary policies at all levels which will allow unhindered implementation of seed security activities in response to calamities (p.23).

The securing of ex-situ germplasm collections (e.g. through duplication in gene banks outside the country and/or emergency collection missions), and pinpointing of mechanisms

for the identification, acquisition, multiplication and re-introduction of landraces or farmers' varieties were proposed as strategies that should be pursued.

Following the establishment of the Global Plan of Action, two workshops were organized by FAO to discuss implementation of Activity 3, with a specific focus on seed security:

- The International Workshop on Seed Security for Food Security: Contributions for the Development of Seed Security Strategies in Disaster-prone Regions, held in Florence, Italy, 30 November-1 December 1997 (FAO Seed and Plant Genetic Resources Service, 1998).
- The International Workshop on Developing Institutional Agreements and Capacity to Assist Farmers in Disaster Situations to Restore Agriculture Systems and Seed Security Activities, held in Rome, Italy, 3-5 November 1998 (FAO, 1999).

The following definition of seed security initiatives was offered at the 1998 workshop:

A seed security programme can be defined as a series of activities developed to ensure access of farming households - men and women - to adequate quantities of quality seeds and plant materials of adapted crop varieties at all times. In this definition, **access** implies that the source of these seeds should be within an acceptable distance, in a timely manner and at affordable prices, while **at all times** refers to the availability of appropriate seed stocks each and every growing season regardless of good or bad growing conditions and/or natural or man-made calamities" (FAO, 1999, p.3).

The 1998 workshop reviewed empirical case studies of seed relief experiences in Angola, Afghanistan, Bosnia, and Rwanda, and presented background papers on key themes such as how to characterize disasters, the nature of farmer seed systems, protection and conservation of plant genetic resources, the impact of regulatory frameworks on seed security, seed stocks and seed multiplication in emergency situations, and food and seed assistance in recovery to crisis.

One of the key insights that emerged from the workshop was that the impact of disasters on farmer seed systems (and by extension, seed security) are often complex and varied (Conclusion #3). For example, the Rwanda case study illustrated how the seed supply systems of two crops – beans and potatoes – were affected very differently following the civil war and genocide that occurred in 1994 (Sperling, 1999). Bean farmers relied on a diversity of local varieties. Following the war, seed was generally available in local markets, but many farmers faced insecurity due to the lack of assets to purchase the seed. On the other hand, for potato, a more general problem of availability of clean seed was experienced. This occurred because farmers relied on the formal sector – particularly the national agricultural research service and development projects – to obtain potato seed, and these sources were not operational following the war. These and other insights had been identified through in-depth assessments carried out by CIAT, as part of the “Seeds of Hope” project.

The workshop also concluded that inappropriate responses could result in further disruption of seed systems (Conclusion #7) and were often due to lack of preparedness (Conclusion #8). For instance, the Angola case study described how efforts to resettle and rehabilitate vulnerable populations in the mid-1990s were initially hampered by the distribution of seed that was poorly adapted to the diverse agroecological conditions within the country (Nankam, 1999). The workshop used the term “variety-sensitive seed relief” to draw attention to this issue.

Thus, from the Global Plan of Action’s initial focus on the consequences of seed loss during emergencies as a potential threat to genetic resources, the focus shifted to the potential consequences for farmers’ access to seeds as a key livelihood asset. Consequently, by 2000, the “seed” in seed security was established as *planting material*, not as *genetic resources per-se*.

b. IMPROVING UNDERSTANDING OF SEED SYSTEMS AND SEED SECURITY

In the following years, researchers and practitioners deepened the analysis of seed relief efforts, (e.g., Sperling and Longley, 2002; Sperling *et al.*, 2004a; Sperling *et al.*, 2004c) and began to develop and test approaches and tools to improve the diagnosis, design and implementation of seed security interventions in post-disaster contexts (ICRISAT/INIA, 2002; Remington *et al.*, 2002; Sperling *et al.*, 2006; Sperling, 2008).

Analyses of seed relief experiences provided important insights into the functioning of seed systems as well as of the strengths and weaknesses in seed recovery efforts. Overwhelmingly, these studies found that needs assessments were not carried out in the majority of seed relief efforts and instead the need for seeds was inferred indirectly from food security/crop harvest data or simply assumed (Longley *et al.*, 2002; Sperling *et al.*, 2004b).

Often, the assumption made by the humanitarian agencies was that seed was not available in post-crisis contexts, and direct seed distributions (also known as “seeds-and-tools”) was the most common response. However, more in-depth analysis found that seed systems were often quite resilient, and in many contexts seed continued to be available through other channels especially local markets, but also through exchange or gift (Jones *et al.*, 2002; Sperling *et al.*, 2004b; McGuire, 2007). Varietal diversity was also found to be relatively resilient to acute stresses in several circumstances. Bean diversity in Rwanda for example was more affected by disease (root rot) than it was by the harvest losses and mass displacement due to the civil war (Sperling, 2001; Buruchara *et al.*, 2002).

Problems of seed availability did sometimes occur, for example, as in the case of the breakdown of the formal seed channels that produced clean potato seed in Rwanda, mentioned above (Sperling, 1999; Buruchara *et al.*, 2002). Disease outbreaks, such as that of cassava brown streak disease in Mozambique (Trædal and Berg, 2004), could

also lead to seed shortages of resistant varieties. However, the more common finding was that seed insecurity stemmed from problems of access to seed, due to households' loss of assets and financial resources as a result of the crisis (Buruchara *et al.*, 2002; Remington *et al.*, 2002; Omanga and Rossiter, 2004; Sperling *et al.*, 2004b; McGuire, 2007).

Several studies documented seed distributions being repeated year after year in some countries, for example in Kenya, Ethiopia, Burundi, Malawi and Zimbabwe (Sperling, 2002; Sperling *et al.*, 2004c; McGuire and Sperling, 2008). This suggested that seed insecurity was caused by more chronic stresses, and that short-term solutions (seed aid) were being used to address longer-term, more chronic problems. Furthermore, this phenomenon had led to instances of seed relief being institutionalized – and vulnerable farmers becoming dependent on “emergency” seed aid as a regular source of seed (Bramel *et al.*, 2004). This in turn was thought to undermine local markets where seed was often available.

Another important insight was that local seed systems (seed saved from own harvest, or obtained on local markets, or through exchange) were found to provide the vast majority of seeds used by farmers for most crops. Although it was often assumed that such seed was of low quality, and many donors required that certified seed be used in relief operations, research showed that this was not always the case (Jones *et al.*, 2002; Otsyula *et al.*, 2004).

Based on these analyses, it was argued that specific seed security assessments were needed that could distinguish between problems of access and availability, as well as identify the underlying causes of seed security problems (including chronic stresses) (Longley *et al.*, 2002; Sperling, 2002). More targeted responses were advocated, built on farmers' existing seed systems and coping strategies (Jones *et al.*, 2002; McGuire and Sperling, 2008). For example, agencies like Catholic Relief Services (CRS) developed approaches such as seed vouchers and fairs¹ as a way to address problems of access. This approach also aimed to provide farmers more control in the choice of crops and varieties, while supporting the role of local markets and traders (CRS *et al.*, 2002; Remington *et al.*, 2002; Catholic Relief Services, 2017). However, in a survey of farmers' perceptions of seed relief in Ethiopia, McGuire and Sperling (2008) found that some farmers preferred direct seed distribution as a source of new varieties.

¹ Seed vouchers are given to vulnerable households that can be redeemed at a dedicated seed fair in which local traders are invited to put their seeds on offer.

C. DEVELOPMENT OF THE SEED SECURITY CONCEPTUAL FRAMEWORK AND ASSESSMENT TOOLS

Conceptual framework

One of the key lessons learned from the above research and evaluations was that a more nuanced understanding of seed systems and seed security was needed to guide relief efforts. This led to the development of conceptual frameworks that could be used to guide seed security assessment. The first seed security conceptual framework was published by Remington et al. (2002) and further developed by Louise Sperling and colleagues (Sperling, 2008; Sperling *et al.*, 2008a). It was inspired by the USAID food security framework and identified three main parameters that were required for seed security: availability, access and quality² (Table 1).

The first two parameters were similar to the corresponding food security frameworks and reflected whether seed was available (from any source) at the right time and within reasonable proximity, and whether households had the means to access this seed. The “quality” parameter was quite specific to seed and included two distinct concepts: “Physical quality” included germination potential, physical purity, and being free from pests/diseases, while “varietal quality” referred to how well the characteristics of the varieties met farmers’ needs and preferences. Remington et al. 2002 argued that both physical and varietal quality are subjective, and that farmers’ standards and criteria may be quite different from those of the formal seed sector. Therefore, farmers should be involved in assessing quality.

In later presentations of the framework, Sperling and colleagues also included the concepts of acute and chronic seed (in)security as a cross-cutting parameter:

Acute seed insecurity is brought on by distinct, short duration events that often affect a broad range of the population. [...] While in normal times households may have various degrees of seed security, all may be affected during an acute event such as a flood or short civil disturbance. Chronic seed insecurity is independent of an acute stress or disaster, although it may be exacerbated by it. Chronic seed insecurity may be found among populations who have been marginalized in different ways. [...] Chronically seed insecure populations may have continual shortages of seed to plant; difficulties in acquiring off-farm seed due to lack of funds; or use low quality seed and unwanted varieties on a routine basis (Sperling *et al.*, 2008a).

Although inspired from food security frameworks, seed and food security are quite distinct phenomena (McGuire and Sperling, 2011). It is a central insight from seed security assessments that food insecurity is a poor indicator of seed insecurity. Thus, it should not be assumed *a priori* that people in need of food aid are in need of seed aid. On the other hand, for rural households whose livelihoods depend to a large degree on crop production, the

² In Remington the third parameter is called “utilization”, but in later presentations of the framework by Sperling and colleagues the term “quality” is used.

households' seed security situation is likely to have a direct impact on the households' food security situation.

Assessment tools

The seed security framework was used as a basis for the development of assessment tools to diagnose the specific nature of seed security problems and identify appropriate programming responses. A comprehensive guide for seed system security assessment, *When Disaster Strikes: A Guide to Assessing Seed System Security*, was published in 2008 by CIAT (Sperling, 2008).

The seed system security assessment methodology includes seven steps (Box 1) that move from describing the context of the assessment zone, crop and seed systems and characteristics of the disaster, to specifically assessing the post-crisis functioning of seed channels. Root causes (including chronic stresses) of seed insecurity as well as opportunities are also examined. Finally, appropriate short and long-term responses are identified based on the assessment findings.

The approach uses the parameters of the seed security conceptual framework (Table 1) to structure the assessment. For example, Step 5 includes analysis of the availability, access and quality of seed from seed sources used by farmers (home production, seed/grain markets, and formal channels), while Step 6 aims to identify the underlying chronic stresses that may lie at the root of the seed security problems identified. Step 7 involves identifying appropriate responses based on an understanding of whether the problems affect availability, access or quality, and whether they are due to acute or chronic stresses.

The guide reviews key concepts, guiding questions, and provides checklists for summarizing findings. Many of the key concepts behind the approach are also presented in a series of short practice briefs, entitled *Seed Aid for Seed Security: Advice for Practitioners* (Sperling *et al.*, 2006). Suggested data collection methods include desk review, key informant interviews, focus group discussions, market surveys and household surveys.

Box 1. Steps outlined in *When Disaster Strikes* (Sperling 2008) to guide seed system security assessment

1. Identify zones for assessment and possible intervention.
2. Describe the normal status of the crop and seed systems.
3. Describe the broad effects of the disaster on these farming systems.
4. Set goals for agricultural relief and recovery operations based on farmers' needs.
5. Assess the post-crisis functioning of seed channels to determine whether short-term assistance is needed.
6. Identify any chronic stresses that require longer term solutions and identify emerging development opportunities.
7. Determine appropriate short- and longer-term responses based on the analysis of priority constraints, opportunities, and farmer needs.

When Disaster Strikes has become the core reference for seed security assessment since its publication in 2008. A website, <https://seedssystem.org/>, has been established that provides practitioners resources and tools that are complementary to the 2008 guide. These include:

- Draft terms of reference for background consultancies to prepare for seed security assessment
- Examples of household questionnaires and checklists/formats for focus group discussions, key informant interviews and market surveys
- Templates and guidance for data coding, entry and analysis
- Guidance on developing workplans and budgets
- Practice briefs, publications and other resources on seed security
- Reports from seed system security assessments conducted around the world
- Recommendations for addressing seed security during and after the COVID-19 pandemic

Currently, there are seed security assessments from 15 countries available on the website, carried out between 2007 and 2017³. However, the approach has been used more broadly: FAO (2014) estimates that approximately 50 seed security assessments were carried out between 2003 and 2013, mostly in the Sahel and in the Horn of Africa, and efforts are now scaling up to use the approach in response to the COVID-19 pandemic (Sperling, 2020). In addition, as described in the next section, several organizations have begun adapting the approach for long-term development.

3. RECENT ADAPTATIONS OF SEED SECURITY TOOLS AND CONCEPTS

a. FAO'S REVISED SEED SECURITY FRAMEWORK

In 2015, FAO published a revised version of the seed security conceptual framework (FAO, 2015), based on input from an expert consultation (FAO, 2013). This was part of a European Union-funded project aimed at developing capacity and mainstreaming the use of seed security assessment in humanitarian contexts⁴. The 2015 framework offered the following definition of seed security:

Seed security exists when men and women within the household have sufficient access to quantities of available good quality seed and planting materials of preferred crop varieties at all times in both good and bad cropping seasons.

³ These assessments have generally been implemented by multiple institutions, including international and local NGOs and government agencies. CRS and CIAT have formed part of the core technical team on nearly all these assessments, with the United States Agency for International Development/Office of US Foreign Disaster Assistance (USAID/OFDA) being the major funder.

⁴ <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/seed-sys/security/en/>

Building on work by Remington and Sperling, the FAO framework makes two main changes. First, “quality” is defined as only referring to the physical quality of the seed, while a new parameter, “varietal suitability” was added to capture how well varieties met farmers’ needs and preferences. Second, “resilience” is added as a cross-cutting parameter. Resilience is defined as “the degree to which the household’s seed system can resist, adapt to and recover from shocks and stresses which threaten the integrity of household seed security” (FAO, 2015, p.10). A stronger resilience framing is included to reflect FAO’s strategic objective *Increasing the resilience of livelihoods to threats and crises*⁵, and draw further attention to preparedness (FAO, 2012). Finally, the FAO conceptual framework document includes some discussion on issues relating to measurement of seed insecurity suggests indicators that could be used to monitor each of the seed security parameters.

In 2016, FAO produced a Seed Security Assessment Practitioners’ Guide (FAO, 2016) that reflects the revisions made to the seed security conceptual framework. Compared to Sperling (2008), the Guide includes less information on what kinds of data to collect, while offering more guidance on how to prepare and organize a seed security assessment, and more detailed examples of how to interpret the results and identify appropriate responses for each of the seed security parameters. Further, the Guide does not focus specifically on the use of seed security assessment in post-disaster situations. Instead, practitioners are encouraged to adapt the assessment, depending on whether it is to be conducted in post-disaster/emergency, non-emergency or protracted crisis contexts.

An approach for analyzing resilience is also suggested:

Resilience is manifested in the degree of seed security in terms of seed availability, seed access, seed quality and varietal suitability after a shock. Thus, it can only be directly measured by changes in indicators for these aspects. In the seed security assessment this can be done in different ways. Using the household questionnaire, it is possible to identify different types of household and see to what extent they are resilient to a seed security shock such as a flood or drought. The reasons for resilience of a household can be derived from analyzing the associations between levels of seed security and various factors, including: diversity of income sources, diversity of crops planted, and levels of fungible assets. Household types that are less resilient can then be targeted for different kinds of interventions which would enable them to be more resilient to the next shock. The kinds of interventions would be no different from the ones already listed under the other parameters of seed security (p. 38).

As part of the above process, FAO made revisions to the seed security assessment tools developed by Sperling and colleagues, both to reflect changes in the conceptual framework and to streamline data collection. The tools were piloted with collaborators in eight

⁵ <http://www.fao.org/about/what-we-do/so5/en/>

countries in East and West Africa (Table 1), however they are not yet available on the FAO website.

b. MULTI-STAKEHOLDER FRAMEWORK FOR INTERVENING IN SEED SYSTEMS

Another adaptation of the seed security framework is the “Multi-stakeholder framework for intervening in RTB seed systems” (CGIAR, 2016) developed by CGIAR’s Research Program on Roots, Tubers and Bananas (RTB). This is an actor-oriented approach to the design and analysis of seed systems.

The basic idea behind the framework is that interventions can benefit from enhancing their understanding of the complexity of seed systems and, in particular, by examining the perspectives and roles of different actors in relation to different seed security parameters. A simple tool is proposed to facilitate reflection on the roles of different actors in the seed system that can be used in planning/programme design, monitoring or evaluation of seed system interventions. Although designed with RTB seed systems in mind, the framework can be used to analyze the seed system of any crop.

The tool consists of a matrix (Figure 2) which crosses two main variables: (1) actors involved in the seed system, and (2) components of seed security. The seed security components are based on a modified version of Sperling (2008), with the division of accessibility and quality into sub-components, and the inclusion of gender as a cross-cutting component (Figure 2, Table 1). A basic set of actors is suggested, but these can be adapted based on the specific context or crop.

Stakeholder	Availability/ supply	Accessibility			Quality	
		Delivery channel features	Affordability/ profitability issues	Info to create awareness & demand	Variety (incl. biodiversity)	Health, genetic purity, physiological age, and physical quality*
Policymakers						
National research						
International research						
Traders (local markets)						
Specialized seed producers						
Farmer organizations						
NGOs & national extension						
Private food sector						
Seed users						
Others						

Figure 2 Matrix used to guide analysis of the role of different actors in relation to seed security parameters. Source: CGIAR, 2016.

The tool is used by posing specific questions for each cell in the matrix, thereby producing an analysis of the role of different actors in relation to each seed security component. Examples of questions are provided but can be adapted based on specific needs. For example, suggested questions relating to varietal quality/diversity include:

- Policy makers: Do regulations promote the use of native varieties?
- Researchers: Is there a gene bank? Do researchers have access to it? Do they know what the local varieties are?
- Traders: What varieties do they sell? How do they know which variety is which?
- Seed users/farmers: What varieties are they growing? What is the cultural significance of the varieties? Local efforts to conserve varieties? What varieties are favored by women and disadvantaged groups?

The Multi-stakeholder Framework can be used to produce some information that is also included in Sperling 2008 – for instance, questions concerning the role of traders/seed companies would cover some of the information collected from market surveys and key informant interviews with traders as part of a seed security assessment. However, by including an actor-oriented approach, the framework can potentially draw more specific attention to opportunities and challenges relating to the roles of actors such as policy makers and donors that are important to consider in a longer-term development perspective. The inclusion of information and knowledge systems as a component of access (e.g. how farmers can access information about crop varieties) is also significant as this is often overlooked in seed security initiatives (Sperling and McGuire, 2012).

The user's guide (CGIAR, 2016) suggests different data collection approaches that vary in complexity, depending on capacity and objectives. For instance, a simpler approach could be based on a literature review and consultation with key informants, while a more in-depth assessment might also include market studies, multi-stakeholder workshops or field experiments. Sperling et al. (2013) also suggest that the framework can be used as a reflection tool, to generate hypotheses or map out strategies.

The framework has been used to analyze the results of 13 completed projects dealing with seed system interventions for roots, tubers and bananas (Andrade Piedra *et al.*, 2016). However, it has yet to be applied for project planning or monitoring (CGIAR, 2016).

c. SEED SECURITY ASSESSMENT FOR NON-EMERGENCY CONTEXTS: SEEDCHANGE

SeedChange (formerly USC Canada) is a non-governmental organization that “works with farmers around the world to strengthen their ability to grow good food, starting with local seeds” (<https://weseedchange.org/>). Their focus is on long-term development initiatives in the global South, as well as in Canada (<http://www.seedsecurity.ca>). Their work builds on the Seeds of Survival program which was initiated in Ethiopia in the late 1980s (Dalle and Walsh, 2015).

In 2013, SeedChange began working with the Cuban National Institute for Agricultural Sciences to develop a seed security assessment process that would be adapted to its long-term seed security programming. First piloted in three municipalities in Cuba in 2014, the methodology was further refined and trialed by local partners in Central America and Africa in 2015-16 (Table 1). Although the seed security assessments were conducted in localities that partners knew well, the assessments provided new insights and intervention strategies in several cases. For example, in Cuba, the assessment highlighted inefficiencies in the formal seed sector, and led to the creation of pilot local seed committees to promote seed production and manage certification for local supply.

Unlike other contemporary approaches, the SeedChange seed security assessment was designed for a regular crop production situation and not just for post-disaster emergency conditions. It was based on the premise that farmers face seed security on a day-to-day basis and not just in the emergency situation. Initially SeedChange used the same three key parameters of seed security as Sperling (2008), but following feedback from local partners, this was expanded (Shrestha, 2020). Like FAO (2015), the quality parameter has been unpacked, separating physical quality from the varietal attributes of the seed. However, SeedChange further divides FAO's "varietal suitability" parameter into the "adaptability" of the variety to local agroecological conditions, and a parameter called "seed diversity and/or choice" (Table 1). The latter is defined as farmers having choice for seeds with desired traits meeting their production, food, cultural, and market needs, and recognizes the fact that a diversity of varieties is often needed to meet the range of farmers' preferences and needs for a single crop.

Another difference is the addition of a parameter called "Capacity to produce and save own seeds" (Table 1). This parameter can highlight issues such as the technical knowledge and methods needed to produce certain types of seed, including farmers' knowledge and practice of selecting seeds (e.g. in standing crop vs. post-harvest) or whether regulations concerning registration and certification allow small-scale farmers to produce and sell local seed. Such factors can in turn influence other parameters in the framework. For example, selection practices can influence quality, while capacity to sell seed can influence availability and/or access. In this regard, "Capacity to produce own seeds" can be considered cross-cutting. SeedChange considers that the parameters of seed security – especially adaptability, seed diversity/choice and capacity to produce own seeds – provide a basis for farming communities to achieve seed sovereignty (Shrestha, 2020).

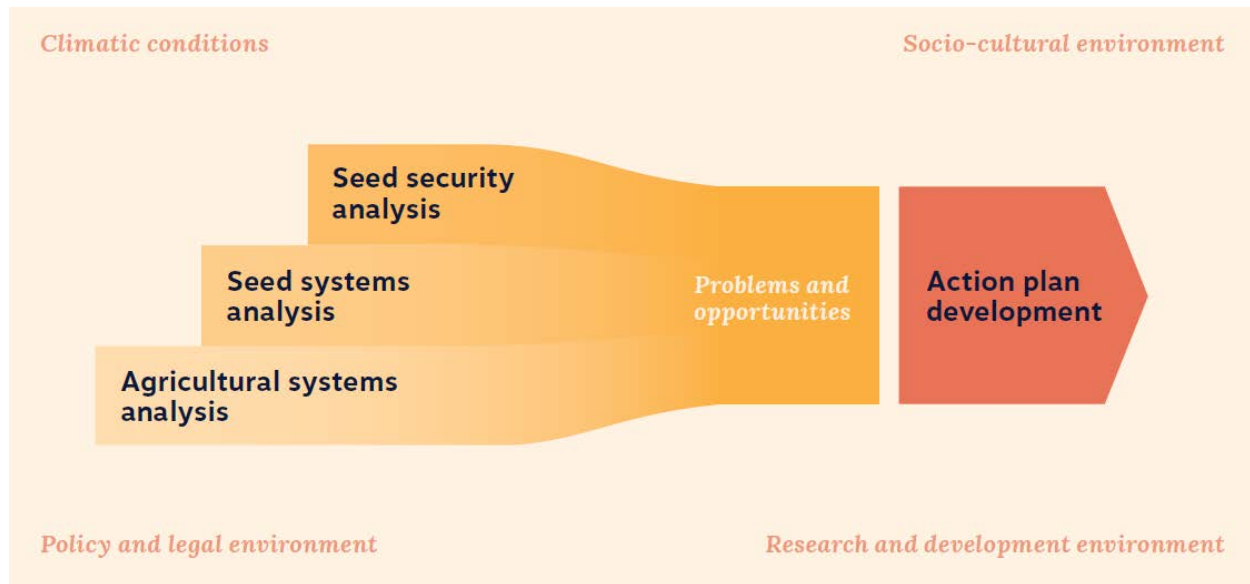


Figure 3. Overview of SeedChange's SSA approach. Source: Shrestha, 2020.

The SeedChange methodology is structured around four components (Figure 3). The first two components (Agricultural and Seed Systems Analysis) provide a broad context analysis, providing a detailed description of the farming, food and seed systems, as well as the associated climatic, socio-cultural, research and development, and policy and legal environments. This then feeds into the Seed Security Analysis, which assesses the functioning of the seed system in terms of SeedChange's six seed security parameters (Table 1), and the identification of intervention options based on the gaps and opportunities. The data collection methods include document review, focus group discussions, key informant interviews, and household survey. Participatory methods are used. For instance, in one exercise, focus group participants visualize the overall seed security status for each crop by rating its performance for each seed security parameters on a wheel (Figure 4) which can then serve as a basis for discussion of strategies.

One of the main adaptations for non-emergency contexts is the broader context analysis which gives attention to issues that are important to design longer-term interventions, such as farmers' access to, and participation in, agricultural research and development. SeedChange's focus on crop diversity also translates into the analysis of a broader range of crops than typical for a post-disaster assessment. The Seed System Analysis identifies varieties that have been lost from the area, as well as assessing the "diversity status" of different crops using the four-cell analysis, commonly used in on-farm agrobiodiversity initiatives (Sthapit *et al.*, 2006). To inform the analysis of farmers' capacity to produce own seed, the Seed System Analysis examines farmers' practices in terms of seed production, selection, processing and storage methods and practice, as well as community norms and practices to maintain seed quality, government policies and their effect on farmers' rights.

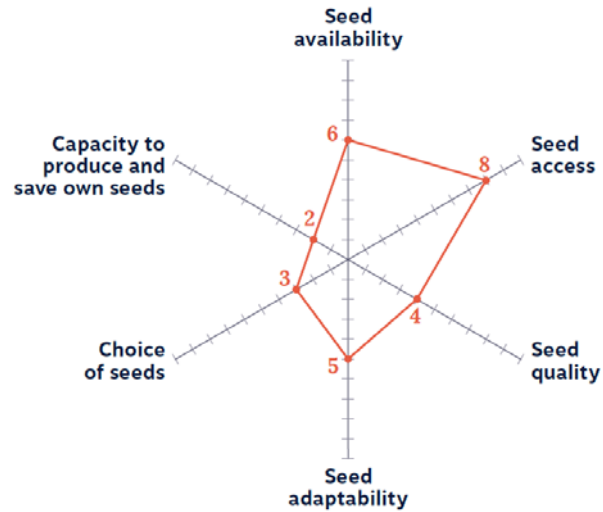


Figure 4. Participatory tool used to visualize the seed security status of different crops. Source: Shrestha, 2020

By contrast, Sperling's approach for post-disaster seed security assessment is more streamlined, focusing the analysis on a few key crops, and honing in on the most essential information needed to support a relief effort (mainly the post-crisis functioning of seed channels in relation to the availability, access and quality of seed for farmers). Some of the issues that are more prominent in the SeedChange approach (e.g. capacity to produce and save own seeds, policy aspects, access to extension services, etc.) could emerge from Sperling's analysis of underlying causes or chronic stresses affecting seed security. For example, a diagnosis of poor seed health could be linked to poor storage conditions at the household level, or other seed management practices. However, these are brought to the forefront in the SeedChange methodology.

Another difference is that Sperling's approach examines the functioning of local markets in more detail through market surveys and interviews with traders. This reflects both the important role of markets as a seed source, particularly in times of stress, as well as the emphasis on interventions aimed at strengthening local markets (Sperling and McGuire, 2010a; McGuire and Sperling, 2016). Such an analysis is also relevant for longer-term interventions but is not included in the SeedChange methodology.

Table 1. Comparison of seed security conceptual frameworks

Parameter	When Disaster Strikes (Sperling, 2008)	FAO Conceptual Framework (FAO, 2015, 2016)	SeedChange (Shrestha, 2020)	Multi-stakeholder framework (CGIAR, 2016)
Availability	Sufficient quantities of seed can be obtained within reasonable proximity (spatial availability) and in time for critical sowing periods (temporal availability).	Seed supply at the right time and place	Farmers have their own seeds or can obtain sufficient quantity of seeds of desired crops from their community or other sources within reasonable proximity, and at the right time of sowing periods.	Seed supply; the physical existence of the seed; having enough seed at the right place and time.
Access	People have adequate cash or other resources (for example, financial credit or friends and relatives willing to help out) to buy appropriate seed or barter for it.	Seed access (means to acquire)	Farmers have their own seeds or adequate cash or other resources (financial credit, friends and relative or community institutions willing to help out) to buy and/or exchange or barter for appropriate seeds.	Divided into 3 sub-parameters <i>Delivery channel</i> : transport, location, distribution, logistics of moving seed from point A to point B <i>Affordability</i> : affordable to farmers and profitable to use <i>Awareness</i> : information on how/where to get quality seed and how to use it)
Quality	Seed is of acceptable quality: it is healthy and useable, and its varietal attributes (genetic traits like size, shape, and taste of grain) are acceptable to the farmer.	Germination, physical purity, free from pests and diseases, moisture content	Seeds are of acceptable quality defined in terms of varietal purity, physical purity, health, vigour, moisture content and germination of seeds.	Health, genetic purity, physiological age, physical purity
Varietal suitability and/or adaptability	n/a (acceptability to farmers included as part of “quality” parameter above)	<i>Varietal suitability</i> : Adapted crop varieties farmers prefer and need	<i>Adaptability</i> : Seeds are well adapted to local environment and show stability in production performance in subsequent years.	<i>Desirable varieties</i> : especially those that respond to market or farmer demand ⁶ . Includes biodiversity (genetic diversity of local varieties of crops).

⁶ The framework states: “Desirable varieties” is often taken to mean modern varieties, improved for higher yields or better nutrition; but farmers may also demand local varieties.

Parameter	When Disaster Strikes (Sperling, 2008)	FAO Conceptual Framework (FAO, 2015, 2016)	SeedChange (Shrestha, 2020)	Multi-stakeholder framework (CGIAR, 2016)
Seed diversity and/or choice	n/a	n/a	Farmers have choice for seeds with desired traits, such as shape, size, color, taste and other traits. Farmers have choice for seeds with desired traits meeting their production, food, cultural and market needs	(biodiversity included as part of “desirable varieties”)
Cross-cutting	<i>Chronic vs. acute seed (in)security</i>	<i>Resilience</i> : stability of seed system in the context of shocks and stresses	<i>Capacity to produce and save own seeds⁷</i> : Farmers have technical, socio-economic and political capacities ⁸ enabling them to produce and save their own seeds at household and community level.	<i>Gender</i>
<i>Use of assessment tools related to these frameworks</i>				
	FAO (2014) estimates that approximately 50SSAs were carried out between 2003 and 2013, mostly in the Sahel and Horn of Africa. Seedsystem.org has published 15 SSAs carried out in: Democratic Republic of Congo, Ethiopia, Haiti, Kenya, Madagascar, Mali, Sierra Leone, South Sudan, Syria, Timor-Leste, Zambia, Zimbabwe.	SSAs using the revised methodology piloted in 8 countries in 2014: Burkina Faso, Chad, Mali, Niger, Ethiopia, Kenya, Somalia, South Sudan. Six are available online .	SSAs piloted in 7 countries: Cuba, Nicaragua, Honduras, Guatemala, Mali, Burkina Faso, Timor Leste	13 case studies analyzing projects on root, tuber and banana seed systems, including projects in Ecuador, Peru, Nicaragua, Nigeria, Ghana, Rwanda, Kenya, Malawi, and regional projects in East Africa and West/Central Africa (Andrade Piedra <i>et al.</i> , 2016)

⁷ SeedChange does not call this parameter cross-cutting but it has been included here as such since capacity to produce own seeds can influence several of the other parameters.

⁸ Technical capacity includes knowledge and skills, socio-economic capacity means having access to resources and being able to organize; political capacity means having supportive policy and legal environments.

4. INSTITUTIONALIZATION OF SEED SECURITY

Seed security concepts and tools have gained recognition within the humanitarian sector and have been incorporated in the guidelines and policies of several institutions. The earliest example is the FAO's Guiding Principles of Seed Relief which were developed at the *Workshop on Effective and Sustainable Seed Relief Activities, Rome, 26-28 May 2003* and subsequently endorsed by the FAO Emergency Coordination Group (Sperling *et al.*, 2004a, p. ix-x). The principles (Box 2) reflect many of the key learnings that were emerging from early development of the seed security framework, including the importance of assessment to better understand and identify ways to strengthen the existing seed systems; ensuring seed relief focuses on varieties adapted to local conditions and farmers' preferences; and recognizing and integrating long-term needs (including sustainability) in addressing immediate crises.

Box 2. Guiding Principles of Seed Relief (FAO, 2003)

- A needs assessment should underpin any decisions to undertake seed relief and guide the choice among possible interventions. This needs assessment should be holistic, putting seed security in the context of livelihood security.
- Seed relief interventions have to be clearly matched to the context (for example, a crisis caused by drought may require very different actions from a crisis caused by war). By supporting food production, seed relief should decrease dependence on repeated food aid.
- Seed relief activities should aim both (i) to be effective with the immediate objective of facilitating access to appropriate planting material; and (ii) to contribute to the restoration, rehabilitation or improvement of agricultural systems in the longer term.
- Ideally, considerations of seed system sustainability should be built into seed interventions from the beginning. As a minimum, seed aid should do no harm to farming systems. Thus, emergency relief activities should support local seed system development, ideally by integrating long-term needs into the design of the project.
- Seed relief activities should be built upon a solid understanding of all the seed systems farmers use and the role they have in supporting livelihoods. The local system is usually more important to farmers' seed security and has been shown to be quite resilient. Depending on the context, the focus in an emergency should normally be on keeping the local seed system operational. One practical problem is that seed systems are often not sufficiently understood, especially in emergency situations. Hence, there is a need for more emphasis on understanding seed systems, their role in supporting livelihoods, and needs assessment.
- Seed relief interventions should facilitate farmers' choices of crops and varieties. Seed relief interventions should aim to improve, or at least maintain, seed quality and to facilitate access to crops and varieties that are adapted to environmental conditions and farmers' needs, including nutritional needs.
- Monitoring and evaluation should be built into all seed relief interventions, to facilitate learning by doing and thereby to improve interventions.

- An information system should be put in place to improve institutional learning and to function as a repository of information gained from cumulative experience. Such information systems should be institutionalized at national levels, to the greatest extent possible.
- A strategy to move from the acute emergency response to a capacity building or development phase should be included in the design of the intervention.

More recently, the *Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture* (Commission on Genetic Resources for Food and Agriculture and FAO, 2012), recognizes the contributions of the seed security framework:

A fundamental shift in thinking over the past decade has led to a seed security framework. The objective of the framework is to investigate the functioning of seed systems and to describe the situation in terms of availability, access and quality of seed. After disasters, farmers often have difficulty accessing seeds of locally adapted varieties, even though they may be available, because they have lost financial and other assets. The new thinking has led to better coordination among agencies and to new types of seed interventions that go beyond direct distribution of seeds and other inputs to farmers. These interventions include market-based approaches such as seed vouchers and input trade fairs, and community-based seed multiplication initiatives for both farmers' varieties and improved varieties (p. 31).

The Sphere Project's handbook, *Humanitarian Charter and Minimum Standards in Humanitarian Response* (The Sphere Project, 2011), widely used within the humanitarian sector, includes a "Seed security assessment checklist" as part of the guidance for Food security assessment standard 1 (p.150):

Where people are at increased risk of food insecurity, assessments are conducted using accepted methods to understand the type, degree and extent of food insecurity, to identify those most affected and to define the most appropriate response.

The checklist includes sample questions to ask in seed security assessments, both before and post-disaster as well as to assess the seed supply and demand from different seed sources (home stocks, markets, formal seed system) (p. 216-217). In addition, guidance under the Food security – livelihoods standard 1 (Primary production mechanisms are protected and supported) emphasizes using methods such as cash transfers, vouchers and seed fairs to offer farmers a choice of seeds that meet their preferences, ensuring that seed relief is timely in relation to the planting season. It is also recommended to focus relief efforts on varieties that farmers are already familiar with (p. 206-207). *When Disaster Strikes* (Sperling, 2008) and other seed security manuals (Longley *et al.*, 2002; Sperling *et al.*, 2006; Catholic Relief Services, 2017) are provided as resources.

The practice briefs produced by CIAT, CRS and CARE Norway (Sperling *et al.*, 2006), include a *Rapid Review Checklist For Developing A Seed Aid Proposal* (Brief #10). In line with this, the USAID/OFDA has integrated a number of requirements in its *Guidelines for Proposals* (USAID/OFDA, 2017) that reflect seed security concepts and principles. For example, “comprehensive multi-agency seed system assessments” are eligible for funding, provided that they are of use to the humanitarian community in general. In addition, proposals that include seed relief “must include an assessment of seed needs as distinct from immediate food needs [...], indicate how male and female farmers normally source their seed, how this has been disrupted, and a strong justification of why the proposed input provision method is appropriate”. They also require that proposals describe the effects of seed distribution on local markets, and provide strong justification for purchasing any non-local or hybrid seeds (p.79). The one requirement which can be seen to contradict seed security principles is OFDA’s strong preference for the use of certified seed for direct distributions. Research has shown that certified seed may not always meet farmers’ preferences (Coomes *et al.*, 2015). However, they do allow that applicants propose other quality assurance practices in lieu of certification, for example for seed fairs.

While the above suggests that seed security assessment has been mainstreamed in the humanitarian sector, in practice they are not always effectively implemented. In a systematic review of seed security assessments, FAO estimated that between 2003-2013, only 10% of post-disaster seed related interventions carried out in eight countries of the Sahel and the Horn of Africa had been based on seed security assessments (FAO, 2014). Furthermore, they found that the quality of assessments carried out varied both in terms of their methodology, as well as the extent to which appropriate responses had been identified:

Though virtually all assessments indicate that own saved seed and local market seed remain the two most important seed sources, there are seldom recommendations on supporting and strengthening the informal sector. Rather, the default recommendation is either to do Seed Voucher and Fairs or Direct Seed Distribution with a focus on certified seed of modern varieties.

Falling back on the distribution of certified seed may reflect a bias towards formal seed systems (Scoones and Thompson, 2011), donor requirements (i.e., USAID/OFDA) or simply a lack of experience with other approaches. Indeed, studies have shown that the effective use of the evidence is a major challenge when it comes to humanitarian assessment, due to factors such as norms or vested interests, prior experience of the assessment teams, and implementation capacity, which may all limit the willingness or ability of institutions to implement the approaches suggested by the assessment (Byrne *et al.*, 2013; Maxwell *et al.*, 2013).

The FAO review recommended building increased awareness and ownership of seed security assessment in the humanitarian community, promoting more widespread standardization in seed security assessment methodology, as well as training a large number of practitioners. Since then, FAO has been working to mainstream the use of seed security

assessments within its seed relief efforts. In addition to reviewing the seed security framework and assessment tools (see above), this included conducting training of trainers, publishing training materials on their website and supporting a community of practice.⁹ These efforts have mostly targeted FAO country offices and national government agencies involved in emergency response and have led to more awareness of the use of seed security assessments within the FAO system. Seedsystem.org has also begun offering trainings on seed security assessment that lead to a certification, and posts webinars, trainings and other events on their website.

In addition to capacity building, Sperling and McGuire (2010b) have argued that donors should play an important role in ensuring minimum standards are adhered to (using some of the checklists and tools mentioned above), and called for more in-depth evaluation of seed relief efforts that give farmers voice to influence seed aid practice.

5. SEED SECURITY IN THE NORWEGIAN AID SECTOR

a. NORWAY'S SUPPORT OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE AND SEED SECURITY

Support of conservation and sustainable use of plant genetic resources

The Government of Norway has long played a key role in supporting the conservation and sustainable use of plant genetic resources for food and agriculture (PGRFA) internationally. Norway has been an active partner in international policy processes concerning genetic resources, including the FAO's Commission on Genetic Resources for Food and Agriculture (established in 1983) and the International Treaty for PGRFA (adopted in 2004). One of the most internationally recognized investments has been Norway's establishment in 2008 of the Svalbard Seed Vault, which provides facilities to store duplicates of seed samples from the world's crop collections. One of the key justifications for Norway's support of conservation and sustainable use of PGRFA is to secure smallholder farmers', scientists' and breeders' access to genetic diversity to support climate adaptation and strengthen food security (MFA, 2011, 2013).

An important principle for Norway is the view that both ex-situ and in-situ conservation of genetic resources are complementary and should be supported, a position that the Government has outlined in its white papers and defended in international policy processes (MFA, 2011, 2012). Norway is among the largest contributors to the Crop Trust's endowment fund that provides support to ex-situ conservation, and at the same time is one of the most significant contributors to the Benefit Sharing Fund of the Plant Treaty. The latter is seen by the Government as a way to support farmers' access to genetic resources:

⁹ <http://www.fao.org/in-action/food-security-capacity-building/project-components/seeds/en/>

The Treaty's multilateral system for exchange of plant genetic resources for food and agriculture regulates access to these resources, as well as the fair distribution of benefits that arise through their use. Through the Treaty's Benefit-sharing Fund, Norway helps to support the preservation and further development of important traditional plant varieties locally in farmers' fields (MFA, 2013, p.68).

Norway is also funding the 10-year, US\$ 50 million project "Adapting Agriculture to Climate Change: Collecting, Protecting and Preparing Crop Wild Relatives" with the objective to rescue, safeguard and utilize agricultural biodiversity for climate change adaptation, led by the Crop Trust and Kew Botanical Gardens (2021-2020).

Norwegian overseas development assistance supports Norwegian NGOs and multilateral institutions who are engaged in food security, agricultural and humanitarian aid¹⁰, some of which includes work on seed and seed security. The seed-related activities of Norwegian NGOs are discussed in more detail in section 4b. The multilateral institutions, CGIAR, FAO and IFAD, support plant breeding and seed activities. However, since the majority of the Norwegian funding is not earmarked, it is not possible to identify to what extent Norwegian support is used to support these particular projects.

Finally, Norwegian research institutes such as the Fridtjof Nansen Institute, the Norwegian Institute of Bioeconomy Research and Noragric at NMBU have research groups focusing on various aspects of the genetic resources and seed security field both in Norway and internationally; however, these are not addressed here.

Norway's engagement with seed security

In addition to its substantive contributions to PGRFA, Norway has also played a role in supporting the development of the seed security framework and assessment tools. For example, Norway supported one of the first major international workshops that discussed strategies and mechanisms for improving seed relief activities (FAO, 1999). Along with USAID, Norway's Ministry of Foreign Affairs (MFA) co-funded the project implemented by CIAT, CRS, and CARE Norway that critically examined seed relief practices in seven African countries (Sperling *et al.*, 2004c) and led to the development of the Practice Briefs (Sperling *et al.*, 2006) and the seed security assessment tools eventually published in *When Disaster Strikes* (Sperling, 2008). Researchers from Noragric (NMBU) also served as advisors to the project.

These experiences appear to have informed the Ministry of Foreign Affairs' 2007 white paper *Norwegian policy on the prevention of humanitarian crises* (MFA, 2007). In the section on food security, the policy notes that issues of access and varietal suitability must be part of a good seed aid strategy:

¹⁰ In 2015, Food security, developmental and emergency food aid constituted 5% of Norwegian development aid, and of this 48% was directed to Food security (agriculture and fishing), 33% to emergency and development food aid, and 19% as core support to CGIAR, FAO, IFAD and WFP Norad, 2017. Samlet rapport for gjennomføringen av matsikkerhet i et klimaperspektiv: Strategi 2013–2015. p. 40..

It may not be an absolute shortage of seed that is the problem in a disaster area, but rather a relative shortage due to lack of purchasing power. In the longer term it is important to ensure that the seed on offer is suitable for the local environmental, social and economic conditions (p.37).

The importance of thorough needs assessments, as well as strategies that do not undermine local markets (e.g. direct cash transfers) is mentioned in relation to food aid. This is further emphasized in relation to seed in the 2009 white paper *Norway's Humanitarian Policy* (MFA, 2009), which states that:

The distribution of seed [...] also requires thoroughgoing analyses of needs. The distribution of money to victims is often a more effective alternative in many situations in that it offers the recipients more options and helps to strengthen the local private sector (p. 29-30).

Both white papers emphasize the need to improve the coordination of short-term emergency response and long-term development and to build local capacity and preparedness to reduce the risk of humanitarian crises and build resilience to climate change and other stresses. Within this context, the 2007 white paper identifies the need for long-term investments in food and seed systems, including building up food and seed stores, and studies and research on climate-adapted crop varieties and cultivation methods. The conservation of genetic resources in national and regional gene banks, including Svalbard is also noted as important for food security. The 2009 white paper identifies measures to improve the coherence of humanitarian assistance as a priority for Norway, and notes that “Improved food security for those most at risk must be dealt with through coordinated action, not just in the form of food relief and humanitarian aid, but primarily by addressing the underlying causes.” (p. 29). The need for long-term approaches to address humanitarian crises is again prioritized in the 2017 white paper on the UN Sustainable Development Goals (MFA, 2017, p.74-75). In this paper, the need to pay attention to “seed distribution [...] and other incentives to increase food production” is mentioned.

Around this time, NGOs beyond CARE Norway began engaging with the seed security framework. For example, the Drylands Coordination Group (DCG), a network that includes six Norwegian NGOs commissioned a report analyzing current approaches to seed security and seed aid, as well as the seed security situation in the African countries where the network was engaged (Bengtsson, 2007). The seed security framework and assessment tools were also explored at a one-day workshop organized by DCG and Caritas Norway in 2008 (Sperling *et al.*, 2008b), and attended by several NGOs, research institutions, and Government agencies¹¹. The purpose of the workshop was to “communicate the recent advances in seed aid understanding and assessment (including concrete tools for better

¹¹ NGOs participating were Care, Norwegian Peoples' Aid, Caritas, ADRA, Greenpeace, DCG; Research institutions included Noragric, NordGen, Cicero; and government agencies were Ministry of Foreign Affairs (MFA), Ministry of Agriculture and Food (MAF), the Norwegian Agency for Development Cooperation (Norad).

practice), to promote guidelines for more effective proposal development and to share experiences and identify needs for building a more sustainable Norwegian emergency response capacity.” (p. 1).

The workshop report states that in its endorsement of the 2007 white paper mentioned above, the Norwegian Parliament requested the Government to develop guidelines for seed aid (Sperling *et al.*, 2008b, p.1). In response to this, during the event a working group discussed options for establishing basic Norwegian "Better Practice Principles" for seed relief and reinforcing several of Norway's special roles in preparedness. In particular, the *FAO Guiding Principles for Seed Relief* (Sperling *et al.*, 2004a, p. x), and the *Rapid Review Checklist for Developing a Seed Aid Proposal* (Sperling *et al.*, 2006, Practice Brief #10) were examined. The workshop recommended that both tools be actively used by Norway, and that MFA ask Norad to potentially adapt these to reflect the priorities laid out in the 2007 white paper (e.g. expanding the gender and local-capacity sections). It was also suggested that Norad potentially program seed security assessments, and that at least 10% of the emergency budget be allocated to “Proactive/Early recovery work (including Linking Relief with Development)”, of which seed security initiatives could play an important role (Sperling *et al.*, 2008b, p.24). However, such Norwegian guidelines have not yet been introduced.

b. SEED SECURITY PRACTICE AMONG NORWEGIAN NGOS

The above analysis shows that Norwegian development actors have engaged directly with the seed security framework and tools, and learnings emerging from the seed security perspective appear to inform Norwegian humanitarian policy.

The Norwegian support to humanitarian aid in post-disaster situations is led by MFA, both from its headquarters in Oslo and from the embassies, but the actual implementation is done by international organizations and NGOs. The UN organizations and programs like WFP, UNHCR and OCHA are central implementers receiving Norwegian funding in post-disaster contexts. In addition, Norwegian NGOs are receiving a substantial share of the Norwegian funding for humanitarian assistance. In 2009, 41% of humanitarian aid was channeled through Norwegian NGOs and 47% through multilateral institutions (MFA, 2009, p.15). Norwegian overseas development also supports Norwegian NGOs working on plant genetic resources and seeds within the context of long-term development initiatives aimed at strengthening food security and agricultural production.

To assess the extent to which seed security concepts or tools are used by Norwegian NGOs in the aid sector, we conducted a brief online survey. It was sent to 16 Norwegian NGOs who are engaged in food security and/or agriculture programming in either humanitarian and/or long-term development aid (see Annex 2). Some organizations were contacted for further information by phone, email or in person.

The 16 organizations were identified from a list of organizations funded by Norad's civil society section in 2017¹² or with framework agreements with MFA for humanitarian assistance. From this list, organizations with a focus on food security and/or agriculture were identified by consulting institutional websites and cross-checking with the membership of the Food Security forum and Norad's records of organizations supported in 2015 for bilateral food security, developmental and emergency food aid (Norad, 2017).

The survey was administered using Google Forms between 10-22 November 2017. The questions were closed (e.g. multiple choice) but allowed respondents to specify "other" responses (see survey instrument in Annex 2). The survey was sent to the staff member who represents the organization in the Food Security Forum, or to the head of the relevant department. Some organizations were contacted for further information by phone, email or in person.

Survey results

Fourteen (14) of the 16 organizations responded to the survey (88% response rate). Six of these identified their work as focused on long-term development, two engaged only in humanitarian work, and the remaining six had programming in both areas.

Overall, eight organizations reported that they support activities that deal with seed, and five organizations said they conducted these activities in both humanitarian and long-term development contexts. The most commonly reported seed-related activities were support for seed storage/post-harvest management; seed distribution (emergency or long-term development context); and seed production (by individuals or groups/cooperatives). Seed policy, seed vouchers and participatory crop improvement were the least cited activities (Figure 5).

Of the eight organizations with seed-related activities, only three reported to use seed security concepts or tools in their work. The first two identified seed security as a goal they work towards and stated they used indicators to monitor seed security, while one of the NGOs also used seed security conceptual frameworks and conducted seed security assessments in one of their country programmes. The third organization used seed security as a way to describe their seed-related work in narrative texts.

¹² <https://www.norad.no/tilskudd/tildelinger/tildeling-til-sivilt-samfunn-2017/>

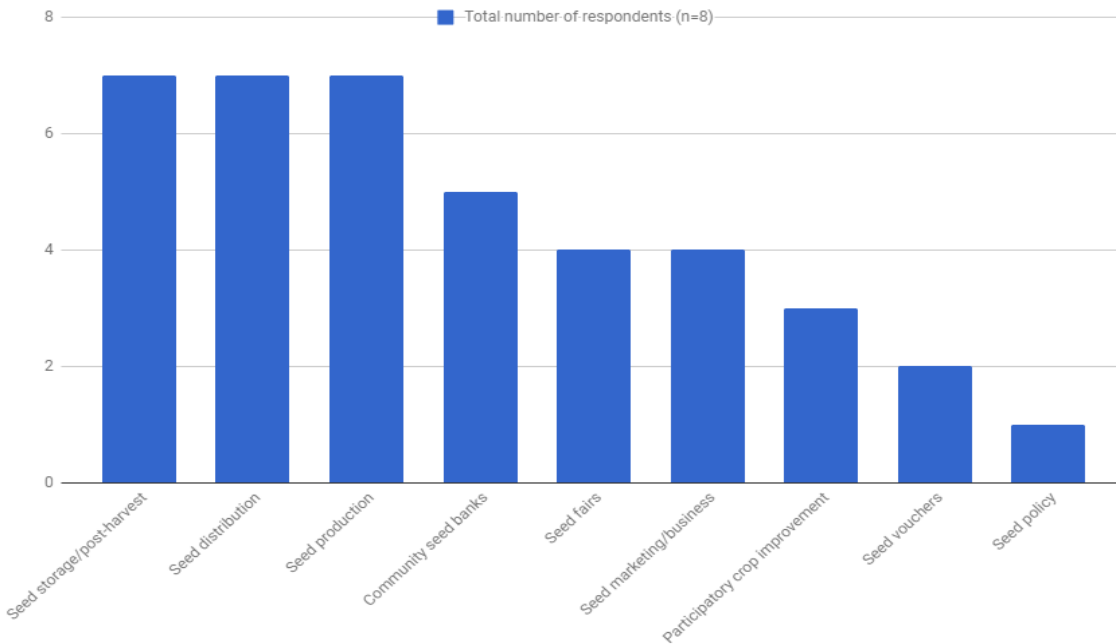


Figure 5. Seed-related activities supported by Norwegian CSOs

Follow-up interviews

To better understand their engagement with seed security concepts and approaches for needs assessment and monitoring, we contacted six of the eight organizations that engage in seed activities by phone, email or in person. This included the three organizations who reported in the survey that they use seed security concepts or tools and three who do not.

The interviews were done with the person who responded to the survey. In some cases, the respondent obtained further input from other colleagues, or shared organizational strategy documents or monitoring tools. In general, one limitation of the information collected in the survey was that respondents did not necessarily have a full picture of all the approaches and methods used in the organization – because local offices or partners used their own methods, because expertise was shared across different members of a federation, or due to difficulty in obtaining input from other branches or colleagues within the short time frame. Although four of the NGOs focus on both humanitarian and long-term development, respondents from these organizations worked primarily in longer-term development. The fifth organization focused on humanitarian work only, while the sixth was focused on long-term development. The results of our study cannot be considered a comprehensive assessment of the organizations' practices, and the use of seed security concepts and tools may therefore be underestimated, particularly in humanitarian response.

Nonetheless, the interviews did provide some interesting insights about the organizations' understanding and use of seed security. In responding to how they personally defined or

understood seed security, many of the concepts included in published seed security frameworks (Sperling, 2008; FAO, 2015) were mentioned, particularly notions of access/affordability, varietal suitability/farmers' preferences, and quality/germination potential. However, other conditions for seed security, some of which are included in SeedChange's framework, were also raised:

- **Capacity to produce locally:** Farmers having capacity to save and store seed for the next season; having access to seed that can be produced locally
- **Meeting future needs:** Having access to seed that meets both current and future needs; having access to seed that meets a seasonal cropping plan, both in good and bad years
- **Presence of reserves:** At a national level, having reserves of seed and genetic materials (in gene and seed banks)
- **Favourable policies:** presence of policies that recognize farmers' rights and seed systems; farmers have control/ownership over genetic resources; presence of policies and investments that ensure that high quality inputs are appropriate, acceptable, available and affordable to smallholder farmers.

All the organizations interviewed said they conducted needs assessments to plan their seed-related activities. In many cases, these were not focused on seed alone, but included household surveys, community diagnosis or vulnerability assessments that considered a broader range of livelihood needs.

Three of the organizations interviewed said they were aware of the seed security assessment tools. One organization had been involved in a multi-agency seed security assessment using tools based on Sperling (2008). Another organization considered the assessment methodologies too comprehensive and technical for their needs, but found the practice briefs (Sperling *et al.*, 2006) to provide good guidance and had adopted some elements from these. Four organizations monitored specific indicators related to seed security or seed systems.

6. DISCUSSION AND CONCLUSIONS

Seed security is fundamentally a livelihood concept that considers seed systems from the perspective of the functions they deliver to farmers at the individual or household level. In this sense seed security can be seen as an *outcome* of the functioning of the seed system. Seed security has direct influence on agricultural production, diversity and resilience, and contributes to food and livelihood security for households who depend on agricultural production (McGuire and Sperling, 2011). In this regard, seed security is an extremely relevant concept for the development sector.

The seed security conceptual frameworks and tools that have been developed over the years emerge from efforts to improve seed relief efforts. One of the main contributions of this approach is the identification of different parameters of seed security (availability, access, quality, varietal suitability/adaptability, etc). In doing so, the seed security framework has

helped unpack the complexity of seed systems. In-depth assessment, evaluation and research using this approach has challenged commonly held assumptions about seed systems in emergency contexts; for example, that disasters wipe out seed systems or that certified seed is the best form of aid (Sperling and McGuire, 2010b). A key insight that has emerged is that the lack of financial resources or other assets is the most common challenge that farmers face in post-disaster situations, limiting their ability to access seeds that are available locally. This has led to the emergence of new approaches, such as seed vouchers and fairs (CRS *et al.*, 2002; Remington *et al.*, 2002; Catholic Relief Services, 2017), as well as efforts to work more directly with local traders to increase the diversity and quality of seed that is locally available (Sperling and McGuire, 2010a; McGuire and Sperling, 2016). Indicators for monitoring seed security have recently been proposed by the FAO (2015) and could form the basis of strengthening monitoring and evaluation of seed security initiatives.

Seed security assessments have been recognized as best-practice for designing targeted seed-relief efforts (Sperling *et al.*, 2004a; The Sphere Project, 2011; Commission on Genetic Resources for Food and Agriculture and FAO, 2012), though the extent to which they are actually used appears limited (FAO, 2014). One reason for this is that seed security assessment has tended to rely on the expertise of a limited group of practitioners. As a result, FAO and the organizations behind Seedsystem.org have invested efforts to raise awareness and build capacity for seed security assessment (Shawn McGuire and Lucio Olivero, pers. comm). More generally, many organizations lack specific expertise in the area of seeds and view their seed-related activities as only one aspect of a broader programming approach. There is a need to raise the profile and capacity on seed issues in general, and potentially to further develop tools that can be adapted to different programming contexts and capacities. The possibility of using a tool like the Multi-stakeholder framework to guide reflection is an interesting option for contexts where an in-depth assessment is not feasible due to time or capacity constraints.

a. EXTENDING SEED SECURITY TO LONG-TERM DEVELOPMENT

There is potentially much to be gained by expanding the use of the seed security concept into long-term seed system development work. Indeed, chronic stresses such as limited access to new varieties, build-up of disease, or labour/land shortage are frequently at the root of seed insecurity need to be addressed by longer-term interventions (Sperling *et al.*, 2008a; McGuire and Sperling, 2013). Seed security is thus not only relevant for non-emergency contexts but is in fact essential in order to address key constraints and seize opportunities for building resilience.

Sperling and McGuire (2012) review how to apply the seed security framework to design initiatives aimed at enhancing resilience, nutrition, or income generation. The seed security framework can also be useful in deepening the analysis of seed systems in the context of on-farm conservation and sustainable use of plant genetic resources. Such initiatives often aim to improve farmers' access to and management of plant genetic resources so as to encourage the maintenance of genetic diversity in farmers' fields (Jarvis *et al.*, 2016). Crop diversity is recognized as a key element in building resilience in the seed and farming system, and in

meeting farmers' different agronomic, cultural, nutritional and other needs. While conservation is a goal in its own right, seed security can contribute to this work by providing a stronger livelihood perspective to the analysis of farmers' seed systems. It can be argued that "sustainable use" of plant genetic resources can only be achieved by addressing the constraints and seizing the opportunities to strengthen farmers' seed security. Making use of the seed security concept can thus help link efforts within conservation and sustainable use of genetic resources to development agendas for food and livelihood security.

The relevance of seed security for long-term development is evidenced by the adaptation of seed frameworks and tools for this purpose. While the existing tools (e.g. Sperling 2008) can be used in non-emergency contexts, the CGIAR/RTB and SeedChange examples both show that considering seed security in a long-term perspective can bring new elements to the forefront, such as the policy context governing seeds and seed systems. More generally, the application of seed security concepts within the context of seed policy development is a potentially fruitful area for the future. Both governments in the global South and most international development actors promote a modernization approach to seed system development which focuses on substituting informal seed systems with formal systems in a linear fashion (Scoones and Thompson, 2011). There is not necessarily a conflict between efforts to formalize seed systems and efforts emphasizing building on what works within farmers' seed systems today. Indeed, the Integrated Seed System Development promoted by several actors involved in long-term development and policy work (Louwaars *et al.*, 2013) emphasizes the complementarity of strengthening several types of seed supply chains. However, seed policy development that mainly aims at supporting formal seed system development can sometimes lead to the establishment of legal provisions (particularly seed laws) that inhibit or prohibit practices that are important for the functioning of farmers' seed systems (Visser, 2016; Herpers *et al.*, 2017). The seed security concept can potentially help bring forth seed system analyses that inform policymakers and development actors of such potential harmful side effects of formal seed system development, as well as effective policy measures – within both formal and informal seed systems - that contribute to strengthening farmers' livelihoods.

Finally, FAO's integration of resilience within the seed security framework is significant for exploring how to link humanitarian and long-term development approaches. Two decades of work on seed security has made it clear that it is often chronic stresses that are at the root of seed insecurity. Addressing these root causes requires a long-term approach, including for example, the integration of effective seed security strategies into disaster risk reduction plans.

b. OPPORTUNITIES FOR NORWAY

Our historical analysis shows that Norway played an important role in the early phase of the development of the seed security framework and related tools and has integrated some key learnings in white papers on humanitarian aid (MFA, 2007, 2009).

Norway is today an important donor and policy actor on genetic resources, while its contribution to seed work is done primarily through the work of Norwegian NGOs. Although more in-depth knowledge may exist at the level of local partners or country offices, in general the awareness of seed security concepts and tools among Norwegian NGOs appears to be relatively limited. FAO's systematic review of seed security assessments indicates that this is a more generalized trend, in which the seed security approach has been driven by a small number of organizations.

Given Norway's involvement with seed security at an early stage, as well as its strong track record in supporting international efforts on plant genetic resources, the country has a good basis/rationale for re-engaging with the operationalization of seed security both in humanitarian and longer-term development contexts. There are several opportunities for this.

Capacity building within the Norwegian aid sector on seed system and seed security is one potential area of engagement. In addition to building greater awareness and technical capacity, it may be relevant to support the development of simpler tools that are better adapted to the programming contexts and capacities of organizations that are less specialized in seeds. The development of Norwegian guidelines for seed relief could also be revisited and/or incorporated into proposal guidelines, as USAID/OFDA has done.

Norway has consistently identified the area of *disaster risk reduction and linking humanitarian response with long-term development* as a priority for its development policy. This is an area of seed security where Norway could potentially make a significant contribution. Currently, seed security concepts and tools are being used primarily, if not exclusively, in post-disaster contexts. For example, while FAO has suggested that seed security assessments can be conducted in non-emergency contexts, in practice, it is in post-disaster contexts that funding becomes available for FAO to conduct seed security assessments.

Norwegian support for the further development and implementation of seed security concepts and tools within longer-term development contexts would complement efforts of other actors. This could be done with an eye to informing disaster risk reduction strategies and action plans, seed policy, as well as to link efforts within conservation and sustainable use of genetic resources to both the short and long-term development agendas for food and livelihood security.

ANNEX 1. KEY INFORMANTS

The following key informants were interviewed to prepare this report:

Ministry of Agriculture and Food (Norway): Svanhild Isabelle Batta Torheim
Ministry of Foreign Affairs (Norway): Lise Albrechtsen
FAO: Shawn McGuire and Lucio Oliveiro
Oxfam-Novib (Netherlands): Bert Visser
SeedChange (Canada): Pratap Shrestha and Beatriz Oliver
National Institute of Agricultural Sciences (Cuba): Regla Cardenas

ANNEX 2. SURVEY QUESTIONS AND DISTRIBUTION

The following questions were included in the online survey to assess the extent to which seed security concepts or tools are used by Norwegian NGOs in the aid sector:

1. What are the main focus areas of your organization's international work? (mark all that apply):

- Emergency aid/recovery
- Long-term development
- Other:

2. Does your organization support programmes or activities that deal with seed? ("seed" includes any kind of planting material, including true seeds as well as roots, tubers, stem cuttings, etc.):

- Yes
- No
- Not sure

3. Which seed-related activities do you support? (mark all that apply):

- Seed distribution (emergency and/or as part of long-term livelihood support)
- Seed fairs
- Seed vouchers
- Participatory crop improvement (breeding, varietal selection)
- Community seed banks
- Seed production (by cooperatives, groups or individuals)
- Improved seed storage/seed post-harvest management
- Seed marketing/business
- Seed policy
- Other:

4. In what context does your organization implement seed-related activities?

- Humanitarian work (e.g. seed aid/recovery following a disaster/shock)
- Longer-term development initiatives
- Other:

5. Does your organization use “seed security” concepts or tools in your work? (Examples: as a goal/outcome, conducting seed security assessments, monitoring or evaluation of seed security, etc.)

- Yes
- No
- Not sure

6. In what ways does your organization use seed security concepts or tools?

- Seed security is a goal or outcome that we work towards
- Use seed security conceptual frameworks to guide the design seed interventions (e.g. FAO framework or others)
- Conduct seed security assessments to guide the design of seed interventions (e.g. using methods such as those on <https://seedsystem.org/assessment-tools/> or others)
- Use indicators to monitor changes in household seed security
- Other:

The survey was distributed to the following NGOs:

- Adina Foundation
- Adventist Development and Relief Agency Norway
- CARE Norway
- Caritas Norway
- Digni
- Norwegian Church Aid
- Norwegian People's Aid
- Norwegian Red Cross
- Norwegian Refugee Council
- Plan International Norway
- Rainforest Foundation Norway
- Royal Norwegian Society for Development (Norges Vel)
- Save the Children Norway
- The Development Fund
- The Norwegian Afghanistan Committee
- World Wildlife Fund Norway

LITERATURE CITED

Andrade Piedra, J., Bentley, J., Almekinders, C., Jacobsen, K., Walsh, S., Thiele, G. (Eds.), 2016. Case Studies of Roots, Tubers and Bananas Seed Systems. Research Program on Roots, Tubers and Bananas, Lima (Peru).

Bengtsson, F., 2007. Review of Information Available on Seed Security and Seed Aid Interventions in Ethiopia, Eritrea, Mali and Sudan. Drylands Coordination Group, Oslo, Norway, p. 29.

Bramel, P., Nagoda, S., Haugen, J.M., Adugna, D., Degene, T., Bekele, T., Trædal, L.T., 2004. Relief Seed Assistance in Ethiopia. Addressing seed security in disaster response: Linking relief with development. International Center for Tropical Agriculture (CIAT), Cali, Colombia, pp. 111-133.

Buruchara, R.A., Sperling, L., Ewell, P., Kirkby, R., 2002. The role of research institutions in seed-related disaster relief: seeds of hope experiences in Rwanda. (Special issue: Beyond seeds and tools). *Disasters* 26, 288-301.

Byrne, K.G., March, J., McGuire, S., Meissner, L., Sperling, L., 2013. The role of evidence in humanitarian assessment: the Seed System Security Assessment and the Emergency Market Mapping and Analysis. *Disasters* 37, S83-S104.

Catholic Relief Services, 2017. Agricultural Fair and Voucher Manual. CRS, Baltimore, MD, p. 113.

CGIAR, 2016. Multi-stakeholder framework for intervening in RTB seed systems: user's guide. RTB Working Paper. CGIAR Research Program on Roots, Tubers and Bananas, Lima (Peru), p. 13.

Commission on Genetic Resources for Food and Agriculture, FAO, 2012. Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture: Adopted by the FAO Council, Rome Italy, 29 November 2011. FAO, Rome, Italy, p. 91.

Coomes, O.T., McGuire, S.J., Garine, E., Caillon, S., McKey, D., Demeulenaere, E., Jarvis, D., Aistara, G., Barnaud, A., Clouvel, P., Emperaire, L., Louafi, S., Martin, P., Massol, F., Pautasso, M., Violon, C., Wencélius, J., 2015. Farmer seed networks make a limited contribution to agriculture? Four common misconceptions. *Food Policy* 56, 41-50.

CRS, ICRISAT, ODI, 2002. Seed vouchers and fairs: a manual for seed-based agricultural recovery after disaster in Africa. Catholic Relief Services, Nairobi, Kenya, p. 72.

Dalle, S.P., Walsh, S., 2015. USC Canada's experience in supporting community seed banks in Africa, Asia and the Americas. In: Vernooy, R., Shrestha, P., Sthapit, B. (Eds.), *Community Seed Banks: Origins, Evolution and Prospects*. Routledge, London and New York, pp. 212-229.

FAO, 1996. Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture and the Leipzig Declaration : adopted by the

International Technical Conference on Plant Genetic Resources Leipzig, Germany 17-23 June 1996. Food and Agriculture Organization of the United Nations, Rome.

FAO, 1999. Restoring farmers' seed systems in disaster situations. Proceedings of the international workshop on developing institutional agreements and capacity to assist farmers in disaster situation to restore agricultural systems and seed security activities, Rome, Italy, 3-5 November 1998. Food and Agriculture Organization (FAO), Rome.

FAO, 2012. Meeting Report: Workshop on mainstreaming seed security assessments, 22-23 November 2012 Rome, Italy. FAO, p. 14.

FAO, 2013. Expert consultation on seed system security. p. 22.

FAO, 2014. Seed Security Assessments in Burkina Faso, Chad, Mali, Niger Ethiopia, Kenya, Somalia and South Sudan 2003 – 2013: Key Findings and Recommendations. p. 3.

FAO, 2015. Household seed security concepts and indicators. Building capacity for seed security assessments. FAO, p. 10.

FAO, 2016. Seed security assessment: a practitioner's guide. Rome.

FAO Seed and Plant Genetic Resources Service, 1998. Developing seed security strategies and programmes for food security in developing countries. Proceedings: International Workshop on Seed Security for Food Security: Contributions for the Development of Seed Security Strategies in Disaster-prone Regions. FAO, Florence, Italy, 30 November-1 December 1997.

Herpers, S., Vodouhe, R., Halewood, M., De Jonge, B., 2017. The support for farmer-led seed systems in African seed laws.

ICRISAT/INIA, 2002. Guidelines for Planning Local Seed System Interventions: Improving the Efficiency in Seed Distribution. ICRISAT-Mozambique, Mozambique, p. 60.

Jarvis, D.I., Hodgkin, T., Brown, A.H.D., Tuxill, J., Noriega, I.L., Smale, M., Sthapit, B., Samper, C., 2016. Crop Genetic Diversity in the Field and on the Farm: Principles and Applications in Research Practices. Yale University Press.

Jones, R.B., Bramel, P., Longley, C., Remington, T., 2002. The need to look beyond the production and provision of relief seed: experiences from Southern Sudan. (Special issue: Beyond seeds and tools). *Disasters* 26, 302-315.

Longley, C., Dominguez, C., Saide, M.A., Leonardo, W.J., 2002. Do Farmers Need Relief Seed? A Methodology for Assessing Seed Systems. *Disasters* 26, 343-355.

Louwaars, N.P., de Boef, W.S., Edeme, J., 2013. Integrated Seed Sector Development in Africa: A Basis for Seed Policy and Law. *Journal of Crop Improvement* 27, 186-214.

Maxwell, D.G., Parker, J.W., Stobaugh, H.C., 2013. What Drives Program Choice in Food Security Crises? Examining the "Response Analysis" Question. *World Development* 49, 68-79.

- McGuire, S., Sperling, L., 2011. The links between food security and seed security: facts and fiction that guide response. *Development in Practice* 21, 493-508.
- McGuire, S., Sperling, L., 2013. Making seed systems more resilient to stress. *Global Environmental Change* 23, 644-653.
- McGuire, S., Sperling, L., 2016. Seed systems smallholder farmers use. *Food Security* 8, 179-195.
- McGuire, S.J., 2007. Vulnerability in farmer seed systems: Farmer practices for coping with seed insecurity for sorghum in Eastern Ethiopia. *Economic Botany* 61, 211.
- McGuire, S.J., Sperling, L., 2008. Leveraging farmers' strategies for coping with stress: Seed aid in Ethiopia. *Global Environmental Change* 18, 679-688.
- MFA, 2007. St.meld. nr. 9 (2007–2008) - Norsk politikk for forebygging av humanitære katastrofer [White Paper no. 9 (2007-2008) - Norwegian policy on the prevention of humanitarian crises]. Norwegian Ministry of Foreign Affairs, Oslo, Norway, p. 64.
- MFA, 2009. St.meld. nr. 40 (2008–2009) - Norsk humanitær politikk [White Paper no. 40 (2008-2009) - Norway's Humanitarian Policy]. Norwegian Ministry of Foreign Affairs, Oslo, Norway, p. 44.
- MFA, 2011. Meld. St. 14 (2010 – 2011) - Mot en grønnere utvikling – om sammenhengen i miljø- og utviklingspolitikken [White Paper no. 14 (2010-2011) - Towards greener development - on the relationship between environmental and development policy]. Norwegian Ministry of Foreign Affairs, Oslo, Norway, p. 75.
- MFA, 2012. Meld. St. 19 (2011–2012) - Noregs deltaking i den 66. Ordinære generalforsamlinga i Dei sameinte nasjonane (FN) og vidareførte sesjonar av den 65. generalforsamlinga i FN [White Paper no. 19 (2011-2012) - Norway's participation in the 66th Ordinary General Assembly of the United Nations (UN) and continued sessions of the 65th UN General Assembly]. Norwegian Ministry of Foreign Affairs, Oslo, Norway, p. 46.
- MFA, 2013. Meld. St. 25 (2012–2013) - Dele for å skape: Demokrati, rettferdig fordeling og vekst i utviklingspolitikken [White Paper no. 25 (2012-2013) - Sharing for prosperity: Promoting democracy, fair distribution and growth in development policy]. Norwegian Ministry of Foreign Affairs, Oslo, Norway, p. 100.
- MFA, 2017. Meld. St. 24 (2016-2017) - Felles ansvar for felles fremtid: Bærekraftsmålene og norsk utviklingspolitikk [White Paper no. 24 (2016-2017) - Common Responsibility for Common Future: The Sustainable Development Goals and Norway's Development Policy]. Norwegian Ministry of Foreign Affairs, Oslo, Norway, p. 97.
- Nankam, C., 1999. Agricultural recovery and emergency seed restoration in the post disaster situation of Angola. A case study: World Vision International. In: FAO (Ed.), Restoring farmers' seed systems in disaster situations. Proceedings of the international workshop on developing institutional agreements and capacity to assist farmers in disaster situation to restore agricultural systems and seed security activities, Rome, Italy, 3-5

- November 1998. FAO Plant Production and Protection Paper (FAO), no. 150. Food and Agriculture Organization (FAO), Rome, pp. 29-37.
- Norad, 2017. Samlet rapport for gjennomføringen av matsikkerhet i et klimaperspektiv: Strategi 2013–2015. p. 40.
- Omanga, P.A., Rossiter, P., 2004. Improving emergency seed relief in Kenya: a comparative analysis of direct seed distribution and seed vouchers and fairs. In: Sperling, L., Osborn, T., Cooper, D. (Eds.), *Towards effective and sustainable seed relief activities. Report of the Workshop on Effective and Sustainable Seed Relief Activities Rome, 26–28 May 2003*, pp. 43-53.
- Otsyula, R., Rachier, G., Nashon, A., Juma, R., Ndiya, C., Buruchara, R., Sperling, L., 2004. The Use of Informal Seed Producer Groups for Diffusing Root-Rot Resistant Varieties during Periods of Acute Stress. Addressing seed security in disaster response: Linking relief with development. International Center for Tropical Agriculture (CIAT), Cali, Colombia, pp. 69-89.
- Remington, T., Maroko, J., Walsh, S., Omanga, P., Charles, E., 2002. Getting Off the Seeds-and-tools Treadmill with CRS Seed Vouchers and Fairs. *Disasters* 26, 316-328.
- Scoones, I., Thompson, J., 2011. The Politics of Seed in Africa's Green Revolution: Alternative Narratives and Competing Pathways. *IDS Bulletin* 42, 1-23.
- Shrestha, P., 2020. Participatory seed security assessment and action plan: a guide. SeedChange, Ottawa, Canada, p. 170.
- Sperling, L., 1999. The effects of the Rwandan War on crop production, seed security and varietal security: a comparison of two crops. In: FAO (Ed.), *Restoring farmers' seed systems in disaster situations. Proceedings of the international workshop on developing institutional agreements and capacity to assist farmers in disaster situation to restore agricultural systems and seed security activities, Rome, Italy, 3-5 November 1998*. FAO Plant Production and Protection Paper (FAO), no. 150. Food and Agriculture Organization (FAO), Rome, pp. 71-91.
- Sperling, L., 2001. The effect of the civil war on Rwandas bean seed systems and unusual bean diversity. *Biodiversity & Conservation* 10, 989-1010.
- Sperling, L., 2002. Emergency Seed Aid in Kenya: Some Case Study Insights on Lessons Learned During the 1990s. *Disasters* 26, 329-342.
- Sperling, L., 2008. When disaster strikes: a guide to assessing seed system security. CIAT (International Center for Tropical Agriculture), Cali, Colombia, p. 64.
- Sperling, L., 2020. Seed security response during COVID-19: building on evidence and orienting to the future. *Food Security*.
- Sperling, L., Cooper, H.D., Remington, T., 2008a. Moving Towards More Effective Seed Aid. *The Journal of Development Studies* 44, 586-612.

- Sperling, L., Longley, C., 2002. Editorial: Beyond Seeds and Tools: Effective Support to Farmers in Emergencies. *Disasters* 26, 283-287.
- Sperling, L., McGuire, S., 2010a. Understanding and strengthening informal seed markets. *Experimental agriculture* 46, 119-136.
- Sperling, L., McGuire, S., 2012. Fatal gaps in seed security strategy. *Food Security* 4, 569-579.
- Sperling, L., McGuire, S.J., 2010b. Persistent myths about emergency seed aid. *Food Policy* 35, 195-201.
- Sperling, L., Nagoda, S., Tveteraas, A., 2008b. Moving from emergency seed aid to seed security – linking relief with development. Workshop organized by the Drylands Coordination Group Norway and Caritas Norway, in collaboration with Norad and The Norwegian Ministry of Foreign Affairs in Oslo May 14th 2008. Drylands Coordination Group, Oslo, Norway, p. 37.
- Sperling, L., Ortiz, O., Thiele, G., 2013. RTB Seed Systems: Conceptual Frameworks for Guiding Practical Interventions. Draft 1 - RTB Working Paper 2013-1. CGIAR Roots, Tubers and Bananas Research Program, Lima, Peru, p. 15.
- Sperling, L., Osborn, T., Cooper, D. (Eds.), 2004a. Towards effective and sustainable seed relief activities. Report of the Workshop on Effective and Sustainable Seed Relief Activities Rome, 26–28 May 2003.
- Sperling, L., Remington, T., Haugen, J.M., 2004b. Overview of findings and reflections. Addressing seed security in disaster response: Linking relief with development. International Center for Tropical Agriculture (CIAT), Cali, Colombia, pp. 1-13.
- Sperling, L., Remington, T., Haugen, J.M., 2006. Seed Aid for Seed Security: Advice for practitioners. Practice Briefs 1-10. CIAT, <https://www.crs.org/our-work-overseas/research-publications/seed-aid-seed-security>.
- Sperling, L., Remington, T., Haugen, J.M., Nagoda, S. (Eds.), 2004c. Addressing seed security in disaster response: Linking relief with development. International Center for Tropical Agriculture (CIAT), Cali, Colombia.
- Sthapit, B., Rana, R., Subedi, A., Gyawali, S., Bajracharya, J., Chaudhary, P., Joshi, B.K., Sthapit, S., Joshi, K.D., Upadhaya, M.P., 2006. Participatory Four-cell Analysis (FCA) for Understanding Local Crop Diversity. In: Sthapit, B., Shrestha, P., Upadhyay, M. (Eds.), On-farm management of agricultural biodiversity in Nepal: Good Practices. NARC/LI-BIRD/Bioversity International, Nepal, pp. 13-16.
- The Sphere Project, 2011. Humanitarian Charter and Minimum Standards in Humanitarian Response. Practical Action Publishing, Bourton on Dunsmore, United Kingdom, p. 393.
- Trædal, L.T., Berg, T., 2004. The case of cassava brown streak disease in coastal areas of Mozambique. Addressing seed security in disaster response: Linking relief with development. International Center for Tropical Agriculture (CIAT), Cali, Colombia, pp. 91-109.

USAID/OFDA, 2017. Guidelines for Proposals: April 2017 Partial Revision. p. 205.

Visser, B., 2016. The impact of national seed laws on the functioning of small-scale seed systems: a country-case study In: Oxfam-Novib (Ed.), p. 88.