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The U.S. Government's Global Hunger & Food Security Initiative

Review of Practice and Possibilities for Market-led Interventions in Emergency Seed Security Response

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Table of Contents

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ACRONYMS

ABC	Alliance of Bioversity International and International Center for Tropical Agriculture
ARIA	Agricultural Research Institute of Afghanistan
CEDERU	Centre de Développement Rural de Kibututu
CEDO	Community Enterprise Development Organization
CIAT	International Center for Tropical Agriculture
CFA	Communauté Financière Africaine (currency abbreviation)
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
CRS	Catholic Relief Services
DRC	Democratic Republic of Congo
DSD	Direct Seed Distribution
DVM	Decentralized Vine Multipliers
EIAR	Ethiopian Institute of Agricultural Research
EMMA	Emergency Market Mapping Analysis
FAO	Food and Agriculture Organization of the United Nations
ICARDA	The International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDP	Internally Displaced Person
INRAN	Institut National de la Recherche Agronomique du Niger
MT	Metric tons
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
OFDA	Office of U.S. Foreign Disaster Assistance
OFSP	Orange Fleshed Sweet Potato
PABRA	Pan-African Bean Research Alliance
QDS	Quality Declared Seed
RAB	Rwanda Agricultural Bureau
S34D	Feed the Future Global Supporting Seed Systems for Development activity
SCCI	Seed Control and Certification Institute (Zambia)
SNNPR	Southern Nations, Nationalities, and Peoples' Region
SVF/SV+F	Seed Voucher and Fairs
SSF	Seed Security Framework
SSSA	Seed System Security Assessment
TASAI	The African Seed Access Index

EXECUTIVE SUMMARY

Work on seed systems has shown how pivotal markets are for helping smallholder farmers access seed in both normal and stress periods. This review focuses on the current and future potential use of markets to support smallholder farmer seed security in emergency and chronic stress contexts. The first objective is to review and categorize past experience across different types of market-oriented interventions and the second objective is to explore possible approaches for moving better practices forward, recognizing both the enablers and barriers for doing so.

The discussion and findings are based on a portfolio of ten cases that were identified as having a supply-side focus. The cases were drawn from eight countries (Afghanistan, DRC, Ethiopia, Kenya, Niger, Rwanda, Uganda, and Zambia) and included nine crops (common beans, groundnuts, maize, millet, potato, soya, sorghum, sweet potato, and wheat). We used the seed security conceptual framework and its parameters of seed access, availability, and seed quality, and then we added "information" as a fourth parameter to characterize these market-based seed interventions and identify them as either formal or informal seed sector. A complementary review on cash transfers for seed security in humanitarian settings assessed the demand side of market-led seed security interventions in emergency contexts (Keane *et al.*, 2019).[1]

This review found that many of the selected cases included a supply side, market-led support intervention in the *formal* sector with the goal to ensure availability of modern varieties. Seed suppliers of varied types were contracted to supply or produce seed—which was subsequently bought back by governments or NGOs and then given to farmers for free or at a deep discount. This type of intervention occurred especially in contexts deemed as chronically seed insecure, and this practice ('contract multiplication'—buy back, give free) was frequently repetitive (2-3 consecutive years or more). A variant of *formal* sector market-led support involved giving credit to agro-dealers who then procured and sold seed directly but were also supported with an additional demand side subsidy in the form of seed vouchers redeemable at the agro-dealers for up to 50% of their seed value. This variant had elements of sustainability by linking relief to development in that the customer base directly interfaced with the market-led seed supplier (agro-dealer).

Market-led support initiatives on the supply side within the *informal* seed sector are more unknown. This review could not document a single case where supply-side support was provided to the *informal* seed sector to encourage market-led seed security for smallholder farmers in emergency and/or chronic stress contexts. While there were anecdotes of grants supporting traders to improve the quality of their seed in emergency and chronic stress contexts, we were not able to specifically identify those cases and gather supporting documentation.

Understanding seed market (both formal and informal seed sectors) functioning during stress periods is a critical precursor to moving forward and expanding market-led supply-side interventions which address seed security for smallholder farmers. While detailed seed market analysis might be a challenge to carry out in the context of an emergency response where there may be time and/or security constraints, tools do exist to address this gap and they can be employed quickly if accompanied by technical expertise. A second precursor is to build in much more data collection to facilitate collaborative learning and socializing of best practices around what is actually being tested and implemented in terms of market-led approaches to address seed security for smallholder farmers. While we are grateful for the cases identified and the information and insights generously shared, both donors and implementors will benefit from more documentation of the actual process, the immediate results, and the medium-term impacts of market-led seed system interventions. Program monitoring and evaluation should be more oriented to assessing market-based outcomes like crop and varietal diversity, farmer choice, competition among seed market suppliers, and expanding a sustainable customer base.

[1] This study has been conducted as part of S34D under the Emergency, Chronic stress and Resilience component.

There is a good deal more work to do in testing and refining market-led approaches to address seed security for smallholder farmers in emergency and chronic stress contexts. Both donors and implementors would benefit from a more entrepreneurial and dynamic approach which leverages existing market actors (informal as well as formal) and integrate lesson learned from both the supply side and the demand side.

INTRODUCTION

Feed the Future Global Supporting Seed Systems for Development activity (S34D) is a five-year Leader with Associates Cooperative Agreement Award, funded by the Feed the Future Initiative through the Bureau for Resilience and Food Security (RFS) and by USAID through the U.S. Office of Foreign Disaster Assistance (OFDA). Catholic Relief Services (CRS) is leading this consortium with support from partners that include: Agri Experience, ABC-PABRA, IFDC, Opportunity International (OI) and Purdue University. S34D's Life of Activity (LOA) runs from August 2018 through August 2023. The overarching goal of S34D is to improve the functioning of national seed sectors in focus countries in an *inclusive* manner—this 'inclusive' approach aims to support all farmers, including women farmers and youth. S34D aims to meet the activity goals by increasing the capacity of each of the seed systems to sustainably offer quality, affordable seeds of a range of crops (***Objective 1***) and increasing collaboration and coordination among all seed systems actors and actions (***Objective 2***).

This activity is unique in that the overall strategy proposes to generate a broader view and integration of the seed systems, with **Objective 1** working across formal, informal and emergency seed sectors; and, **Objective 2** placing emphasis on the interactions and synergies among the three systems. This integrated approach is further strengthened by cross-cutting intermediate results that seek to improve policies and practices that support pluralistic seed systems, rather than focusing on individual parts of each system. An important aspect of the activity is to gain a better understanding about how seed systems interact and where there may be positive or negative market interactions. In the case of detrimental actions, S34D intends to develop interventions to address market distortions.

Market-led approaches in humanitarian assistance are gaining recognition, with the aid sector showing an increased recognition of the potential importance of both the formal private sector and more informal markets as a means to deliver assistance. Despite this growing interest in the humanitarian community to work with a range of markets, there seems to be a relative lack of in-depth market analysis to guide intervention design or to assess market performance and impact — on markets or beneficiaries — after an intervention. "*Market outcomes are a significant determinant of livelihood outcomes, and so understanding how crises affect markets and market relations is critical to understanding livelihoods, and both development and humanitarian outcomes*" (Levine, 2017).

This review focuses on the current and future potential use of markets to support smallholder farmer seed security in emergency and chronic stress contexts. This review emphasizes the supply side in market-led seed security response support (to help render quality seed available and accessible to farmers in stress periods). A complementary review has analyzed the demand side and user issues linked to humanitarian market-led seed security response (Keane *et al.*, 2019).[2]

[2] Keane, Jules, Dina Brick and Louise Sperling. 2019. Study on cash transfers for seed security in humanitarian settings. A Feed the Future Global Supporting Seed Systems for Development activity (S34D) report.

BACKGROUND

A brief review of field responses

While donor seed investments have primarily focused on strengthening the formal sector, seed-specific evidence shows that the informal sector remains the core for farmer seed acquisition, especially in Africa. A data set of 10,000+ discrete farmer observations across multiple crops and countries in Africa reveals that farmers access 90% of their seed from informal systems, with over 50% of that sourced from local markets and 55% of that seed paid for in cash (McGuire and Sperling, 2016).[3] Such field-based evidence illustrates that smallholder farmers are making seed investments themselves and that this suggests a broader scope for supporting both formal and informal market sectors in normal and stress periods (with the latter divided here between acute and chronic stress contexts).

Approaches to link humanitarian aid and market support to address seed security constraints has expanded significantly over the last two decades. These advances are most evident if focused on the client or demand side. To help farmers access seed during stress, a range of assistance approaches have been developed and implemented, such as giving farmer beneficiaries vouchers variously tied to seed fairs, seed producers or agro-dealers and even giving farmer beneficiaries cash directly for their essential seed buying (Keane *et al*, 2019; CRS, 2017; Mercy Corps, 2016). The use of seed vouchers, coupled with fairs (SV+F), has particularly increased in humanitarian practice since around 2000. Seed vouchers & fairs were developed based on the idea of working with local seed traders and seed producers under conditions where seed was available (Remington *et al*, 2002). The use of SV+F expanded very rapidly — to the extent that a meta-analysis of their scope and effectiveness was completed in 2005 in Zimbabwe, Ethiopia and the Gambia (see Bramel and Remington, 2005, for country specific details). Voucher-based approaches more generally (with or without fairs) have been tied to a range of providers, e.g., redeemable with seed producers (CIAT *et al*., 2010) or agro-dealers (Mercy Corps, 2016). Such a voucher-based strategy might be usefully categorized by the term 'smart subsidy.' In one review, the main characteristics of 'smart seed subsidies' were described as follows: they targeted specific farmers, they were market-based, and they included an exit strategy.[4]

An overriding issue to raise around these demand-side interventions is how the supply side has been shaped (or restricted)—i.e. what is ultimately put on offer for farmers to access with vouchers or cash through these demand-side interventions. It is important to note that along with the expansion in access methods has come an increased level of control on the seed sellers (size, location, legal status, open or closed tender processes) and seed types (crops, varieties, quality) allowed in these programs. Seed assistance programs with a market-oriented seed access component often operate as a highly regulated market, where local and existing seed traders are often not able to participate, and where locally-available and farmer-preferred crops and varieties may be purposefully excluded.[5] For example, agro-dealers may not be at liberty to source crops and varieties on their own, and farmers may not have many choices in terms of where they can redeem a seed voucher. Another common example is the program requirement for the exclusive use of certified seed where the systems and protocols for certification do not exist and/or are irregularly applied.

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[3] The data set also contained information on use of intermediary or integrated seed sources (that variously span the formal and informal sectors) and include entities such as farmer cooperatives or community-based seed producers. Most seed planted by farmers comes from their own stocks or from neighbors, friends, and family. Seed sourced in local markets that was not purchased with cash was sourced through bartering.

[4] Baltzer and Hansen evaluated input (principally seed & fertilizer) subsidy programs in Malawi, Zambia, Ghana, and Tanzania and concluded that there was not sufficient evidence to indicate what some of the long-term impacts of these programs are on seed systems. The value for money proposition that smart subsidy agricultural inputs programs are a good investment, an upfront justification for these programs, was not evident from their review. They concluded that these programs are costly and in-effective because the benefits often accrue to the politically connected and not to the rural poor; that the symptoms of low input use are the focus of investment rather than the disease of market failure and low farmer demand for inputs; and that these programs created an artificial market and that market sustainability and exit strategies were not put in place (Baltzer and Hansen, 2012).

[5] Personal communications with Tom Remington (January 2019, April 2019, July 2019, September 2019).

Supporting formal or informal markets?

Humanitarian aid support on the supply side has been less well pursued—hence this review to refine our knowledge and practice further. We acknowledge from the outset that the choice to support either formal markets and/or informal markets gives cause for fundamental reflection.

The formal private sector role in seed is growing in the developing world, particularly in Africa, but the sector continues to have limited results in serving smallholder farmers at scale (total volume and geographical coverage), breadth (diverse crops and varieties), and depth (diversity of goods and services). The African Seed Access Index (TASAI), launched in 2015, has funded 12+ studies to assess farmer access to seed from the formal sector.[6] Among TASAI's key findings are that the formal private seed sector is growing in sub-Saharan Africa – mainly in maize – but maize dominates public crop breeding in terms of human and financial resources; and across the main food crops, old varieties persist despite widespread introductions of new varieties (Mabaya and Mugogoua, 2017).

Informal markets are rarely a point of focus for market-based interventions, despite the fact that they are a major source of farmers' seed across a broad range of crops and they play a critical role in promoting genetic diversity. The use of local markets for seed varies by income; but typically, poor farmers are more likely to consistently rely on local markets to access both seed for planting and to access new germplasm. There are multiple reasons why informal markets do not receive support from the public sector (government or research programs) such as a lack of appreciation of the importance of such markets for seed; a perceived challenge of distinguishing between grain and seed in local markets and, hence, compromising quality; or fear that working with informal market participants undermines (i.e. competes with) the formal sector where most public and private sector investment is based (see Sperling and McGuire, 2010).

Wherever the support is provided, whether to formal and/or informal markets, market-based approaches should aim to promote choice in terms of crops, varieties, and competition among suppliers and should not burden smallholder farmers with high costs to access seed.[7]

Finally, to set the stage, we raise the issue of negative as well as positive impacts when supporting markets. Humanitarian aid, even when the aid is intended to support markets, can have negative and positive outcomes on both the supply and demand side. On the supply side for example, tender processes intended to be open and transparent can prevent small traders and suppliers from participating because they are not 'pre-qualified', cannot meet the tender volume, do not have access to credit, or they may lack representation in the capital city where the tender is floated. On the demand side for example, free or discounted seed may disrupt and dis-incentivize existing suppliers and have knock on effects on credit relationships when existing market actors are supplanted by project-supported market actors.

The preceding discussion has sketched some of the broad developments and issues surrounding market-led seed interventions, especially in humanitarian practice, as well as initial thinking on the use of formal and informal markets linked to seed system support. Some of these market-oriented reflections can also be applicable to longer term development-oriented seed programs. In this vein, it could be useful to think about strategies to link relief to development perspectives and create more robust seed markets that can span emergency, chronic stress and developmental contexts.

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[6] The TASAI index assesses the performance of the top four grain and legume crops in each country across five categories: Research and Development, Industry Competitiveness, Seed Policy and Regulations, Institutional Support, and Service to Smallholder Farmers (https://tasai.org/publications/).

[7] Farming households need seeds for a range of crop varieties that meet their local needs and tastes and are adapted to local agro-ecological and climatic conditions. It bears emphasis that Quality seed is a necessary but not sufficient condition for sustainable production. Strategies to assist smallholder farmers to improve their livelihoods will require addressing many of these elements in an integrated approach (see El Khoury, Wafaa and Delve, 2018).

STARTING FRAMEWORK

Before reviewing the methods and then specific cases, we share the initial conceptual framework which shaped case selection and subsequent analysis.

As defined in humanitarian practice, seed security has three basic features or building blocks. The Seed Security Framework (SSF) outlines the fundamental elements as: seed must be available, farmers need to be able to access it, and the seed quality must be sufficient to promote healthy seed system functioning (Remington, *et al.*, 2002).

From the farming community perspective, *seed availability* is defined narrowly as whether sufficient quantity of seed of target crops is present within reasonable proximity (spatial availability) and in time for critical sowing periods (temporal availability). *Seed access* largely depends upon the assets of the farmer or household in question: whether they have the cash (financial capital) or social networks (social capital) to purchase or barter for seed. Seed quality includes two broad aspects: seed quality per se, and variety quality. *Seed quality* consists of physical, physiological and sanitary attributes (such as the germination rate, and the absence or presence of disease, stones, sand, broken seed or weeds). *Variety quality* consists of genetic attributes, such as plant type, duration of growth cycle, seed color and shape, palatability and so on (Sperling, 2008). In a stress situation, it is very rare to have major constraints in all three seed security features at the same time. The challenge is to diagnose the real problem and then to target alleviating actions. Note in the table below we have added a seed security feature on *information*. This encompasses two-way information systems: information to farmers and feedback from farmers[8]. It is our view that all the features – availability, access and quality – should have an integrated information component.

Importantly, these seed security parameters are often described using the client or farmers (demand side) as the focal point: Is seed available to farmers locally; is it accessible; and is the quality what farmers want and need? This review tries to shift the analyses also to the supply side, and specifically to markets. Given a focus on market-led support (rather than direct client-centered responses), what kinds of interventions could enhance the availability, accessibility and quality of market functioning to serve farmers? Further, recognizing the diverse sets of markets, we divided conceptual thinking into possible support initiatives to formal markets and to informal market functioning. As a shorthand, the major actors in formal markets might be research centers, seed parastatals and private sector companies. Informal markets might include farmer sellers, collectors, brokers and traders working at difference scales (Sperling and McGuire, 2010).

Table 1 presents our initial brainstorming attempts on seed security-linked possible interventions. It includes some responses actually in practice, as well as a large range of those not yet attempted (or for which we could not locate documentation).[9]

For ease of interpretation, we added a column (A) containing the more well-known client focused responses (and these are discussed in Keane *et al.*, 2019). It is column B—on actual or potential market-led responses on the supply side—that is the focus of this review and exploration. The description of specific case studies (page 12) will shed light on which types of support have been tested or implemented at scale—and some of the actual effects.

[8] Product profiles are gaining more traction and several donors (USAID, Bill & Melina Gates Foundation) are encouraging more use of a product profile framework (crop and variety profiles) and more demand-driven approaches to breeding as means to promote more two-way information from farmers to breeders, seed producers, and seed companies.

[9] This list of current and possible interventions is probably not exhaustive. We welcome hearing from and learning from readers on other possible market-led support options.

Table 1. Characterizing market-based seed interventions tied to specific seed security problems[10]

	Column A	*Column B*	
Seed Security parameter	**Client-based (farmer) intervention**	**Market-based intervention (supply)**	
		Formal sector	*Informal seed sector*
Availability	Link farmers to sources of stress tolerant crops and varieties (may give cash?) Cross-cuts with variety quality and information systems)	Transport vouchers/cash to traders (to move supplies to remote areas-- both availability and access) Institutional purchases from companies	Transport vouchers/cash to traders (to move supplies to remote areas—both availability and access) Advocacy for relaxed quality restrictions-allowing for more supplies Capital advances to traders/loans.;
Access	Conditional cash Unconditional cash Cash plus Vouchers Conditional seed (seed for work?) Client transport subsidies	Transport vouchers to formal sellers (to move supplies to remote areas-- under both availability and access) Incentives to companies to pack small (reduce price)	Transport vouchers to traders (to move supplies to remote areas-- both availability and access) Digital payment to traders (access and availability) Debt relief for traders? Capital advances/loans
Quality • Seed Health	Cash for storage purchases/improvements Cash tied to agro-dealers (for crops/varieties farmers know)		Work with traders to improve seed (and grain) storage facilities e.g., training on quality parameters for seed and grain storage; encourage use of seed/ grain moisture meters and hermetic storage containers (PICS).
• Crop, Variety, Quality	Cash tied to agro-dealers (for crops/varieties new/introduced). Cash tied to improvements such as seed dressing. Reduce barriers to new variety access, multiplication, certification, marketing, finance, etc.		Work with traders to move new varieties (linked to information systems) (skill enhancement) Work with traders to distinguish among varieties—and to keep stocks separate (skill enhancement)
Information Two-way information systems • Information to farmers • Feedback from farmers	Cash plus in kind info. Scratch cards/ digital vouchers to facilitate tracking purchase data. More use of product (crop and variety) profiles for farmers, researchers. and seed companies.		Information systems to help farmers learn about stress-tolerant varieties/ crops (cash for radio announcements/SMS) Information systems to train traders.

[10] (Sperling, 2019). Note: many of these parameters may overlap; for example, availability of stress tolerant crops or varieties could be potentially be listed under availability, variety quality, and/or information systems.

METHODS

This review was desk-based. No new fieldwork or data collection was carried-out. Potential cases were identified by reaching out to seed system researchers, donors, and NGOs and soliciting actual examples of market-based seed support on the supply side in the context of emergency or chronic stress. Organizations were approached that had some field experience in seed system support and that could draw on experiences of multiple countries and multiple years. Some of those contacted included CGIAR (ICRISAT, CIP), FAO headquarters and country staff, Wageningen University & Research, and NGOs (Mercy Corps, Catholic Relief Services, Lutheran World Relief). Publicly accessible databases of donors (e.g. USAID/OFDA) were also reviewed. All organizations expressed significant interest in the subject matter.

The search aimed for a case portfolio centered in either the formal or informal seed sector (or both) and that addressed diverse seed security parameters. Case identification proved more challenging than expected. Sometimes relevant cases could not be recalled with the detailed required; for example, one could find general summaries of seed activities, but, despite lengthy agricultural program evaluation documents (e.g. 100 pages), only scant discussions of the technical seed program details (maybe a 2-page analysis) were available. Also, field staff working on the programs moved to other programs or organizations—or while implementing, many were not conversant with seed specific issues. Multiple rounds of emails, phone interviews, Skype calls, etc., worked to fill in some gaps and to build more comprehensive descriptions of what may have unrolled on the ground and around decision-making more generally.

Ultimately ten cases have been identified as being relevant to this market-led review of seed security work. They are drawn from eight countries (Afghanistan, DRC, Ethiopia, Kenya, Niger, Rwanda, Uganda, and Zambia) and include nine crops (common beans, groundnuts, maize, millet, potato, soya, sorghum, sweet potato, and wheat). The cases span from the mid-2000's in Afghanistan to current cases being implemented in 2019 in DRC, Ethiopia, Rwanda, and Zambia. Most of the cases have unfolded from 2010 to the present.

CASE DESCRIPTIONS & BROAD FINDINGS

Each of the cases included in this review is briefly described below. For each case, the salient features are described in a vignette and then case-specific reflections are presented immediately after. The complexity of each case, and well as the diversity of the set in total, suggest that this immediate-feedback format is a logical option. Our aim in providing immediate feedback ('reflections') is not to criticize programs but rather to stimulate future thinking linked to program design and practice by sharing lessons learned.

Annex I (Catalogue of Cases) presents more detail on each case and may be useful for seed system specialists. The sources for the case information are listed in Annex II.

1. Government Backed Sweet Potato Vine Markets in Rwanda. 2017, trigger stress: drought.

Over the past few years, the government of Rwanda has spent approximately $400,000 annually on the purchase of sweet potato vines for smallholder farmers suffering from recurrent drought. The sweet potato vine materials have been purchased through a competitive market-based tender process that is managed centrally and distributed for free to beneficiary farmers. These government tenders are often won by seed trader intermediaries and sometimes by vine producers. Most of the vines are procured from a group of 79 decentralized sweet potato vine multipliers who are supported technically by the International Potato Center (CIP). The 79 decentralized vine multipliers grow both orange flesh (high vitamin A variety) and white flesh (traditional style) varieties.

These vine multipliers sell most of their vine to institutional buyers, primarily the Government of Rwanda or intermediaries selling to the Government of Rwanda. The vine procurement process is centralized and makes it difficult for vine multipliers to participate as direct bidders. That said, an estimated one third of their production is sold directly to farmers through organized roadside markets. Several NGOs involved in root production and nutrition activities are also important institutional buyers.

Seed inspection for vine producers selling to the Rwandan government or to intermediaries selling to the Rwandan government is not rigorously followed. Payment to vine producers participating in the Government tenders is frequently delayed. The decentralized vine multipliers supported by CIP are inspected by the national seed service and receive certificates, but there are other vine producers in Rwanda who do not have certificates yet find a way to sell into these institutional vine markets. The main seed quality issue for sweet potato planting material revolves around poor tolerance to pest and disease.

Reflections

Maintaining sweet potato vines in the dry season is a recurrent challenge. Competitive and centralized seed tender and distribution processes may not deliver market benefit to farmers or to seed producers. Such centralized tenders may be the least expensive option but may not provide sufficient seed choice to farmers or encourage seed producers to meet the seed quality standards which farmers demand. Seed quality may be compromised due to a limited feed-back loop between the seed user and seed producer.

More decentralized procurement processes and small lot tendering can encourage smaller seed producers to participate. By default, large tenders lock out small producers. Partial up-front funding from the Rwandan government or NGO projects to support vine production—combined with performance contracts for seed producers—could reduce the risk for the vine producer while maintaining a market-based incentive structure.

A relief to development transition can be facilitated by mapping the existing sweet potato seed system to illustrate how male and female farmers access sweet potato planting materials and to identify more sustainable options for engaging vine seed producers and traders.

2. **Legume Seed Grower Association selling into Zambia's maize focused seed markets, through the government-sponsored input programs. 2011-present, trigger stress: low productivity and need for crop diversification.**

Sanikuno seed producer group is comprised of 40 farmers. Since 2011, the group has produced legume seed of common beans, soybean, and groundnuts. In 2018, they produced an estimated 14 MT and their most important client is AFRISEED, an institutional buyer that is the primary legume supplier to the Zambian government-backed agricultural input programs. Sanikuno does not have a guaranteed market and, each year, they make production decisions based on previous year sales and their forecasts for the upcoming year. For several years, they did not sell into the institutional seed markets because they did not pass inspection.

Sanikuno has a very good working relationship with the national legume program and participates regularly in varietal demonstration trials for new legume varieties. Sanikuno seed fields are inspected annually by the national seed inspectorate (SCCI), and there have been several times when the group has failed such seed quality reviews. When Sanikuno fails formal inspection, they cannot sell their seed to the buyers that sell to the government agricultural input program, and they sell seed on the local grain market. Sanikuno wants to expand their sales channels.

Over the last decade, the Zambian government has allocated more than 50% of the agriculture budget to input programs and helping farmers with inputs is a government priority. The government agricultural input program purchases and disseminates inputs — primarily hybrid maize seed and fertilizer — through centralized procurement and dissemination through agro-dealers. The program has evolved over the last few years to reduce centralized procurement of hybrid maize and to encourage agro-dealers to buy directly from hybrid maize seed companies. A similar decentralization of the procurement process for legume seed has yet to take place.

Encouraging legume production and diversification out of maize has been an emerging policy of the Zambian government since 2012, and legume seed has increasingly been centrally procured under the Zambian government input programs. Agro-dealers in Zambia participating in the government input program by stocking and disseminating maize and fertilizer do not purchase legume seed directly from seed producers. Rather, legume seed made available to farmers through the government input programs is centrally procured and made available for free to farmers. This intervention involves only modern varieties that are registered in the national seed catalogue. Varieties that are not in the national catalogue, even if there is big market interest for these, are not included.

Reflections

Seed markets dominated by a single buyer are less likely to promote crop and varietal diversity. Centralized procurement may be easier to administer but it does not necessarily foster market- based competition for seed quality, equitable access to seed markets for seed producers, or choice of varieties by farmers.

One important aspect of seed quality—providing adapted crops and varieties which meet the interests and need of male and female farmers—cannot be addressed exclusively by the seed inspectorate processes. To address legume seed quality issues that relate to appropriate crops and varieties—so as to promote diversity and respond to farmer demand—requires seed production to be more decentralized such that seed producers sell into the region, communities, and agro-ecologies where the seed is produced. Seed producer groups may be better positioned to identify new seed sales opportunities if they are linked with national research and extension systems to access new germplasm and conduct demonstration trials in local areas.

3. **Quality Declared Seed for Potato and Sweet Potato in Ethiopia. 2016 onwards, trigger stress: drought.**

Drought-affected farmers in two regions of the country— Southern Nations, Nationalities, and Peoples' Region (SNNPR) and Amhara—have been provided with quality planting material of potato and sweet potato which is produced by potato seed producer cooperatives and sweet potato commercial farmers. The

program has been running since 2016, is supported by USAID/OFDA, and is managed by the International Potato Center (CIP), which works mainly with seed producer groups and cooperatives which were established from earlier funded projects, many of which were funded by USAID. Training on seed production and management is provided periodically to seed producers. Farmers and development agents are also trained on modern seed storage methods—diffused light stores for potato and the triple S method (sand, storage, sprouting) for sweet potato - to help farmers be more effective managers of potato and sweet potato planting material.

All seed procured by the program is inspected under the authority of the Regional Bureau of Agriculture using quality declared seed (QDS) standards which were officially endorsed by the Ethiopian government in 2015 for potato and in 2016 for sweet potato. CIP has been working with the Ethiopian Institute of Agricultural Research (EIAR) on QDS standards since 2011. All seed is procured through a competitive bidding process open to the registered seed producers having a valid quarantine license that is renewed annually. The fields of all winning bids are inspected to ensure quality control and that the volume proposed per the bid can be met in practice. All purchases of planting material from seed produced under these programs is done through CIP with supply contracts over $20,000 requiring a CIP regional signatory and with supply contracts over $50,000 requiring a CIP headquarters signatory.

Procurement of seed for this emergency project was valued at $200,000 in 2019, and it is estimated that more than 90% of all seed will be purchased by institutions and programs and provided to farmers for free.

Reflections

Governments are a major institutional buyer and as a such an important partner in promoting more sustainable and market-oriented seed interventions in the context of emergency and chronic stress. However, large market-led seed supply contracts, based on competitive but restrictive tender processes, may be cost effective but can also discourage the emergence of more decentralized and competitive seed production and seed marketing enterprises. This is even more likely to occur where seed is being provided for free and is not paid for by the seed users.

Chronic stress contexts are often framed as an emergency context in order to justify an acute one-off investment or short-term response. When this occurs repetitively, it can result in a legacy of inefficient seed producers who are not responsive to the actual needs of farmers. This is even more likely to occur where seed is being provided for free and is not paid for by the seed users.

For potato seed there may be clear scope for more market-led sustainable commercial seed production: farmer demand and willingness to pay for clean potato seed has been well established in many different countries and contexts. Market-led approaches require linking producers to farmers as seed buyers as opposed to free recipients of planting material.

4. **Certified Seed Fairs in the Complex Humanitarian Crisis of Eastern DRC. 2017-2019, trigger stress: ongoing conflict resulting in market disruption and population displacement.**

Eastern DRC has faced a series of complex humanitarian crises which have led to widescale internal displacement and the disruption of markets due to insecurity. Despite the challenges, local markets still function and can be supported to help smallholder farmers access seed. The Center for Rural Development in Kibututu (CEDERU) is a well-established faith based Congolese NGO based in North Kivu, Eastern DRC. They have partnered on dozens of agricultural projects over the past two decades. From 2017-2019, they carried out three sets of seed fairs in Eastern DRC which served in total more than 8,000 farming households in three different locations and for three different organizations: FAO, Oxfam, and Samaritan's Purse. In all of the seed fairs, the seed traders that participated in the fair were selected following an open tender process overseen by the national seed inspectorate (SENASEM - Service Nationale de Semences) and only certified seed was allowed at the fairs. The three seed fairs involved two crops: common beans and maize.

The seed fairs were intended to encourage market participation and to help seed insecure farmers to access quality seed through the market forum of a fair. Two of the three sets of fairs were organized as modified distributions whereby farmers received a fixed amount of seed in exchange for a voucher. A very limited number of seed traders participated in the fairs and few seed producers participated directly. For the FAO supported fairs, seed traders were requested to source seed from FAO supported seed producers in North Kivu. Certified seed—with the oversight of SENASEM—was a requirement for seed sold in all fairs yet the SENASEM certification process and protocols are not uniformly applied in DRC. Seed tenders in DRC almost universally require certified seed under the authority of SENASEM. This has created a large institutional market demand for certified seed that greatly surpasses the market supply of certified seed.

Reflections

Seed fair interventions following war and displacement may put a lower priority on encouraging multiple seed traders out of a concern for security. However, it is important to recognize that fewer vendors may result in less crop and varietal diversity. More market participants can increase the level of competition and encourage more diversity in the fairs. Limiting the fairs to seed that is certified and to pre-qualified seed traders may create unintended barriers to crops and varietal diversity and exclude existing seed traders and seed producers who have good quality locally available seed. The use of 'emergency seed' or 'truthfully labelled seed' can be used as temporary and distinct labels for seed in emergencies where it has been deemed impossible to source sufficient amounts of certified seed. This can reduce the phenomenon of poor quality, certified seed which is ubiquitous in institutional emergency seed markets where certified seed is a requirement in tendering processes yet true certified seed is not available in sufficient quantity. The temporary use of 'emergency seed' or 'truthfully labelled seed' can encourage a more diverse range of seed producers and traders to participate in emergency seed markets legally and transparently while also protecting the integrity of certified seed.

5. Developing a Wheat Seed Private Sector in Afghanistan. 2003 onwards, trigger stress: war-rehabilitation

After more than 20 years of war in Afghanistan, the research and seed production infrastructure for wheat collapsed, even though wheat was a priority food crop that accounted for one quarter of agricultural gross domestic product in 2014. The FAO developed and oversaw the implementation of three projects from 2003 to 2013 (programs GCP/AFG/018/EC; GCP/AFG/045/EC; and GCP/AFG/059/EC) that were market oriented and helped to establish a private wheat seed sector. There are currently more than 100 private seed enterprises[11] producing and selling wheat seed, and certified wheat seed production has reached 35,000 metric tons annually.

Through research collaboration with the Agricultural Research Institute of Afghanistan (ARIA), the International Maize and Wheat Improvement Center (CIMMYT) and the International Center for Agricultural Research in Dryland Areas (ICARDA), higher yielding wheat varieties adapted to Afghanistan were identified and introduced using wide scale demonstration trials and field days. Most of the wheat varieties were tested in Kenya for UG-99[12] rust reaction, all released varieties were resistant to yellow rust and had high yielding potential. Within a few years, modern wheat varieties covered almost 60% of the total irrigated wheat under production. The projects helped to establish a National Seed Association of 120 private seed producers and the National Seed Board (NSB), an umbrella coordination body for seed policy and regulation which helped to streamline access to new germplasm and the process for varietal testing and release and seed certification. The main buyer of wheat seed produced by the private sector has been other aid agency development projects and the Ministry of Agriculture, Irrigation and Livestock (MAIL). Private seed enterprises also sell seed directly to farmers.

[11] It is likely that these enterprises are individuals or groups of farmers selling to a parastatal.

[12] UG-99 is a lineage of wheat stem rust (a fungal plant disease) which is particularly virulent and poses a threat to global food security. In general, there are three major wheat rust diseases: stem rust, leaf rust, and yellow rust. Yellow rust, also known as wheat stripe rust, is principally a disease of wheat grown in cooler climates such as Afghanistan.

Reflections

Where seed systems have been destroyed by years of conflict or neglect, institutional markets are an important starting point to re-establish a functioning and responsive seed system. Establishing the infrastructure for market-based seed production can take decades to establish but only a couple of years to destroy.

Market-led institutional-based buying alone may not result in increased use of new and modern varieties. Varietal trials and demonstrations are necessary—even when institutional sales are driving a seed market—to motivate seed demand and farmer adoption of higher yielding and disease tolerant varieties.

It is important to consider how to transition to more sustainable market-led seed production where farmers buy seed directly. Options such as direct seed marketing to farmers at cost recovery prices can expand markets, reduce the risk for seed producers, and encourage a transition from centralized institution-based seed sales to more decentralized farmer-based seed sales.

6. **Durability of the Informal Sweet Potato Seed Sector in Northern Uganda. 2013-2015, trigger stress: long dry season prevents farmers from maintaining vines, periodic insecurity (skirmishes).**

This case focuses exclusively on the informal sector in a periodic conflict zone with insecurity spurred by the Lord's Resistance Army. A two-year research study of sweet potato seed systems revealed how the system endures in this unstable context and gave insight into the roles of seed producers, seed traders, seed transporters, and small-scale seed sellers. Sweet potato vine purchases and sales were monitored among a group of local vine multipliers and town vine sellers. This was done regularly during the course of the vine selling season of April to August over consecutive years. Information collected included volume and value of sales per transaction, price, varieties purchased, location of buyers, and location where vines were to be planted. The data revealed frequency of transactions, types of buyers, conditions for purchase and which could lead to higher or lower prices, and the varieties in demand. Overall, the work resulted in a strong characterization of a well-structured and functioning market for sweet potato vines. The informal focus might have strong lessons for elsewhere.

Vine sales to farmers from local multipliers were mostly to customers in a 10 km radius and prices fluctuated as a function of the condition and location of sales. For example, the best average price per bundle of vines sold by vine multipliers was under the condition that the vines were packed and delivered to the farm. More frequent, but less lucrative, was vine sales in local markets and this required packing, transporting, and the risk of not selling. Least remunerative, but lowest risk and effort, was when vine buyers came to the field of the vine multiplier. In contrast to the local multipliers selling to local farmers, multipliers working for NGOs seemed to suspend normal market-based economic behavior as these multipliers produced and sold at scale to NGOs and received a price premium of 60-250% over that of the local vine multipliers.

Reflections

The study illustrated the resilience of the existing sweet potato seed sector and more broadly highlighted the value of understanding how local systems work before designing market led interventions to improve a seed system. To leverage this informal sector requires an effort to understand how it functions, the main actors, the services these actors provide, and the constraints and opportunities they face.

In the Uganda case, the informal seed sector for sweet potato vines is resilient, efficient, and market-oriented in providing farmers access to sweet potato vines at a variety of price points. This informal seed sector (traders, transporters, producers) is sustainable and warrants more support to promote knowledge and access to new varieties and other sweet potato seed system innovations which contribute to food security, nutrition, and welfare outcomes for sweet potato farmers.

The informal seed system learning led to subsequent projects in Uganda and Tanzania where the focus was on working with the informal seed sectors actors and strengthening their collaboration with breeding programs to increase the speed at which they accessed new germplasm and to expand the diversity of germplasm promoted through informal sweet potato seed systems.

7. **Cooperative-based Seed Production and Marketing of Millet in Niger. 2016-2020, trigger stress: drought, Internally Displaced Persons (IDPs)**

The Federation of Kishi is a cooperative comprised of more than 11,000 farmers of which more than 7,000 members are women. Millet is the most important food crop and the basis of the local diet. Farmers generally use their own seed for millet production but rely on the market during periods of stress. The region of Tahoua where the intervention occurred is vast—more than 40,000 square miles and a population of more than two million people. It has faced chronic stress: there were emergency response activities funded from 2012/2013 following the Sahel food security crisis and in 2017 there were failed rains. The region is relatively stable but there is an influx of internally displaced people due to conflict in Northern Nigeria.

Ten millet seed producers were identified by the cooperative on the basis of having at least one hectare to allocate to millet seed production and willingness to apply a technical package as recommended by the Niger national research program (INRAN). Over the course of three years, more than 12 MT of millet seed have been produced. Production targets are set annually in April / May at the onset of rains. There are no forward contracts, but producers, due to being in the cooperative, are confident that they will have a market, whether due to localized drought and/or the demand for the new variety provided. Producers follow the production steps required for certification, but they are not certified as it is not a legal requirement in Niger for seed that circulates within a cooperative. The same variety – HKP – was produced in all seasons and is preferred due its early maturity and high yield. The variety was identified by INRAN, and in the first year of the activity eight trials were organized across the millet production zone to show the performance of the variety versus local varieties. All seed production inputs are provided by the Kishi Union for free to the seed producers, and seed is stored centrally at Kishi Federation warehouses. When seed is sold, the input costs are subtracted from payments made to the seed producers. In 2017, nearly all of the seed was sold internally to union members and some seed was sold through seed fairs organized by NGOs in the region. In 2018, seed was purchased from seed producers at .58 USD per kg (350 CFA) and sold at .62 USD per kg (375 CFA). In 2019, seed was purchased from the seed producers at .62 USD per kg (375 CFA) and sold at .71 USD per kg (425 CFA).

Reflections

In general, seed production decisions—crop and variety—necessitate regular consultation and feedback with the seed producers and the intended seed users. Building linkages between national research partners, breeders, seed producers, and farmer organizations / cooperatives is critical to the development, deployment, demand, and adoption of varieties which respond to the diverse needs of farmers and markets.

Seed production decisions within the cooperative were based on consultative discussions with cooperative member farmers and seed producers. These consultation discussions regarding production decisions and projected farmer seed demand were pragmatic and helpful and may be more likely to occur when there is decentralized community- based seed production.

Producing seed in the cooperative and selling to individual cooperative members can give profit and is market-driven but it seems unlikely that the seed producers will keep producing seed if there is not a regular infusion of new millet varieties because millet seed is easily produced and managed at farm level.

8. **Building Seed Markets with Agro-dealers and Partial Vouchers in Northern Karamoja Region, Uganda; legumes, cereals and vegetable seed. 2012-2017, trigger stress: ongoing conflict resulting in market disruption and population displacement, recurring drought.**

This program – Growth Health and Governance (GHG) program - was implemented in a semi-arid, traditionally pastoralist region where a government-led disarmament process aimed to sedentarize herders and promote crop agriculture as a livelihood. The region has received a lot of aid to support this transition. The seed activities were intended to increase market demand for a range of certified seed of legumes, cereals and vegetables with the overall goal to increase agriculture production and build seed markets in the region. The planning premise was that seed markets would develop because the farmers (formerly herders) would become used to the high quality and recognize that the seed became less productive when replanted year after year. Also, the theory posited, farmers' accessing and planting seed procured through agro-dealers would experience the modern returns and become regular recurrent seed buyers.

Seed companies in the Ugandan capital were provided credit guarantees worth 60% of the stock they provided to agro-dealers. Nine agro-dealers participated and were required to pay 10% of the cost of the seed which they stocked, had 90 days to pay for stock or return it to seed companies, and were not aware of the credit guarantees to the seed companies. Farmers were provided with vouchers to access the seed that were valid on condition that farmer-clients pay 50% of the value of the voucher and redeemed only at the nine endorsed agro-dealers.

In 2017, the GHG program provided vouchers to 19,058 farmers of whom 94% were women. Systematic random sampling was carried out in September 2017 among voucher recipients to determine voucher redemption rates. The survey revealed that, across the three districts of the program, 31% of voucher recipients had redeemed the vouchers they received. The program closed in August 2017.

Table 2. Vouchers generated and redeemed by GHG program in Karamajong District 2012-2017

# Vouchers Generated	# Vouchers Redeemed	% of Vouchers Redeemed
125,268	38,650	31%

In August 2017, a voucher activity report was generated by the program partner responsible for paying agro-dealers. The report showed that 35% of the total value of vouchers made available were redeemed. The report also indicated that 15,988 legume vouchers, 12,196 cereal vouchers and 9,861 vegetable seed vouchers were redeemed.

Table 3. Value (USD) of vouchers made available and redeemed in Karamajong District 2012-2017

Value of Vouchers made available ($)	Value of Redeemed Vouchers ($)	Value of Un- Redeemed Vouchers ($)	% of Voucher Value Redeemed
1,803,643	639,448	1,164,195	35%

The five participating seed companies were interviewed at the close of the program to share their perspectives and recommendations. All expressed interest to continue to work in the seed markets of the region under the condition that agro-dealers pay for the transport of seed, that agro-dealers pay for seed stocks within 60 days, and that agro-dealers make down payment on seed stocks (10% for some seed companies and 80% for others). All of the seed companies suggested more focus on seed marketing and extension as well as supporting farmers to work in groups and cooperatives to make bulk purchases.

Reflections

Large credit guarantees to suppliers and extensive subsidies to farmers can strengthen seed market linkages and foster the development of formal seed markets in the short term. However, more sustainable market led approaches require more investment in marketing and understanding the needs and interests of the consumer and farmer. Low voucher redemption rates illustrate that many poor farmers may not access seed even with

50% subsidies[13]. The low redemption rate may be explained by lack of access to money but may also indicate that the varieties on offer were not of sufficient interest to the farmers targeted.

Understanding farmer demand for seed, their interest in specific varieties and their willingness or ability to pay is a *sine qua non* to promote a more sustainable consumer led market-based approach. Market-led seed program programs built on hypotheses concerning farmer behavior regarding seed access and use will be stronger if the hypotheses are grounded on understanding farmer demand for seed. Smaller voucher values and the use of small packs can increase farmer interest in acquiring new and modern varieties but may not lead to the purchase of significant volumes of seed sold by seed companies.

9. Small packs for legumes in drought prone Kenya. 2004 onwards, trigger stress: drought and need to address smallholder (poorer) purchase patterns.

Dryland Seed began operation in 2004 with a focus on legume seed: beans, cowpea, and green gram. They have a climate-smart agriculture business model and produce and sell drought tolerant and early maturing crops and varieties. Sales are primarily through agro-dealers and they establish demonstration plots and carry out field days to market their seed to farmers. Seed is packed in affordable small packs ranging from 100 grams to one or two kilograms. The 100 gram small packs are provided to farmers during field days and the one – two kilogram packs represent the most common units of sales through their agro-dealer networks.

Individual sales to farmers accounts for less than 10% of Dryland sales. Direct purchase by NGO and government programs account for up to 30% of sales, and sales through agro-dealers – which includes agro-dealers supported by climate smart agricultural programs – accounts for more than 60% of sales.

Dryland Seed can expand its business through a combination of a sustained growth in legume production, licensing new varieties from seed companies, and by having preferential access to new public varieties. Some of the challenges Dryland Seed has identified include the high cost and labor intensity of packing seed; reluctance of agro-dealers to stock packs under two kilograms; high distribution costs relative to the margins they make on seed; presence of counterfeit seed on the market; and tendency of farmers to recycle seed.

Reflections

Small packs are a useful market-based approach to help seed companies expand their customer based and increase farmer access to seed. Climate smart agriculture is a niche market opportunity for nascent seed companies to sell seed into new channels. Demonstration plots, field days, and small packs of seed are a tried and true means to introduce farmers to new varieties and sustainably build market demand.

10. Small packs for bio-fortified legume seed crops in Uganda. 2010 onwards, trigger stress: need to decentralize sale in 'last mile' communities and to promote biofortified variety options.

Community Enterprise Development Organization (CEDO) is a member-based agricultural enterprise which evolved out of a community-based common bean seed producer. CEDO registered as a seed company in 2010. Early generation seed is sourced from government structures and produced and sold by contracted producer groups in thirty districts of Uganda. Seed production has ranged from approximately 150 to 400 metric tons annually. Individual farmers account for 60% of seed buyers; agro-input dealers account for 15% of buyers; seed processing companies account for 15% of buyers, and NGO and government programs account for 10% of buyers.

[13] Although the levels of poverty declined slightly during the course of the GHG project, the percentage of people living on less than $1.25 per day within the project area was 87 percent in 2018; and the depth of poverty was 53.3 percent (Vondal *et al.*, 2019). The project evaluation report states that, by their own admission, the project implementing partner had underestimated the level of poverty in Northern Karamoja. Assessments showed that women, who were the principal buyers of seed, given their role as cultivators, could not afford the higher costs of modern seeds and could not afford to fail by taking the risk of trying the seeds if they did not increase crop productivity (*ibid*.).

CEDO has an innovative marketing strategy which consists of the use of small packs and distribution through mom & pop village-based shops and village based agents; advertising in media and through market days and agricultural fairs; and providing credit for both large and small scale buyers. CEDO is able to effectively reach farmers in the last mile with quality seed due to the small-scale packaging, aggressive marketing, and promoting diverse seed marketing channels.

Reflections

Seed margins are low so it makes sense to develop a number of diverse sales channel and not to rely on conventional agro-dealers. Unless there are some subsidies or program support, agro-dealer margins on seed alone are often too low for them to justify holding seed stock and tie up working capital. Small packs are a useful market-based approach to help seed companies expand their customer based and increase farmer access to seed.

COMBINED INTERVENTION FRAMEWORK

General Overview of Cases

Using the Market-based Seed Intervention framework (Sperling, 2019), we now characterize the broad market support strategy implemented in the set of cases previously described. Which types of markets were being supported and, in terms of perceived seed security constraints, where did the humanitarian response choose to put the prime support emphasis? There are several broad conclusions which emerge quite strongly (refer to table 4).

Table 4. Market-based Seed Interventions in the Ten Supply-Side Cases Reviewed[14]

Seed Security parameter	**Market-based intervention (supply)**	
	Formal seed sector	*Informal seed sector*
Availability	#1 Rwanda- govt purchase for free distribution #2 Zambia- govt purchase for input programs #3 Ethiopia-govt purchase for free distribution #4 DRC Gathering of certified seed traders-for fairs #5 Afghan-Focus on establishing private sector supply—companies- and multiplication/testing #8 Uganda- credit to agro-dealers (to increase stocks of certified seed)	
	#7 Niger- Cooperatives (example of an integrated sector) focus on multiplication and sale to union members	
Access	#9 Uganda focus on promoting small packs – legumes (drought areas) #10 Kenya- focus on promoting small packs (last mile)	
Quality • Seed Health	(most had some government inspections.)	
• Crop, Variety, Quality	#1 Rwanda-govt focus Orange Fleshed Sweet Potato #2 Zambia- govt focus legumes (expand from maize) #5 Afghan- focus on modern variety promotion #7 Niger- focus on modern varieties (with technical package) #10 Uganda- focus on biofortified varieties	
Information Two-way information systems • Information to farmers • Feedback from farmers	Two-way information sharing was not a pivotal design point for any of the cases. #8 Uganda – credit to agro-dealers revealed useful information regarding farmer redemption rates—i.e., the demand side.	

Informal markets: No case (and no organization) chose to actively support the informal markets. A single case studied them (#6 Northern Uganda) which was used to inform subsequent projects in both Uganda and

[14] Note: Case #6 on Northern Uganda was a study only that later influenced intervention design in Uganda and Tanzania.

Tanzania. Also, a single case straddled the informal and formal, i.e. an integrated approach, supporting farmer cooperatives in Niger (#7); this approach was possibly linked to the chosen crop of millet which is commonly produced in informal channels. The Niger case started with the use of registered varieties sourced from research, but the seed produced at the level of the cooperatives was not formally certified. Therefore, the lion's share of market-led cases (with slight exception) strategically elected to support only the formal seed systems.[15]

Seed Security Feature—Availability: In terms of the seed security features, eight of ten cases had a focus on promoting seed availability. These embraced an impressive range of crops: #1 Rwanda-sweet potato; #2 Zambia Legume Seed-common beans, soybean, and groundnuts; #3 Ethiopia-sweet potato; #4 DRC-maize and beans; #5 Afghanistan-wheat; #7 Niger-millet; and #8 Uganda-range of crops at agro-dealers: legumes, cereals and vegetables.

In terms of the availability approach, six of the eight cases promoted some sort of subsidized multiplication, whether by NARS, seed producers, private sector companies, or farmer cooperatives, and then elected to give the seed produced for free or via voucher programs. The Niger case (#7) is perhaps of note as the seed was sold to cooperative members. The Uganda case with agro-dealers (#8) is also to be remarked in that implementers gave credit to existing agro-dealers to procure seed by their own means.

Seed Security Feature—Quality: Both aspects of quality were addressed in the market-led interventions, variety quality and seed health *per se*.

Variety quality: It is notable that many of the cases focusing on an availability response (N=5) also chose to use the occasion to promote modern varieties (sometimes referred to as improved varieties). Again, this was done across an array of crops (Orange Fleshed Sweet Potato (OFSP), Legumes, Millets, bio-fortified crops/varieties - beans and OFSP).

Seed health: Interventions around seed health also figured prominently in each case but were a key, determinant factor in two particular cases. In the Afghanistan case (#5), screening varieties for tolerance to wheat rust was a pivotal aspect of the case—this was seen as a positive advance against stress. In the DRC SV+F case (#4) seed certification processes were a base for deciding which providers were allowed to contribute to the program. In the DRC case, it might be argued that the certification requirement potentially reduced crop and varietal diversity as it excluded from fairs local seed traders and seed producers and only beans and maize were made available in fair venues. Note that all cases had some sort of rigorous quality screening process, aiming for certified or QDS standards. In only the Niger case were local quality standards used and supported, with the cooperatives themselves taking the lead in determining acceptable standards.

Seed Security Feature—Access: Only two cases programmed specific interventions linked to rendering the supply more accessible. They introduced small pack formats to make seeds more affordable for smallholder farmers—who then purchased with their own money (#9 Kenya and #10 Uganda).

Seed Security feature—Information: None of the cases had as its pivotal design point information sharing or feedback focused on the supply side. (That said, post-distribution monitoring was a key activity for case #8 as it revealed useful information regarding farmer redemption rates—i.e., the demand side.)

Discussion

The cases cover a range of seed projects aimed at supporting markets and addressing seed security issues in emergency or chronic stress environments. Hence, some market-led supply approaches are being implemented, even if not at the scale or with the diversity of approaches that were anticipated before this review started. It is notable that many of the cases involved creating and restricting seed markets to project-

[15] A case reported previously (Sperling and McGuire 2010) is worth sharing and seems to be a one-off. In 2002, the NGO CARE conducted a SV+F activity in Ethiopia that aimed to shape the supply side through working with traders. To get entrance to the fairs, traders were required to have business licenses, separate out varieties, and maintain clean warehouses.

supported seed producers or pre-approved suppliers. With availability defined as the focus, subsidized and or captured markets were given the prime support. The challenge with such a focus on "captured markets" may be three fold: (1) when the project stops the supplier often stops as they may not have been encouraged to develop and sell into non-subsidized markets; (2) existing seed market actors, those existing before the project funding, may lose market opportunity when project supported seed producers operate in the same market area; and, (3) seed practitioners (project holders, donors, and public sector organizations with a mandate related to seed) may be less cognizant and oriented to work with the existing market seed actors because project funds are oriented to captured markets.

Interestingly, there seem to be similar and perhaps fundamental gaps in all the cases identified—and which might be important to address in future project/program design. In only one case, Uganda, was there an explicit discussion, mapping, and diagnosis of the existing (*ex-ante*) seed system. Such knowledge is critically important so as to build on existing systems and not to disrupt or harm them. Second, providing information to seed users (often farmers) and receiving information from seed users (again farmers) was not explicitly planned as an essential core element: i.e. the information education and communication strategy of seed was perhaps weaker than warranted and perhaps did not build in adequate accountability to affected populations as related to seed.

Case-specific seed security mapping (across all features, prime and secondary)

To allow further visibility of results, see mapping below of select cases—providing more detailed seed security parameter analysis. Simply, the review aims to illustrate that the seed security framework can be a useful tool for moving forward specific program design and reflection. (Cases were chosen to suggest the range. See Annex I for further details on all 10 cases).

1. Government Backed Sweet Potato Vine Markets in Rwanda. 2017, trigger stress: drought.

Seed Security Parameter	Market-based Intervention	
	Formal Seed Sector	*Informal Seed Sector*
Availability	Supply contract for vine multipliers encourages annual production.	
Access	Cuttings are transported to locations and disseminated to farmers (free?).	
Quality	Procurement process and mixing of varieties are reported as on-going challenges.	
Information	No feedback system from male and female farmers to seed producers. No farmer demand methods/tools used to help producers assess farmer demand.	

2. Legume Seed Grower Association selling into Zambia through the government-sponsored Input programs. 2011- present, trigger stress: low productivity + need for crop diversification.

Seed Security Parameter	Market-based Intervention	
	Formal Seed Sector	*Informal Seed Sector*
Availability	Seed legume production based on previous year's sales, mostly to institutional buyers.	
Access	Seed is purchased and transported to Lusaka, packaged and warehoused, and disseminated through two government programs.	
Quality	Seed is inspected by SCCI.	
Information	No feedback system from farmers to seed producers. No farmer demand methods/tools used to help producers assess farmer demand.	

4. Certified Seed Fairs in the Complex Humanitarian Crisis of Eastern DRC. 2017-2019, trigger stress: ongoing conflict resulting in market disruption and population displacement.

Seed Security Parameter	Market-based Intervention	
	Formal Seed Sector	*Informal Seed Sector*
Availability	Seed traders are selected to participate in seed fairs and encouraged to procure seed from project supported seed producers.	
Access	Many fairs were a modified form of direct distribution, not allowing the farmer to decide on the crop, variety and volume of seed.	
Quality	Low crop and varietal diversity.	
Information	Post seed fair evaluation among participating farmers identifies opportunities for improvement. Pre-fair assessments could be made more explicit to identify crops and varieties most demanded by farmers served by the fairs.	

7. Cooperative based seed production and marketing of Millet in Niger. 2016-2020, trigger stress: drought, IDPs.

Seed Security Parameter	Market-based Intervention	
	Formal Seed Sector	*Informal Seed Sector*
Availability	Production was done by seed producers affiliated with the cooperative and most of the seed produced was sold to the cooperative members. Production decision – crop / variety – was determined based on discussion with community-based organizations.	
Access	Sales were made to individual farmers through the cooperative.	
Quality	In Niger, no state-mandated quality control, but cooperatives themselves took the lead in determining acceptable local quality standards.	Modern varieties with technical package
Information		

8. Building Seed Markets with Agro-dealers and Partial Vouchers in Northern Karamoja Region, Uganda; legumes, cereals and vegetable seed. 2012-2017, trigger stress: ongoing conflict resulting in market disruption and population displacement, recurring drought.

Seed Security Parameter	Market-based Intervention	
	Formal Seed Sector	*Informal Seed Sector*
Availability	Credit for commercial seed producers and agro-dealers.	
Access	E-vouchers at a 50% subsidy redeemed through agro- dealers.	
Quality	Commercial seed was assumed to meet quality standards.	
Information		

9. Small packs for legumes in drought prone Kenya. 2004 onwards, trigger stress: drought and need to address smallholder (poorer) purchase patterns.[16]

Seed Security Parameter	Market-based Intervention	
	Formal Seed Sector	*Informal Seed Sector*
Availability	Private company- produces their own seed	
Access	Packing in small sizes to make seed more affordable	
Quality	Certified seed- including many legumes	
Information	Demonstrations, etc.	

[16] Note: Small packs can be made to cater to stressed clients and to respond to the suggestions of institutional buyers.

REFLECTIONS

Enabling features for market-led seed work

In terms of market-led support on the supply side, the review found a good number of cases focusing on formal sector market support and especially on ensuring availability, often of modern varieties. Seed suppliers of varied types were contracted to produce seed—which was subsequently bought back by governments or NGOs and then given free to farmers. This occurred especially in contexts deemed as chronically seed insecure, and this practice ("contract multiplication," buy back - give free) was frequently repetitive, for two or three consecutive years or more. A variant of formal sector market support involved giving credit to agro-dealers who themselves then procured and sold seed directly (albeit with partial subsidy, via vouchers). This variant had elements of sustainability and linking relief to development in that a customer base directly interfaced with the market (agro-dealer) provider.

Market led support initiatives on the supply side, oriented to the informal seed sector, are more unknown. This review could not document a single in-depth case, although there were anecdotes of donors giving grants to support informal traders to improve the quality of their seed in emergency and normal periods. Seed traders (or seed/grain traders, as they deal in both commodities) are often portrayed negatively, but they can be highly innovative in linking diverse markets, responding to farmers' local needs, and functioning over years even in remote and conflict-ridden environments (Sperling and McGuire, 2010). Specific suggestions for improving local seed supply and particularly supporting local seed traders and seed sellers have been suggested for decades (see Thiele, 2003; McGuire and Sperling, 2008). Seed/grain traders can potentially bolster all aspects of farmers' seed security to help with seed availability, access, quality and information in acute and chronic stress contexts. An easy entry point might be with small packs of certified seed—until the regulatory environment becomes more flexible so as to respond to farmers' real sowing conditions.[17]

As precursors to moving forward and expanding market-led support intervention around seed security, it seems a priority to understand seed market functioning better in stress periods, both formal and informal seed sectors. Such detailed market analysis might be a challenge to carry out in the context of an emergency response where there may be time and/or security constraints—both of which can hinder efforts to identify, describe, and map out existing market players and assess how the emergency has impacted the market and market players. That said, tools do exist to address this gap e.g. The Seed System Security Assessment (SSSA) or the Emergency Market Mapping Analysis (EMMA), or a combination of the two (see Sperling, 2008 and Bryne *et al.*, 2013). They are quick, they do require some expertise, and unfortunately, they are rarely used. Note that market analysis of the demand (farmer) side as well as supply side needs to be promoted. What do farmers want and need in stress periods? What are they willing to pay for? Which types of farmer are buying and under what conditions? (see Almekinders *et al.*, 2019).

A second precursor is to build in much more learning around what actually is being tested and implemented. While the authors of this exploratory review are very grateful for the cases identified and the information and insights generously shared, both donors and implementors could have benefitted from more documentation of the actual process, the immediate results, and the potential medium-term impact-- linking such relief to development. Market-led support, by nature, should have spinoff effects and more enduring impacts. As suggestions, program monitoring and evaluation could be oriented to assessing market-based outcomes like crop and varietal diversity, farmer choice, competition among seed market participants, and expanding a sustainable customer base.

Practically, on the ground, there is a good deal more work to do in testing and refining market-led support approaches focusing on supply. Table 1 brainstormed on a large range of possible seed supply-linked support options (refer to Table 1), but the review ultimately could find few of these that had been implemented (and

[17] We note that a growing number of countries, especially in Africa, do have QDS standards (e.g. Uganda, Tanzania, Zambia) as well as emergency seed clauses (e.g. Kenya, Zimbabwe) which allow for a wider range of seed qualities to be procured and sold in select situations.

please do alert us to any and all cases we may have missed). Both donors and implementors might best become more pioneering here—especially going beyond availability support.

In closing, we list below a first set of enabling features for framing further market-led seed security work. All seem essential to every type of seed security market-led intervention.

Enabling Features for Modern Market Led Interventions in Emergency and Chronic Stress Environments

1. Understand local market functioning—both formal and informal markets. This includes mapping the different actors such as producers, small traders, transporters, large traders and identifying how they address seed access, availability, and seed quality.
2. Focus not only on seed availability but on understanding market demand and developing a conscious market strategy to sell seed based on male and female farmer demand.
3. Promote clear and simple gender-sensitive feedback loops from the seed buyer to the seed producer and the seed trader. Establish an information and communication system and activities which help integrated feedback loops in the seed value chain and place the emphasis on existing seed value chain actors, i.e. those that will be present after the program stops.
4. Ensure that the outcome of the market-led intervention is not a restricted market of less participants (few traders or seed sellers) and lower crop and varietal diversity but rather an expanded market of more crops and varieties—adapted to stresses faced by farmers.
5. Devise clear strategies that link relief to development—what happens after the institutional buying stops? How to engage with existing informal seed sector actors?

For feedback, including suggesting other cases to move forward learning, contact Stephen Walsh (walshstephenpatrick@gmail.com) and Louise Sperling (sperling@seedsystem.org).

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ANNEXES

Annex 1. Catalogue of Case Studies

Country & Crop	Market Intervention	Context	Scope	Project Partners	Intervention Features	Immediate Recommendations	Future Research
1. Rwanda (sweet potato)	GoR buys from sub-set of 79 seed producers (DVM). Country wide. Predictable market.	Emergency distribution due to recurrent drought. Material is transported to beneficiaries and provided for free.	400,000 USD annually	Government of Rwanda; International Potato Center; tender winners, vine producers.	Government tender processes lead to intermediaries and not vine multipliers directly. Tender processes are not always put in the public domain; payment to vine producers often delayed, seed inspection and vine quality is not rigorously followed. Approximately 70% of all vines are sold on a commissioned / contractual basis and 30% through spot markets. About 30% of vine production sold is to farmers, varying considerably by vine multiplier. Vine marketing strategies started in 2014 and include innovative strategies like selling at roadside markets, advertising with road signposts, organizing vine multiplier forums, advertising on radio or tv, and building linkages with NGOs involved in root production and nutrition activities. GOR became an important vine buyer since 2017, buying at least once per year and distributing to vulnerable farmers. Seed (vine) multiplication sites are inspected under the authority of the NARS, RAB. Many NGO's request CIP to give certificates to decentralized vine multipliers (DVM) to encourage their professionalism. Vines are not classified into categories. The main seed quality issues addressed by this program include poor quality vines used by farmers, varietal degeneration, poor resistance to pest & disease, and lack of vine conservation strategies.	Revise the procurement process to better integrate farmer demand for specific sweet potato varieties, encourage more decentralized production; introduce performance contacts and competition among seed producers; encourage choice for farmers in terms of varieties and suppliers; encourage use of diagnostics to understand farmer demand.	Post-distribution monitoring to understand how farmers experience the program, the impact on the farmer, and farmer willingness to pay so as to increase sales of vines directly to farmers.
Country & Crop	**Market Intervention**	**Context**	**Scope**	**Project Partners**	**Intervention Features**	**Immediate Recommendations**	**Future Research**
2. Zambia (legumes, common bean, soya, groundnut)	Working with a seed grower association to access to new varieties, early generation seed, and make market linkages.	Chronic seed insecurity; seed is primarily purchased by wholesalers who sell back to GoZ seed input programs.	Sanikuno produced 14 MT of legume seed in 2018, comprised of 40 producers in one district, they are one of the more	Self Help Africa; local seed businesses; Stewart Global – Afriseed, Government of Zambia. They started out in 2010 under a	Seed is almost exclusively sold to a single buyer who conditions and sells to the government. They have not registered any sales to farmers in the district. Sanikuno has followed a similar model since 2010 under two different programs and donors. Seed inspection is conducted by SCCI (national seed inspection service) and Sanikuno has failed inspection in several years and as a result has lobbied to have seed	More diversified sales channels for seed producers and more sales to individual farmers and into the community and catchment area where the seed is produced. Use of small packs as a	Identify ways to strengthen the sales between the seed producers and the community / catchment areas where the seed produced; look for innovations which can strengthen and diversity

	These interventions are country wide; Sanikuno Seed Grower Association is Kafue District, Lusaka Province, Zambia.	Maize focused; government programs are primarily maize seed and fertilizer with legumes being promoted to encourage diversity.	mature seed producers of 20-30 seed producers' groups working with self-help in Zambia	European Union- funded seed project called OPAD.	inspections and certificates issued to individual farmers as opposed to the overall association. Seed that fails inspection is sold to local traders. Sanikuno has a good relationship with the national agricultural research program, has participated variety trials with the legume program, and remains in close contact with the head of the national legume program.	marketing tool to encourage farmer access to seed and to new varieties Support / subsidies for small replicated demos of legume varieties.	community based seed producer markets and reduce the role of large government or project backed aggregators .
Country & Crop	**Market Intervention**	**Context**	**Scope**	**Project Partners**	**Intervention Features**	**Immediate Recommendations**	**Future Research**
3. Ethiopia (sweet potato, potato) [e.g. QDS seed]	Sub-set of farmer groups + cooperatives are quality declared seed producers selling to the project. SNNPR and Amhara region. Training, access to new production technologies, market linkages, and seed storage method for potato (diffused light stores) and sweet potato (sand, storage, sprouting) method.	Drought since 2015, program is aimed at improving food and nutrition security by supplementing cereal based diets with potato and sweet potato.	Financial scope to be determined, up to a few hundred farmer groups.	USAID (OFDA); International Potato Center (CIP); cooperatives; Regional Bureau of Agriculture identifies recipient farmers in the respective regions.	For both potato and sweet potato, quality declared planting material is purchased from quality declared seed producers. The main difference is that for potato the seed producer cooperatives supply the planting material while, for sweet potato, the vines are produced by commercial farmers and vine cuttings are transported carefully and planted within 2-3 days. Seed is procured through an open and transparent bidding process among existing producers, each bidder must have a cooperative registration certificate, an annually updated quarantine license, and a bank account. Bids are analyzed by committee and fields are inspected. The supply contracts are signed by CIP and suppliers. During the most recent season, the emergency project purchased 97,000 USD in seed potato and 102,000 USD for sweet potato vines. No pre-financing is provided but seed producers receive training on seed production and management. Project staff inspect fields to ensure they are disease- free and to estimate plant material quantities. All project seed fields and stores are inspected by the Input Control and Quarantine Office of the Regulatory Department in the MoA. All seed which passes inspection is called QDS. Over 90% of all seed produced by this program is purchased by institutions and projects. The Bureau of Agriculture oversees the field inspections and monitors implementation of QDS regulations. QDS standards have been employed for potato and sweet potato since 2011/2012 and were endorsed by the government since 2015 for potato and since 2016 for sweet potato.	Public access data base / centralized data management of all seed produced by location, varieties, source material, planting date, and intended harvest date. Farm and community level diagnostic assessments to characterize potato and sweet potato seed systems and qualify / quantify farmer demand for potato and sweet potato.	Post-distribution monitoring to understand how farmers experience the program, the impact on the farmers accessing planting material, and farmer willingness to pay for planting material so that sales can be increasingly made to farmers.

Country & Crop	Market Intervention	Context	Scope	Project Partners	Intervention Features	Immediate Recommendations	Future Research
4. DRC (beans, maize)	Seed fairs and non-food items.	Emergency response following war/ displacement. Local NGO conducted seed fairs with support from FAO, OXFAM, and SAMARITAN's PURSE.	4,000 households in Lubero and Masisi; 1,200 households in Ituri; 3,000 households in Ituri.	FAO; CEDERU; seed traders; SENASEM (seed inspectorate); OXFAM NGO; SAMARITAN's PURSE	Seed traders were selected following a tender process which was overseen by the national seed inspectorate (SENASEM), only certified seed was allowed at the fair. Limited crop and varietal diversity. For FAO-supported seed fairs, the seed sellers were encouraged to source seed from FAO-supported seed producers. Two of the three fairs were organized as modified distributions whereby each household was allocated a fixed amount of seed in exchange for a voucher. A limited number of traders /seed sellers participated in the fairs. Few seed producers participated directly in the fairs.	Farm and community level diagnostic assessments to characterize seed systems and qualify / quantify farmer demand for seed. Encourage farmer choice and local seed producers and local traders by allowing them to bring seed to seed fairs. Expand the number of sellers at the fairs and encourage seed producers to sell directly at fairs.	Introduce a new seed class 'emergency seed' to reduce the motivation of seed practitioners (donors, projects, seed producers) to only seek certified seed as the current practice. This practice blocks quality seed from informal markets/producers to be transparently sold, instead creating an artificial market for certified seed which cannot be met. One result is that 'informal seed' is sometimes sold without transparency as 'certified'.
Country & Crop	**Market Intervention**	**Context**	**Scope**	**Project Partners**	**Intervention Features**	**Immediate Recommendations**	**Future Research**
5. Afghanistan (wheat)	Seed enterprises supported with infrastructure grants / market linkages.	Emergency/post-war following two decades of conflict and seed infrastructure collapse and varieties that were screened for tolerance to wheat rust (UG-99).	Country wide and with ten years of European Commission project financing.	FAO, 100+ private seed enterprises, National Seed Board, Ministry of Agriculture, Irrigation, and Livestock, and research partners CIMMYT & ICARDA	Variety testing and screening in Kenya for UG-99 to identify high yielding varieties with resistance to yellow rust. Field demonstrations and on- farm trials were an important component to promote the modern wheat varieties. Main buyers of seed included aid agencies, Ministry of Agriculture but nearby seed producers also sold some production directly to farmers. Modern wheat seed covers more than 60% of irrigated wheat production in Afghanistan and certified wheat seed production has reached 35,000 metric tons annually.	Seed production and sales was stimulated by institutional purchases (projects) and the threat of wheat rust, to sustain a more market oriented and farmer driven wheat seed market will require greater decentralization and more emphasis on varietal demonstrations.	Improve seed marketing directly to farmers and increase the cost recovery from subsidies to wheat seed producers. Identify lower cost options for promoting farmer access to varietal diversification.
Country & Crop	**Market Intervention**	**Context**	**Scope**	**Project Partners**	**Intervention Features**	**Immediate Recommendations**	
6. Uganda (sweet potato)	Multi-year data collection to characterize local seed potato vine market in northern Uganda.	Emergency/ chronic stress. Long dry season precludes farmers from saving seed/ vines, there is a recurrent market for sweet potato vines.	Informal seed producers, seed traders, seed transporters	Seed producers, seed traders, seed transporters	Existing seed sector was mapped in the region and a subset of participants (producers, traders, transporters) were interviewed over several seasons to understand their respective role in the local seed system. Two follow on interventions were funded as a result of this work, both focused on increasing linkages between breeders and the local sweet potato seed system actors in order to promote access to more varieties and to strengthen feed-back loops between existing seed system actors and breeding programs.	Interventions (like this) should occur with recognition of the informal / existing actors working in same system. Support Farm and community level diagnostic assessments to characterize seed systems and qualify / quantify farmer demand for seed (like this case) more routinely.	

Country & Crop	Market Intervention	Context	Scope	Project Partners	Intervention Features	Immediate Recommendations	Future Research
7. Niger (millet)	Seed producers are supported with training, foundation seed, and linkages to buyers.	Chronic stress, emergency response to 2012/2013 food security crisis and 207 failed rains.	Six seed producers; under 2 MT of seed in FY2018; all seed was produced and sold through a Cooperative comprised of 11,000 farmers.	Federation of Kishi (farmer cooperative of which a sub-set of seed producers), National Research Programs National seed inspectorate; support from Cargill Foundation.	Varieties are identified by the national research program. Production targets are set at the start of the planting season based on discussion within the federation with seed producers and farmers; this includes production targets and prices. No contracts are signed. Agricultural technical services of Nigeria monitors seed production through seed field visits but the seed is not formally certified.	Need farm and community level diagnostic assessments to characterize seed systems and qualify / quantify farmer demand for seed.	Devise exit strategy; (which is not evident). How does this intervention support sustainability of the system?
Country & Crop	**Market Intervention**	**Context**	**Scope**		**Future Research**		
8. Uganda (legumes, cereals)	E-Voucher: partial voucher scratch (50%) reimbursed at registered agro-dealers and credit provided to seed producers and agro-dealers.	Chronic stress	18,000 E-vouchers redeemed in 2016. Farmers bought nearly 14,000 metric tons of legume seed and 2,500 metric tons of cereal seed.		a. What were the seed quality issues which were alluded to, but not discussed in any detail, in the program evaluation? b. The 50/50 scratch cards: Were there any issues convincing farmers to pay the 50%? Were all scratch cards purchased? How was the collection aspect administered? Any data on the demographic of farmers that paid the 50%? c. Credit supply guarantees: How were these administered? How many guarantees were provided and what was the typical value? d. E-Voucher purchase data: Did the purchase data include information by crop, variety, and agro- dealer? Were there any operational issues to get this data? e. Follow up with Seed producers / Agro- dealers: Did the program include exit strategy activities for the seed producers and agro-dealers supported by the program?		
Country & Crop	**Market Intervention**	**Context**	**Scope**	**Project Partners**	**Intervention Features**	**Immediate Recommendations**	**Future Research**
9. Kenya (legumes)	Dryland Seed: Small packs used in drought context.	Chronic Stress					
Country & Crop	**Market Intervention**	**Context**	**Scope**	**Project Partners**	**Intervention Features**	**Immediate Recommendations**	**Future Research**
10. Uganda (legumes)	Small packs used for bio-fortified crops.	Chronic stress					

Annex 2. Sources for the Cases

Case Study 1: Rwanda Sweet Potato
Personal correspondence with program manager Sindi Kirimi, CIP Rwanda in September – October 2019.

Case Study 2: Zambia Legumes
Field visit, trip notes, and personal correspondence with seed producer group under a program review to assess how NGO seed activities can be more supportive of seed business development in October 2018 and April 2019.

Case Study 3: Ethiopia Sweet Potato and Potato
Personal correspondence with program manager Berga Lemaga, CIP Ethiopia in September – October 2019.

Case Study 4: DR Congo
Personal communication with Paul Muhasa, CEDERU director in September – October 2019.

Field visit with CEDERU in Goma, DRC on Sunday July 21, 2019.

Un-published internal program document (2019) summarizing lessons learned from several seed voucher and fair experiences led by CEDERU in Eastern DRC in 2017 and 2018.

Case Study 5: Afghanistan
Personal communication with FAO Afghanistan October 2019.

Afghanistan and FAO Achievements and success stories (2011); FAO Afghanistan Seed Program Summary of Achievements (2015).

Case Study 6: Uganda Informal Seed Systems
Rachkara, P. *et al.* (2017). Innovative and beneficial informal sweet potato seed private enterprise in northern Uganda. Food Security 9. pp. 595-610.

Case Study 7: Niger Millet
Millet in Niger case study – Personal communication with LWR staff Kouka Zoungana, Bijou Kuzimbu, and Nana Aminata Toure in West Africa, and Niger in September – October 2019.

Case Study 8: Uganda Vouchers
Personal correspondence with Mercy Corps staff Sylvia Alaso, Fredrick Mpaata, Iveta Ouvry in September-October 2019.

Uganda case study – Final Performance Evaluation of Northern Karamoja Growth, Health, and Governance Development Food Assistance Project (January 2019).

Seeds E-voucher: An Approach to Inclusive Agri-Market Development; The TOPS Agriculture and Natural Resource Management Case Study Series (October 2016).

Un-published program documentation (2019) related to voucher activity reports for multiple programs, un-published document on random sample of seed voucher program participants to assess use of vouchers.

Case Study 9: Kenya Small Packs
Kenya case study on small packs – power point presentation of Dryland Seed, small packs and climate smart (March 2017), Formal meeting proceedings; https://seedsystem.org/wp-content/uploads/2018/09/New-Models-for-Legume-Seed-Business_meeting-report_FINAL-FINAL.pdf

Case Study 10: Uganda Small Packs
Uganda case study on small packs – power point presentation of CEDO, small pack and seed credit model (March 2017). Formal meeting proceedings. https://seedsystem.org/wp-content/uploads/2018/09/New-Models-for-Legume-Seed-Business_meeting-report_FINAL-FINAL.pdf