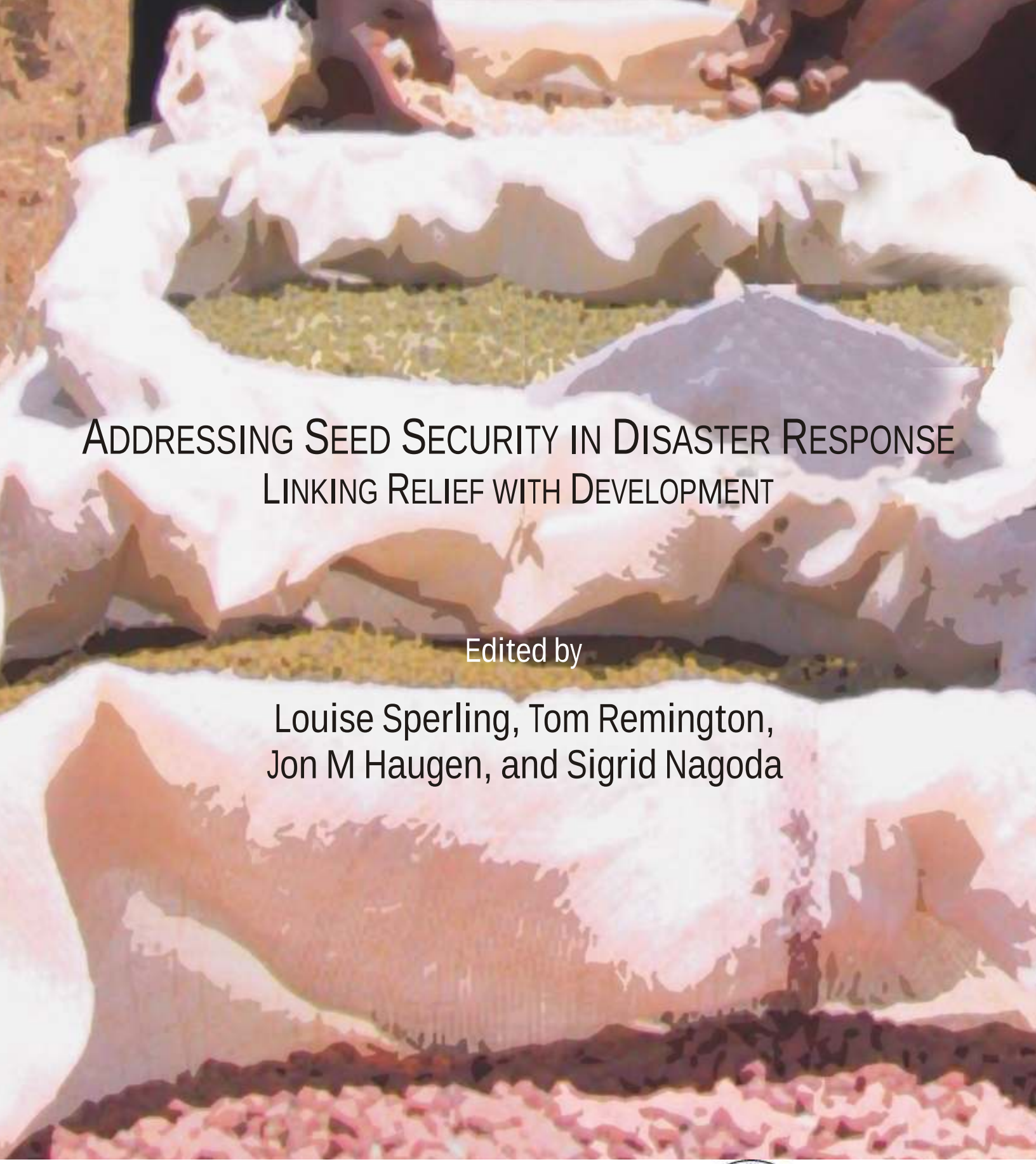

Addressing Seed Security in Disaster Response

Linking Relief with Development

Edited by

Louise Sperling, Tom Remington,
Jon M Haugen, and Sigrid Nagoda

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Two sets of donors had the vision to fund comprehensive follow-up of emergency interventions. From the United States Agency for International Development, Laura Powers of the Office of Foreign Disaster Assistance and Eric Witte of the Economic Growth and Agricultural Trade Unit have been relentless in trying to find out what really happens—and in improving emergency practice. Lillian Wikstrøm of the Section for Humanitarian Affairs at the Ministry of Foreign Affairs in Norway has also shown particular interest in improving crisis response.

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Dedication

"To the many farm families who never seem to catch a break—yet who show tremendous courage and resilience in the face of disaster.

And to the many practitioners who do their best to assist—against formidable odds and often at considerable risk."

Overview of Findings and Reflections

Louise Sperling
Tom Remington
Jon M. Haugen

Introduction

This volume contains eight case studies managed by CIAT, CRS, and CARE Norway in a project entitled, *Assisting disaster-affected and chronically stressed communities in East, Central and Southern Africa: Focus on small farmer systems.* The case studies were undertaken to evaluate various forms of emergency seed aid and to couple these with analyses of the broader seed and crop systems. The objectives were to understand if and how vulnerable farmers are being helped by the kinds of assistance they receive—and how to move forward on improving practice.

The work was undertaken over a two-year period, in seven countries in Africa. In all cases, the seed aid practitioners were also engaged in the evaluations and reflections, so that "lessons learned" could immediately influence the "next steps of practice." It is to the credit of the participating national agricultural research systems (NARS) and nongovernmental organizations (NGOs) that they were willing to take a hard look at the effectiveness of their interventions. Equally, the donors, both USAID/OFDA and the Ministry of Foreign Affairs/Norway, are to be lauded for promoting substantive follow-up on emergency assistance because such follow-up is rare.

Table 1 gives the broad overview of the major features of the case studies: the countries in which they were undertaken, the stresses that originally triggered a decision to supply seed-related assistance, and the types of interventions that eventually unrolled. Note that the analyses of the real stresses changed as the work progressed.

Table 2 hones in on the salient (defining) questions of each field program. Five of the cases address key features of specific interventions (such as introductions of new varieties), while three present overviews of the practice and evolution of seed aid on a country-wide basis.

In the volume that follows, case study abstracts provide findings specific to the intervention and context. In this introduction, we step back and reflect on the broader findings that emerge from this rare opportunity to examine seed aid across countries, across stresses, across interventions, and across different types of seed systems.

Table 1. CIAT/CRS/CARE-Norway Project: Major Descriptors

Case study descriptors	Content
Countries	Burundi, Ethiopia, Kenya, Malawi, Mozambique, Uganda, Zimbabwe
Trigger Stresses	Drought, civil strife, flood, plant disease (and crop breakdown), distorted political economy
Interventions	• Direct seed distribution • Seed vouchers and fairs • Starter packs and targeted input distribution • Community-based seed production • Introduction of new varieties
Crop foci	Maize, beans, cassava, sorghum, rice, millet, cowpeas, bananas, sweet potatoes also: wheat, barley, vanilla, cocoa, moringa

Table 2. CIAT/CRS/CARE-Norway Project: Defining Questions

Specific site	Defining question
Analysis of Specific Interventions	
Eastern Kenya	Direct seed distribution and seed vouchers and fairs: what is their relative cost-effectiveness?
Northern Burundi	Seed vouchers and fairs and the role of traders: who benefits?
Western Uganda	Seed vouchers and fairs: real agro-biodiversity gains?
Western Kenya	Introductions of new (self-pollinated) varieties in period of crop breakdown: do informal farmer producer groups move quality seed, and quickly?
Northern Mozambique	Introductions of new varieties in a period of crop breakdown: are there special concerns with vegetatively propagated material?
Overview of Seed Relief and Evolution of Practice	
Malawi	Direct seed distributions Seed vouchers and fairs Starter packs/targeted input programs Community-based seed production
Ethiopia	Direct seed distributions/local procurement
Zimbabwe	Direct seed distributions

General findings: Seed systems under stress

Acute response implemented in chronic stress contexts

Emergency seed system assistance was delivered in six out of the eight cases in response to what was characterized as an acute stress. That is, acute seed insecurity was presumed to have been brought on by *distinct, short-duration events* that affected a significant portion of the population. However, more in-depth analysis, in all six cases, showed the problems to be of a more chronic, systemic nature: e.g., declining productivity, water-related stress, ongoing civil unrest, and/or misplaced political policies.

The other two cases, both of crop breakdowns (one in western Kenya with beans and the other in northern Mozambique with cassava), were the only ones in which prior assessments (or diagnoses) actually took place. These revealed that the "acute manifestation" was due to more systemic biotic, abiotic, and economic pressures: build-up of plant disease, lack of crop rotations, declining farm sizes.

The result of an "acute" response in a more chronically stressed context means that the problem is not alleviated and that seed system assistance is then needed—again and again. However, the effects of giving "acute" aid in chronic stress contexts are not just neutral (and may have negative impacts). During the second and third rounds of aid, one is not just starting from the same (compromised) baseline. Increasing evidence, within and beyond these case studies, demonstrates that aid given on a repeated basis distorts farmers' own seed procurement strategies (see Malawi case herein and Kenya case, Sperling, 2002), undermines local seed/grain market functioning (Burundi case herein), and even compromises the development of more commercial seed supply systems (Zimbabwe case herein and Tripp and Rohrbach, 2001).

So, there are negative effects of giving acute seed aid on a repeated basis, particularly for vulnerable farmers, for local and regional traders, and for the developers of private enterprise.

Chronic seed distribution promotes the emergence of a relief seed system

Seed aid distribution is taking place in a large number of countries: one season, two seasons, three seasons, and beyond. The giving of seed aid is itself becoming a "chronic" activity. Table 3 summarizes the number of years seed aid has been given in several of the countries under study. Figures have been amassed from actual government records, from NGO reports, and from the accounts of implementers working on the ground. There seem to be few checks for stopping such assistance (simply when funds dry up?) and deliberate exit strategies have not been planned.

Table 3. Chronic Seed Aid Distribution

Country	Seed Aid Distributions
Burundi	22 seasons since 1995
Eastern Kenya	1992/93, 1995/97, 2000/02, 2004
Ethiopia	Food aid 22 years since 1983/84 Seed aid on and off during the same period
Malawi	9 seasons or more since 1992
Zimbabwe	Near continuous since 1991 (food aid, seed aid, or both)

The rise of a chronic seed aid system has been identified as a profitable business opportunity for the entrepreneurial, who specialize in quick delivery of a small range of crops. It has also led to the rise of a separate seed system based on relief, i.e., a "relief seed system" (see the Ethiopia and Zimbabwe cases). Relief seed systems are created to assist farm communities in post-disaster contexts and are based on the assumption that other seed channels (in both the formal and farmer seed systems) are simply nonfunctional.

Relief seed systems have evolved dramatically and differentially in different countries in Africa, but their rise has been quick and steady. They seem to be of two basic types: in Kenya, Zimbabwe, and Malawi, there are commercially based relief seed systems. This is because of the importance of maize as a commercial crop and the dominance of commercial maize in the seed market. In countries without a significant maize-based commercial seed sector (like Burundi) or those with a niche market (Ethiopia), donors and relief agencies have always relied on the farmer seed system to source their seed for emergency redistribution. The functioning of such systems involves a straightforward set of steps: a disaster is declared, seed need is assumed, and then a well-established chain of suppliers moves into action.

No diagnosis and an assumption of lack of seed trigger seed-related disaster responses

The lack of any diagnosis related to the seed system has now become a commonplace observation within the disaster literature (Sperling and Cooper, 2003). In practice, one of four strategies is employed for "assessing" seed security and none is sufficiently accurate or timely for assessing seed security among vulnerable farming populations:

- No assessment is done at all—and seed need is assumed.
- Food security assessments are effected—and seed need is assumed.
- A crop production fall (decline) is measured—and seed need is assumed.
- Lengthy surveys of farming and rural production systems are completed—and the results are analyzed and written up—after emergency seed has been delivered.

Within the cases documented here, only two instances of diagnosis or problem assessment were noted. Both were research-driven and related to an analysis of progressive crop failure due to plant disease/farming system pressures.

In the absence of seed-related needs assessment, the default option has been to assume that there is a lack of available seed. This has been done in a wide range of disaster contexts since the start of seed aid practice.

Two sources of concrete information, from very different perspectives, indicate how incorrect this automatic assessment of lack of availability often is.

1. A growing number of studies have actually traced where farmers in "disaster" situations sourced the seed they planted—in areas where seed aid distribution had taken place. Table 4 indicates that in contexts where precise data were examined (and with larger sample sizes), relatively little of the seed sown came from emergency aid (with the importance of the assistance varying by crop and context). This means that, as farmers were lining up to become beneficiaries of free seed aid, they were simultaneously sourcing non-aid channels to access most of their needed seed supplies.

Table 4. Importance of Relief Seed in Farmers' Overall Seed Supply during Disaster Periods

Context	Crop	% of seed planted sourced through relief	Source
Zimbabwe/drought/political instability/2003	Pearl millet	12*	Bramel and Remington (this volume)
Rwanda/war/1995	Beans	28**	Sperling, 1997
Kenya/drought/1997	Maize	11	Sperling, 2002
Somalia/drought/2000	Sorghum	10-17*	Longley et al., 2001
Somalia/drought//2003	Maize	3	Longley et al., 2001

* This figure includes seed delivered by NGOs and the government during the stress period, some of which may have been labeled "relief." During "'normal'" times, farmers access 5% of their pearl millet seed from these channels.

** The figure of 28% came from the first seed distribution, two months after intensive fighting ceased. Relief seed was then distribution again, the next major planting, and in January 1996, and only 6% of the bean seed shown came via relief channels.

2. This project also set out to assess seed availability via local seed/grain traders, who may supply seed in crisis periods. In Burundi, where seed aid has been given since 1995, 41 traders recounted their experience with seed sourcing over the last 10 years of drought and war. Seventy-eight percent indicated that there had never been a problem with availability. The other 22% nuanced their answers, with only one (item *a* below) suggesting an absolute lack at one point in time (see Burundi case, this volume).

    a. only once—during the 1993/94 war—when everyone was fleeing (n=1);
    b. in 1993, when all seed had been bought up by the emergency NGOs;
    c. during the "events," seed was available in Rwanda (30 km away) but "my bicycle broke down";
    d. the problem was price.

Trader remarks highlight how relative the term "availability" is and how directly linked it is to a trader's means. Those who source seed using bicycles, and with slim price margins, have different parameters of availability than those with large trucks (and who also easily cross borders). As this overview is being written, a large-scale commodity trader has been hired by the project to assess seed availability in eastern Kenya—where government and NGOs have been distributing free seed on an impressive scale (for the second season in 2004). The Kenya analysis is drawing results comparable to the Burundian one: seed is widely available in local seed/grain channels. Via the Kenya case, this project has commissioned the commodity trader to construct a practical checklist for assessing market functioning (including seed availability) from an expert point of view.

In sum, in terms of assessment, the field-based studies show that in multiple contexts (e.g., drought, civil strife, or both), farmers have been able to access the large majority of their seed from local channels. Several trader assessments have further confirmed the availability of seed on a large scale—during periods of outside aid. Again, availability is a relative term, and much depends on the means of traders serving a region: their price margins, transport facilities, and seed sourcing networks.

To date, only two types of cases have been identified that show when availability of seed in a disaster context may be a fundamental constraint.. The first case is where local seed on offer is no longer adapted to local growing contexts, often due to biotic and abiotic pressures (e.g., cases herein are in eastern Kenya, due to bean root rots, and northern Mozambique, due to cassava brown streak). Purists might label this problem as a seed quality constraint, rather than one of availability. However, the fact remains that farmers did not have anything to plant that would actually grow.

The second case involves contexts where there have been substantial production shortfalls and local markets have never sufficiently developed to deliver routine seed or planting supplies. In addressing this latter issue of availability and market failure, it might be useful to distinguish between spatial and temporal issues of availability, or the lack thereof. Delving into the root causes for these lacks should encourage practitioners to move from a focus on seed aid to one on strengthening the seed system.

Local seed/grain markets identified as a core element for seed system stability

The more one looks at seed systems in detail, the more the role of local seed/grain markets appears as a central element in promoting seed security. Varied market-related findings are emerging from direct field analysis:

1. Market-sourced seed (especially for self-pollinated crops and cereals, in general, with the exception of maize) provides a core for farmer seed security, especially among the more vulnerable, e.g., in this volume, Burundi, Zimbabwe, and western Kenya; see also Rwanda (Sperling, 1997) and eastern Kenya (Sperling, 2002).

2. Local grain markets, from which seed is obtained, have been shown to be more durable than expected in stress periods, with analysis showing their functioning in periods of civil strife (e.g., Burundi) as well as in periods of drought and floods.

3. The genetic quality of seed sourced in markets is most often acceptable to farmers, as it is generally grown in surrounding agroecological contexts.

4. Surprisingly, the physiological and phyto-sanitary quality of seed purchased in local markets can also be partially regulated (through purchase from known contacts and rigorous farmer sorting). Laboratory analyses (for purity, health, and germination) demonstrate acceptable quality parameters for the market seed examined. Such data do not mean that all market seed is of high quality. They do, however, firmly show that the reverse is not universally true. Market seed, *a priori*, should not be equated with low-quality seed.

5. For the non-hybrids, local seed/grain markets are proving an important channel for moving new varieties, that is, new genetic materials developed by formal research systems. In fact, for some crop types, local markets seem to move new varieties more effectively than formal seed channels.

6. Markets have proven to be a useful source for re-accessing seed of desired types and quantities that has been lost or temporarily abandoned in stress periods.

Given their pivotal role in seed system stability—and resilience—one of the major conclusions of our case studies is that local grain/seed markets must be strategically supported, not undermined, in post-stress periods. They provide a central core of seed security, particularly for the vulnerable.

Seed systems during crisis prove generally resilient—except in cases of crop/variety breakdown

Evidence shows that seed system resilience, of the local, farmer system, is the norm, rather than the exception during periods of stress. "Resilience" in this context means that seed channels continue to provide varieties and seed that farmers find of acceptable quality, and which will grow when sown. Further, those analyses that focused on varietal diversity have generally found that major varieties are not lost—not during drought, war, nor even select cases of flood (viz. Ferguson, 2003)

There are important exceptions to this observation on seed system resilience. In areas of crop breakdown, when existing varieties no longer perform due to formidable pressures (usually plant disease or declining fertility), the local systems may not have the capacity themselves to bring in new materials. Particularly in cases where vegetatively propagated crops (e.g., cassava, sweet potatoes) provide the base of food security, outside assistance may become key. The problem of cassava mosaic virus in East and Central Africa since the late 1980s demonstrates such need.

Misplaced seed-quality parameters in emergency response result in overemphasis on "health" to the detriment of genetic quality

Issues of seed quality very much shape the types of seed assistance (and asset transfers) that can unfold. In emergency seed procurement, quality issues most often focus on whether the seed is certified or not (as many donors require formal verification as a prerequisite for seed procurement.). Quality stereotypes have equated certified and formal sector seed as being of high germination and good seed health, with poor assessments applied to farmer seed (home-produced and procured from the market), which is stereotyped as generally poor. Case study analyses have shown that such labels can be deceptive. The quality of formal-sector seed may not be as advertised (this volume, see western Kenya case) and emergency-grade seed overall is of highly variable health and genetic quality (eastern Kenya case). Farmer seed and market seed has also proven to be "objectively" of good quality, as assessed in laboratory analyses (western Kenya case).

Some of the existing emergency interventions build in special measures to examine quality on a site-by-site basis, such as the catalyzing of regulating committees during seed vouchers and fairs (SV&F). Undoubtedly, additional mechanisms can be put in place to reinforce acceptable quality standards. Minimally, seed on offer via emergency assistance should be as least as good as that which farmers routinely sow.

The focus on the seed health parameter of "quality" has diverted attention away from what is probably the more important quality issue for seed: the seed on offer, at the very least, must be adapted to the stress conditions at hand, and have generally acceptable crop characteristics. It is puzzling that genetic (variety) quality, in practice, has been given second priority in emergency responses. Varieties emerging from formal research sectors or on offer from commercial companies are assumed "good enough," whether or not they have been selected for use in the regions of stress or for growing under the management conditions practiced by beneficiary farmers.

Optimally, the genetic quality on offer should anticipate on-site stresses; e.g., they should be early maturing for those facing a hungry gap or resistant to specific disease pressures in areas with marked pathogen build-up.

Intervention-specific findings

Moving from the overview of seed system insights, the section below summarizes findings tied to specific types of support interventions aimed at seed systems.

Broad pattern of default: DSD to CBM

At present, a narrow range of responses are employed to bolster seed systems in stress. Diagnoses being minimal or perfunctory at best, the evolution of a seed-related assistance pattern is well established (see Malawi, Zimbabwe, Ethiopia cases, this volume) During emergencies, institutions jump to direct seed distribution (DSD) by default. During recovery, institutions move to community-based multiplication (CBM) schemes by default. So seed system assistance is characterized by "option by default." Practitioners supply interventions they feel competent to implement, but not necessarily the interventions that are needed for a given context.

DSD versus SV&F: Misplaced comparison

The capability to conduct a range of interventions has created a divide in practitioner circles. Seed vouchers and fairs are being implemented by those who sense the need to go beyond seeds and tools (S&T), while S&T (re-baptized as direct seed distribution) remains the baseline response.

DSD is about seed—nothing more and nothing less. It assumes that seed is not available—and orchestrates a seed transfer. If done well, a range of varieties and crops can be delivered to a large number of beneficiaries—and in time for sowing. The DSD approach is neither inherently good nor bad.

SV&F at first glance, focuses on seed, and also involves a seed asset transfer. The baseline assumption for implementing SV&F revolves around a problem of "access," and, more explicitly, that there is *not* a problem of availability in the disaster-affected zones.

As one looks more deeply, however, into the two asset-related transfers, it is clear that an "apple and orange" comparison has been put forward. While both use seed as their most visible vehicle, SV&F are implemented to achieve a much broader, and substantially different, set of goals (see eastern Kenya, Burundi, western Uganda case studies, this volume). They are designed to build and stimulate local seed systems under stress, as well as to give a boost to local trading economies in potentially unstable times. In supporting local livelihood systems, SV&F, *de facto*, lay the immediate ground for moving away from outside or external assistance and link relief and development aims from the early stages of a crisis.

Fine-tuning SVFS—only through follow-up

Three aspects of SV&F were also subject to greater scrutiny in the case studies, and unanticipated insights emerged only because of follow-up:

- **Agro-biodiversity not necessarily supported by SV&F**

Contrary to expectations, crop and variety diversity is not enhanced, *a priori*, by the SV&F approach, but neither are the systems *de facto* undermined. The diversity present at a fair cannot reflect the range of diversity in the farming system (some crops do not come to market and less sought-after varieties are not put on offer by traders). The diversity actually put on offer is also not necessarily accessed by farmers: some seek first to fill their vital needs—before their optional wants. More diversity-related transactions could be promoted if, from the supply side, traders and seed sellers were given incentives to put more on

offer (prizes? or modest subsidies for offering diverse and new varieties?). Demand might also be stimulated, if farmers were given more knowledge about the products on offer, as well as the opportunity to purchase "trial" size samples. Ultimately, the demand side will have to be more strategically stimulated if and when SV&F are reshaped to become innovation and livelihood fairs *per se*. SV&F could serve as important venues for putting new varieties, management ideas, or agro-enterprise products on offer. They are already being used to move non-seed inputs (as done at the trade input fairs in Mozambique).

- **Traders are important beneficiaries in SV&F, but not at farmers' expense**

Despite the small scale of transactions, traders at SV&F are often drawn from surrounding locales, and prove key for injecting immediate cash into the stressed economy.

Traders emerge as a clear beneficiary group in SV&F, in addition to, but not at the expense of, beneficiary buyers. In the Burundi case, those selling at fairs tended to emerge from a specialized trading class, with an evident female bias (women cannot easily own land). In western Uganda, traders were generally seed sellers, as likely to be full-time farmers as not.

Traders particularly benefit from fairs in terms of (a) receiving direct cash payments (versus having to extend credit), (b) having a high volume of daily sales, and (c) obtaining prices slightly higher than on the open market.

As traders are generally local, investment in their business translates into investment into the local economy, with the SV&F trader revenues in Burundi, for instance, being reinvested particularly in commercial activities (including the extension of credit).

The coupling of farmer beneficiary and trader beneficiary seems to be a "win-win" situation. However, as the scale of SV&F widens, the relative client benefits should be examined more closely.

- **Analyses of cost-effectiveness not conclusive**

Several cost-effectiveness analyses have been done comparing DSD and SV&F, and their results are not conclusive. Much depends on the scale on which activities have been implemented and how these have evolved through time (the capacity-building costs become lower as the relatively "unknown approaches" become more familiar). The major difference in cost-benefits are not the direct effects so much as the ancillary effects on surrounding seed, economic, and livelihood systems. In terms of seed, *per se*, greater diversity is available through SV&F, as well as the important fact that they allow farmers to select among that diversity in response to their own particular stress situation.

Variety introductions prove potentially key in a crisis but seed diffusion channels need to be focus of equal concern

New varietal introductions can make a key difference to production and stability in crisis times. However, the cases indicate several pivotal decisions that need to be made concomitantly with an assessment that new varietal material may be warranted.

- **Variety basket should be on offer**

A choice of varieties should be on offer—particularly as the context is one of stress. In both western Kenya and northern Mozambique, the basket of options helped to anticipate probable future breakdowns of disease resistance.

- **Not everything new is good**

Not everything new is good. Maize hybrids, in particular, are often promoted as new items on offer in stress contexts. However, their performance is very uneven as an emergency input (see Kenya, Zimbabwe, Ethiopia, Malawi cases). This underlines the need for a strategy for new introductions to be carefully weighed, particularly if the recipient herself is not the one selecting the precise emergency aid option.

- **The choice of specific diffusion channels is critical for new variety impact**

The choice of diffusion channels for moving new varieties (formal, informal, market, groups of farmers, etc.) is potentially as important for achieving impact as the quality of the product being diffused. It makes strategic sense to build on channels that move products fast, widely, at low cost. The case analyses showed unimpressive results for working through informal farmer seed multiplier groups, but remarkable diffusion results via local grain/seed traders. Parallel to a focus on diffusion channels, the varied seed production models being promoted throughout Africa (of which farmer multiplier groups are one) need to be designed from the start with an explicit impact-oriented outreach focus—if they are to reach the vulnerable.

Several of the case studies showed that new varieties in themselves can have an important impact in specific kinds of stressed contexts. However, research needs to speed up its product- development response if it is to become a reliable partner in alleviating disaster scenarios.

Seed security: Moving forward the frontiers of disaster response

The steps for improving the effectiveness of seed aid practice seem fairly straightforward, and implementable over the next five years. They involve a combination of positive strategies: (a) promoting real learning evaluations that can fine-tune current implementation modes, (b) broadening the basket of potential response options—through low-risk case scenario tests and capacity building, (c) supporting assessments of seed system security prior to intervention (which will also encourage methods/tools to become further refined), and (d) developing strategies for "emergencies" that factor in chronic stress. A fundamental step for moving forward also involves acknowledging that "more of the same"—repeated DSD or SV&F—may not be achieving the expected humanitarian aims. Most of the recommendations below encourage a moving away from knee-jerk emergency responses—towards interventions where implementers better understand what they are implementing and why.

Evaluation of assistance

The scale of seed aid has escalated since it was introduced as a complement to food aid about 15 years ago. Given (a) its impressive scale, (b) the observation that seed aid has become repetitive, and (c) evidence that aid can have negative as well as positive effects, evaluation should be promoted for a range

of contexts. Perfunctory evaluations (such as tallying the quantity of seed distributed to *x* number of farmers) serve as little more than self-confirming checklists that implementers have "done a good job." Instead, evaluations should minimally have two salient characteristics:

- First, they should be situated within a brief analysis of the functioning of on-going seed systems and frankly assess how important the aid was versus other seed-related sources and support. Taking a sample of farmers and finding out what they actually sowed and why is quick, easy to do, and gives a reality check on the importance of the intervention.
- Second, each evaluation should program a critical question follow-up so as not to repeat the same mistakes: e.g., did the poorest get seed? (why or why not?) Was the crop profile on offer appropriate? (why or why not?) Did farmers re-sow the new varieties delivered? (why or why not?)

The money required for such follow-ups is modest in relation to the funds employed in the intervention itself. The time required for such punctual questions involves but a matter of weeks. If such modest time/money commitments prove obstacles for implementing organizations, they should not be intervening at the heart of vulnerable farming systems. Ideally, evaluations of seed system support should also be framed within assessments of the larger regional economy and livelihoods, but it is unrealistic to expect the quick-response teams to conduct in-depth analyses. So for moving evaluation in seed aid forward, we suggest the practical and do-able, and consign the "ideal" (more in-depth) to specialists.[1]

Broadening the base of response options: Focus on capacity building

The repertoire of seed system responses in emergencies has already been broadening, particularly in the last four years, with seed fairs, vouchers, direct cash payments, input and livelihood fairs, etc., Further follow-ups analyzing and comparing these options are underway in a number of countries and are supported by several agencies (e.g., in Ethiopia: OFDA/USAID and ODI). Unfortunately, implementation of response alternatives is frequently de-linked from an analysis of the problem at hand (see next point on needs assessment), and pro-linked to the current specific capacity of the implementing organization. There is an urgent need to build the capacity of implementers to engage in a range of response options. Without an explicit donor focus on practitioner capacity building, we will get more of the same.

Refinement and promotion of seed system security assessments (SSSA)

The methodology for doing seed system security assessments is quickly being honed, and key elements can be applied immediately. Work during the last few years has shown which seed channels to focus on during acute crisis (90% of the time, own production and local seed/grain markets) and how to assess whether such channels are functioning, at what level, and for whom.

For instance, one of the tenets of the SSSA Guide (CIAT/CRS/CN, forthcoming) is that "*production shortfall is not necessarily equal to seed shortfall."* Modeled after actual Eastern African farming parameters, the example illustrated in table 5 clearly shows that one can lose most of the harvest (88% for beans and even 99% for sorghum) and still have enough seed to sow—assuming that all the crop harvested can be saved for actual planting.

1. At the time of this writing, CRS has conducted ex post evaluations of seed vouchers & fairs in Gambia, Ethiopia, and Zimbabwe, and has recently completed a meta-analysis of the SV&F approach (Bramel and Remington, forthcoming).

Our understanding now of the importance of local grain/seed markets is also contributing to the SSSA guides and shifting the focus of methods beyond assessing what farmers actually have in their hands (own production and home stocks) to what they can access. Two key parameters shape market analysis in the SSSA in particular. Differences between the seed and grain on offer need to be factored in across crops, and a spatial overlap must be laid over market zones and zones of agroecological adaptation.. In all cases, elements of a comprehensive SSSA thinking guide are in place, and such seed security assessments—as distinct from food-need calculations—should be encouraged in the coming years. Only with more focused seed security assessments can we hope to more toward more tailored support responses.

Table 5. The Relation between Harvest (Home Production) and Seed Needed for Sowing (Theoretical Example, Eastern Africa)

Crop	Beans	Sorghum
Surface area per household	¼ ha	¼ ha
Seeding rates per hectare	100	10
Sowing needs per surface sown (¼ ha)	25 kg	2.5
Multiplication rates of seed	8	100
Harvest per surface sown (¼ ha)	200	250
% of harvest needed to meet basic sowing needs	12.5	1.0

Source: SSSA Guide (CIAT/CRS/CN, forthcoming).

Factoring in chronic stress needs from the beginning of an emergency response

Finally, we highlight an implication of one of our key findings: that much of the acute response is being implemented in more chronically stressed contexts, where a swath of the population is continually vulnerable—usually due to poverty.

In such a context, the emergency response should explicitly work through a lens that anticipates features of such chronic stress. At a minimum, interventions should be avoided that (a) expose farmers to increased risk and (b) have the potential to undermine functioning systems. In a positive vein, interventions should be promoted that (a) counter the stress but which also (b) aim to strengthen farmers' own capacities, bolster the functioning of their farming systems, and stimulate growth in the local economy. We now know firmly, mostly through seed systems studies, that seed (in)security is rarely about seed—and almost always about poverty. Hence, those implementing emergency responses should now face the obligation to squarely address this poverty link, even during periods of stress.

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Drought, Civil Strife, and Seed Vouchers & Fairs: The Role of the Trader in the Local Seed System

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Abstract

This case study describes the role of seed fairs in supporting, stimulating, and strengthening the local seed system. It analyzes local channels of seed supply with a focus on understanding how they function in times of stress and how seed vouchers and fairs support local seed traders. The study is based on 41 semi-structured interviews conducted with seed traders who participated in seed vouchers and fairs in Kirundo Province, Burundi, in February 2003.

Results of the study show that seed traders at seed voucher and fair activities are an experienced and specialized group with formidable trading skills. Selling seed is more likely to be the primary occupation and exclusive revenue opportunity for women. Barriers to entry into the trade seed are not excessive. Seed fairs have a positive impact on the local seed system by stimulating social capital and kinship ties between traders and buyers, building seed-sourcing relationships that extend beyond the seed fair, and providing capital, which is predominantly allocated to local commercial and farm activity.

The case should encourage seed aid practitioners in Burundi and beyond to take a longer-term and more holistic approach towards assessing and addressing seed needs. It is also expected to help practitioners design and implement seed fairs that stimulate further local enterprise and give farmers access to a range of innovations, including access to new varieties, new products, and the varied inputs needed to intensify production.

Introduction

Located on the western edge of the Rift Valley, Burundi is a land of hills and mountains with 11 agroecological zones. The central plateau is scattered with countless streams, which create a landscape of steep-sided hills and wetlands in the valleys. The rainfall pattern is bimodal with rainfall peaking in April. The driest period occurs from June to September. The short rainy season usually lasts from October to December but is more hazardous and variable in length than the long rainy season, from February to May.

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Burundi's economy is essentially based on agriculture, with small farms providing over 90% of the population's livelihood. The land-use system is diverse and comprised, with regional differences, of various components, including coffee, tea, maize, sugar, potatoes, and other food-based cropping systems. The natural vegetation has been degraded to the point where there is little forest left except in the highest elevations.

The population of Burundi was estimated at 6,600,000 in 1998, with a growth rate of over 3% per year. In 1990, the average population density was estimated at 180 inhabitants per square kilometer. However, this figure varies greatly from region to region, with some areas showing a population density as high as 400 inhabitants per square kilometer. Land pressure is one of the prime underlying causes of the Burundian conflict and is a significant contributing factor to food insecurity.

Since 1993, civil unrest and conflict has caused over 200,000 deaths and displaced over 700,000 people, both internally and externally. Burundian civil society has been undermined as a result of a combination of massive population displacement, a poorly functioning and substantially underfunded public sector, and continued fear and mistrust among large segments of the population. With the signing of the Arusha Accords in April 2000, the arrival of a government of transition in November 2001, the peaceful transition of the presidency in May 2003, and a cease fire between major belligerents in October 2003, there is significant hope that Burundi has turned the corner.

Context of the study: The region and farming system, and recent interventions

This study is took place in Kirundo Province, in the extreme northwest of the country, bordering Rwanda and covering an area of 1700km2. The province is divided into two natural agroecological zones: the Bugesera zone, which covers 65% of the province's total surface and has an average altitude of 1350m, and the Bweru zone, with an average altitude of 1600 meters covering the remaining 35%.

The study is focused on the Bugesera zone, which has the ecological characteristics of dry areas with poor rainfall of 900–1100mm/year, a very long dry season of seven to eight months, and poorly developed schlerophyllic vegetation. Kirundo Province enjoys a fertile soil, which can, under optimal conditions, produce a large variety of food and cash crops. The Bugesera zone's economy is based on agriculture and livestock. The region is traditionally a producer of beans and sorghum, but bananas, coffee, cassava, and sweet potatoes are also cultivated there.

Agricultural production and food security at the household level have been devastated by the combined effects of drought and political crisis. For the last six years, all of Kirundo Province, and particularly the Bugesera zone, has experienced a severe rain shortfall with declines of 70% of the norm for 2000 and 2001. Farming families characterized as very poor and poor, with an average land area of less than one hectare under cultivation, make up 65% of households in the region. Households deemed "average," with one to two hectares under cultivation, represent 25% of the households. "Rich" households, accounting for 10% of Kirundo Province, have an average of two or more hectares under cultivation.[2]

In Kirundo Province, as elsewhere in Burundi, seed assessments are based on assessments of household food security, without distinguishing between issues of access and availability (where access refers to

2. Based on compilation of assessments of household food economy conducted by WFP and Save the Children-UK in Kirundo Province, July 2000 and January 2001.

adequate means of acquiring desired seed through cash, barter, and social networks; availability refers to the presence of sufficient quantities of desired seed within reasonable proximity to people at critical sowing periods). This conventional approach to seed aid tends to become a Pavlovian response to a misdiagnosed problem.[3] Moreover, assessments have been based on seasonal calculations without regard to potentially more chronic problems related to seed systems.

Traditional seed and tools interventions are, at a minimum, two to three times the cost per beneficiary of seed fairs, while the economic benefits, to the community at large (who do not receive agricultural inputs from the intervention) are negligible.[4] With conventional seed distribution, there is little evidence that the intervention supports the local seed system or addresses more chronic seed-system problems.

Conventional seed distribution, under the coordination of the Food an Agricultural Organization of the United Nations (FAO) is the dominant intervention through which seed needs are addressed in Burundi. The summary of FAO-coordinated responses in the table below is not exhaustive but it does provide a good representation of both the scale and scope of the international community's emergency agriculture response over the past six years.

Table 1. Summary of FAO-Coordinated Responses to Agricultural Emergencies, 1997–2002

Year	Metric Tons of Beans	Hoes (units)	Total Households Served	Households served by season
1997*	1232	0	166,155	83,077
1998*	2937	210,640	367,962	183,981
1999*	4742	271,829	547,472	273,736
2000*	5020	115,725	596,185	298,092
2001*	7107.5	206,800	677,352	338,676
2002A**	2557.5	166,500	205,500	205,500

Source: FAO Burundi.

* Two agricultural seasons.

** One agricultural season.

Catholic Relief Services (CRS), Burundi has, up to the date of this study, used an alternative approach to respond to seed needs in Kirundo Province. Over the course of three agricultural seasons leading up to this case study, approximately 30,000 farming households have had their seed needs met through the seed voucher and fair (SV&F) approach.[5] This approach responds to problems of seed access, where farming families lack the income, resources, or social capital needed to access seed. The approach

3. "In Pavlovian or 'respondent' conditioning we simply increase the magnitude of the response elicited by the conditioned stimulus and shorten the time which elapses between stimulus and response."— Skinner, B. F. (1953). Science and Human Behavior, 65.

4. Numbers are derived from CRS experience with seed and tools interventions and seed fairs in Sudan, Kenya, Tanzania, and Uganda, where the average cost of seed per beneficiary ranged from $4.41 to $11.02 per household ('Getting Off the Seeds and Tools Treadmill with CRS Seed Vouchers and Tools' – Disasters Journal, 2002, Volume 26(4); 316-328.)

5. Through 2003, CRS and local partners have carried out seed fairs in Burundi, Ethiopia, Eritrea, Gambia, Kenya, Malawi, Senegal, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe, serving over 400,000 farming households recovering from man-made or climate-induced disaster.

involves supplying farming households that lack access with a voucher that is used to acquire seed. The vouchers are later redeemed by seed traders for cash.

No formal assessment of seed needs was conducted for any of the Kirundo seed fairs. Communities were targeted for seed based on a seasonal assessment conducted by FAO and provincial authorities. CRS, in coordination with local authorities, was given the mandate to respond to seed needs for specific communes in Kirundo Province. Local authorities, in consultation with the governor of the Province and the Provincial Department for Agriculture and Livestock (DPAE), selected the specific communities for seed fair interventions. Coverage was, in principle, 100% in the communities selected.

The Burundi OFDA-funded study focuses on the SV&F traders, large and small, who participated in the Kirundo seed fairs.[6] The aim is threefold: (1) to understand and quantify the impact of SV&F at the farm level, (2) to get a better assessment of the economic effects of SV&F events on small seed traders, and (3) to get a better understanding of how the traditional seed system functions, its strengths and weaknesses, so as to design and implement interventions explicitly geared to alleviating acute and chronic challenges.

Moving beyond access: The need to understand the local seed system and the residual impact of seed vouchers and fairs

The results from the Kirundo seed fairs indicated that when subsidies in the form of a voucher redeemable in local currency are provided to stimulate demand among seed-needy households, local seed suppliers respond favorably by providing seed that is adequate in both quantity and quality. Hence, during the three agricultural seasons preceding this study, seed needs in Kirundo Province could be more aptly characterized as being caused by lack of access as opposed to lack of availability. Otherwise stated, there was sufficient seed to meet total seed demand for the dominant crops in the seed system, but a number of farming households lacked the buying power and/or kinship networks to access this seed.

Over 1200 exit interviews were conducted among seed-voucher holders at the Kirundo seed fairs (40 per seed fair), which showed that the average seed package obtained by recipients was greater in quantity than that received by conventional distribution and that this amount of seed was sufficient to meet their planting needs. The average package received by voucher-holding farm families over the three agricultural seasons was 20kg beans, 1kg sorghum, 0.5kg maize, and 0.33kg groundnuts; the voucher value for each family was US$ 6.00.

Additionally, the price at which this seed was obtained through the SV&F approach did not indicate any problem with seed availability. Local market prices for bean seed, the dominant crop in the Kirundo system and the dominant seed provided by seed aid practitioners, showed no price spikes at the time of any of the Kirundo seed fairs that would indicate a lack of seed availability. There were price premiums paid at the Kirundo seed fairs (10% to 20% higher than to the same seed available at local markets in Kirundo). This is attributed to voucher recipients being required to spend their vouchers on the day received, at the seed fair organized by CRS, and with seed suppliers who were registered by CRS.

6. Trader is used throughout this document to refer to everyone who exchanges seed for vouchers at seed fairs: those who bring seed from their own production to the fair, those who source seed on credit and pay it back credit after the fair, and those who never take actual title to what they bring, reimbursing to the owner for what has been sold and handing back unsold seed to the owner after the seed fair.

Seed quality (defined here as seed that is known and preferred by farmers and adapted to local farming conditions) is more problematic. Using the yardstick of conventional seed relief in Burundi, which is sourced almost exclusively in Burundi from large traders and undergoes no process that would differentiate it in quality from the seed available in local markets, the seed sourced through seed fairs is deemed superior by farming families.

Exit interviews from the Kirundo seed fairs indicated that farmers preferred the seed from seed fairs as opposed to seed from conventional distribution for three reasons: (1) seed fair seed is more adaptable to local soils, (2) seed fairs provide farmers an opportunity to choose the seed they want and negotiate its price, and (3) seed fairs provide farmers an opportunity to buy seed from traders they know.

Seed fairs in Kirundo may have provided adequate seed quantity to needy farming households, but the issue of getting new varieties into the hands of farmers in a demand-driven fashion, and understanding how this approach through the local seed system can improve seed quality in the medium to long term, remains a major challenge.

The exit interviews from the Kirundo fairs point to the potential for this approach to support the local seed system, and perhaps address more chronic problems related to the seed system. Seed traders reported reinvesting proceeds from the seed fairs into seed production and seed trade, but the behavior of the seed traders in time of acute and chronic stress, and the characteristics of seed suppliers in the region, was not well enough appreciated or understood to provide a more robust argument for how seed vouchers and fairs might support the local seed system.

The Kirundo seed fairs confirmed the need for a better understanding of how the local seed system functions under both acute and chronic stress, thus exploring the potential for seed fairs to address both chronic and acute shocks to the seed system, which could be seen as being driven by "access" as well as "availability." They also established the need for a better understanding of the profile and characteristics of seed traders, particularly women, who constitute a third of all seed traders. In addition, the fairs demonstrated a positive impact on the local economy but pointed to the need for a better understanding of how they affect the local economy and the local seed system.

Methodology

This study was conducted in collaboration with local governing authorities in Kirundo Province and the PDAE. Both CRS and CIAT aided with the fieldwork.

In February 2003, preliminary (participatory and semi-structured) interviews with local traders and farmers, suggested four key insights:

- There has been no problem with seed availability in recent years; the last real problem was in 1999.
- In normal times, most traders source their seed directly from farmers; only in a crisis do they buy from traders.
- Small vendors greatly appreciate seed fairs because fairs provide them with fourfold income in one day, compared to other sales channels, and they don't have to extend credit.
- Traders suggested putting new varieties on offer at lower prices than local varieties so as to stimulate initial client interest. Traders also asked to be provided credit by CRS to bring these varieties to the fair.

In July 2003, a questionnaire was developed to target seed traders who had participated in the Kirundo seed fairs during the previous agricultural season. The questionnaire was pre-tested over two days, and field interviews were completed in early August 2003. Semi-structured interviews were conducted by three CRS staff who had been involved in the planning and implementation of seed fairs in Kirundo over the preceding three agricultural seasons.

The questionnaire consisted of thirty questions and was divided into four sections:

- Seed-trader profile
- Seed characterization/sources and sales channels/sourcing in stress periods
- Seed fair operations and the seed fair impact
- Trader observations

A total of 41 seed traders who had participated in the Kirundo fairs during the previous agricultural season were interviewed (16 women and 25 men), roughly half of the approximately 80 seed traders who had participated in the fairs. Traders were chosen from different sites within Kirundo where the seed fairs were held, specific emphasis was placed on gender representation from all of the fair sites and representation of traders from the three main categories: small (having gross revenues of less than US$ 500 during the previous agricultural season), medium (gross revenues of more than US$ 500 and less than US$ 2,500 during the previous agricultural season), and large (gross revenues of more than US$ 2,500 during the previous agricultural season).

Findings

Seed trader profile

More than half of the traders interviewed indicated that they had traded seed for more than 10 years; fewer than 20% had been at it for five years or less. This appears to show that seed traders—at least those at the seed fairs—are a well established group. This may also indicate that traders are specialized and that trading seed may, at a minimum, require a medium-term investment in building trade relations and acquiring knowledge specific to the trade.

Twenty percent of the traders interviewed described themselves as full-time seed traders; 63% described themselves principally as traders who also do some agriculture; the remaining 17% described themselves principally as farmers who also do some trade. Among those self-described as full-time seed traders, only one was male. Of the 16 female traders, only one described herself as more of a farmer than a trader. This further supports the idea that seed traders are a specialized group. This difference between male and female traders with regard to their self-definition of their trader status indicates a female bias among traders and potentially a lack of access to land among female traders (as is the case for Burundian women in general).

More than 75% of the traders (33) reported seeing a growth in volume and product line since they started trading seed. This could be attributed to reinvesting profits into their trade and the generally well-established nature of the group interviewed. This could also mean that this sub-set of traders (seed-fair traders) is more entrepreneurial. Note that with a single exception (a sunflower specialist), the seed traders tended not to specialize in any particular crop; they variously sold beans, sorghum, maize, and groundnuts.

Start-up assets for seed traders

Traders were asked about the assets they had needed when they started trading seed. Over one-third said they started with no access to financial capital or credit, making due with their own stock of seed, access to land, and their own means of transport. Over two-fifths (18) indicated starting up with only financial capital or credit, which includes bank loans, loans from family and friends, and credit for seed from larger seed traders as well as family and friends. Almost two-thirds of the traders started up without access to transport.

Traders were asked if their start-up assets were sufficient. Nearly one-third of traders (12/41) indicated that their start-up assets were sufficient and that this was due to seed coming from their own production, gifts from friends and relatives, and small loans from friends. Among the two-thirds who considered their start-up assets insufficient, access to credit for financing was the biggest challenge.

Traders were asked if there are special requirements, such as knowledge and connections, that are necessary for a seed trader to start in the trade. Aside from assets, social relationships and kinship ties appear to be important: a large majority of traders (28) mentioned the need for the support of parents, family, friends, and neighbors. However, a solid minority (13) saw no need for anything special and indicated that they started with their own stock and made due with what they had.

Seed characterization/sources and sales channels/sourcing in stress periods

Distinguishing seed from grain

Traders were asked if they distinguish between seed for sowing and grain for eating, for the crops they sell. More than half the traders (23/41) said they made a distinction between seed for planting and grain for eating. Fifteen indicated that the population at large does not make this distinction. Only three said they made no distinction because when they were selling they were not able to determine the buyer's intended end use.

Traders distinguishing seed from grain provided the following reasons for such distinction: some varieties are separated because of price variations due to end use, such as with white sorghum for porridge versus the more expensive red sorghum for beer. Beans are separated because at harvest they are mixed, yet there are price variations within the mixture, and some varieties, like yellow beans, may be more susceptible to infestation and should be separated out before storage.

Traders were asked to discuss the sources of the grain versus the sources of the seed that they sold. All of the traders considered the sources to be the same. They noted no difference in production but rather in processing for end use, storage, or for price.

Five of the six traders who had gross revenues of more than US$ 2,500 during the previous agricultural season sorted grain from seed. Among these five, four of them sorted by variety for beans and one sorted by grain for beans.

For traders with gross revenues of more than US$ 500 and less than US$ 2,500 during the previous agricultural season, 45% sorted seed from grain.

For small traders, who had gross revenues of less than US$ 500 during the previous season, 66% sorted seed from grain.

Sources of seed used in trade

Table 2 is based on the total volume of seed sold by the traders during the previous agricultural season and thus portrays an aggregate of all seed sourced by all 41 traders.

Table 2. Sources of Total Volume of Seed Sold among 41 Traders in Season 2003B

Crop	Volume (metric tons)	Sources				
		Farmers	Own production	Rural collector /trader	Stockist /trader	WFP (Distribution)
Beans	504.65	231.9	32.05	124.4	116.3	—
	100%	46%	6%	25%	23%	
Sorghum	7.4	4.45	1.25	0.2	1.500	
	100%	60%	17%	3%	20%	
Maize	6.7	0.8	—	—	—	5.900
	100%	12%				88%
Groundnuts	3.724	1.7	0.284	1.740	—	
	100%	46%	7%	47%		

Own production and direct on-farm sourcing accounted for at least half of the crops referenced above. Maize, however, is an anomaly here; Kirundo is not known for its maize production and WFP's food distributions provide a ready stock for consumption.

Rural collectors are small traders, based at trading centers and in proximity to farmers, who procure seed directly from farmers. They rarely sell retail and usually, but not always, hold the seed to sell to other traders, large as well as small. Rural collectors are an important link in the supply chain, providing the human face to much of the credit and capital that reaches the farmer.

Stockists are small traders who advance capital and credit to intermediaries who, in turn, source seed from farmers and then provide the seed to the stockist. Stockists are more likely to hold seed and to sell retail.

Large traders (who had gross revenues of more than US$ 2,500 during the previous agricultural season) were far more likely to source seed from their own production than small or medium traders, and "own production" for large traders was likely to take on a different meaning. Subcontracting and credit arrangements with farmers were likely to be considered "own production" for many of the large traders.

Sale channels

Cash was used to source 71% of the total bean seed sold among all traders in 2003B; credit was provided for 23%.

Social capital is extremely important in seed sales, as evidenced by over 40 separate seed fairs where decisions about "whom to buy from" were based on whether the trader was known to the buyer and came from the same area (a phenomenon that could also be linked to soil specificity and bears further research). And credit is considered a necessity to establish social relations. In table 3 the use of credit by traders, critical for building on social capital and kinship, is indirectly indicated.

Seed fairs represented a tremendous market for all seed traders, with generally higher prices than local markets: approximately 12% to 20% above local market prices, on average.

Table 3. Channels for Sale of Total Volume of Seed Sold among 41 Traders in Season 2003B

Crop	Volume (metric tons)	Volume by sales channel (metric tons)			Means of sale
		Direct sale on Market	Traders	CRS seed fairs	
Beans	503.35	115.96	207.9	180.49	Cash Direct
	100 %	23%	41%	36%	
Sorghum	7.4	4.88	2	0.52	Cash Direct
	100%	66%	27%	7%	
Maize	6.7	6.55	—	0.15	Cash Direct
	100%	98%		2%	
Groundnuts	3.724	1.32	1.700	0.704	Cash Direct
	100%	35%	46%	19%	

Sourcing seed during periods of stress

The seed traders described two distinct stress periods in the recent past, one due to drought (1997–2000) and an earlier one due to civil war (1993–1995). Initially, blanket statements were made to characterize the stress:

Trader characterizations of the drought stress:

1. no seed on market
2. prohibitively high prices of seed brought in by large traders from the region
3. everyone living off aid from NGOs and WFP
4. even grain planted did not germinate
5. heavy migration among the able-bodied

Trader characterizations of the civil war stress:

1. no seed on market
2. own production insufficient for food needs
3. even large local traders had no seed

However, when asked to comment in more detail (on dates, regions)—if there was any time when planting material was absolutely not available, the majority of seed traders (32/41) said that there was never a time in their experience when seed or planting material was absolutely not available. Although expensive during the drought period, bean seed was available from other parts of Kirundo Province, although some traders stated that even when seed was available, it was useless to sow because of the drought.

Nine of the traders said there were times when there was no seed available at all. Specifically in reference to the drought, they said they could not find seed because all the seed had been bought up and distributed by NGOs. These traders did not sell during this period.

When asked to reflect on each crop sold and where it is sourced in times of stress, 10 of the traders said they sourced beans regionally (Rwanda, Tanzania), most renting a vehicle. Eleven said they sourced beans by traveling on bicycle to other parts of Kirundo Province, and nine said they sourced beans from other regions of Burundi, using a vehicle.

The definitions of access and availability depend on the size of the trader's business and access to transport. Although seed was available even during times of profound stress, larger traders had a better chance of sourcing volume because they had access to transport to regional markets and a greater likelihood of having cash or credit. Sourcing seed during this period was possible but difficult, with many traders giving up. Major sources during this period were small traders on bicycle from Rwanda and large traders bringing seed in from the region (Uganda, Tanzania, Rwanda, and other parts of Burundi).

Sourcing under stress by trader size

All six of the large traders reported sourcing during periods of stress from Uganda, Tanzania, Rwanda, and other regions of Burundi, using vehicles.

The majority of these revenues go back into the agricultural economy as investments or repayment of debts. Over 80% of the revenue generated by seed traders from fairs is allocated to commerce, agriculture, or debt repayment.

Commercial activity, which includes extending trade credit, accounted for 43% of seed fair revenue, while repayment of debts accounted for 27%. There was significant overlap among these categories, as credit for seed fairs was considered "commerce" among some traders and "debt" among others. Only 13% of seed fair revenue was invested into agriculture and livestock. Household consumption accounted for 17% of revenues. This includes medical expenses, school fees, home construction, and clothing.

Social capital

Social capital is both a widely cited special quality for traders at start-up and an important factor in developing and expanding their trade. Knowing the trader and having a relationship with him or her appears to be an important factor in determining from whom to buy seed. In this light, seed fairs provide a mechanism to build on existing social capital and perhaps can help us gain insights into the challenges of getting new varieties into the hands of farmers.

According to seed traders, the decision to purchase from one trader as opposed to another is based on the adaptability of the seed on offer, precision of the scales, the trader's honesty, the confidence the buyer has in the trader, price, and the welcome the trader offers.

Roughly half (22) of the seed traders interviewed stated that their seed fair customers had also become generous customers outside the seed fairs. Some of these traders noted that they had sourced seed from these same buyers at harvest.

Gender: The female métier bias

Data from the seed fair trade payout sheets over the three agricultural seasons leading to this study showed a growing role for female traders. The total number of individual traders paid in the first agricultural season was 346, 18% of whom were female. In the second agricultural season, 23% (of 289 traders) were female, and in the third season of January 2003, out of 491 traders, 31% were female. This increase of 66% between the first and third seed fairs seems to indicate that seed fairs provide an interesting income opportunity to women.[7]

The case study revealed that full-time traders may be disproportionately female. Male traders, except for very large traders, tend to have other sources of livelihood and hence are far less likely to describe themselves as full-time traders. Only one of the 16 female traders identified herself as more of a farmer than a trader, which may indicate a lack of access to land for female traders and hence a far greater likelihood that trade would constitute their dominant means of livelihood.

These findings point to the importance of seed trading as an occupation and income opportunity for females. Seed aid practitioners should pay particular attention to designing interventions that provide access to female traders, particularly small traders, as they appear to play an important role in local seed supply channels and seed trade is a valuable income opportunity for this vulnerable sub-set which derives less entitlement from land than medium to large traders.

Encouraging traders who don't come to the fairs

Twenty-two of the traders (over half) said that there were traders who don't come to the fairs but who should be encouraged to participate. The reasons given for them not coming included being intimidated by larger traders; being afraid that they would not sell anything at the fair and would then be left holding a stock of unsold seed; and not having access to transport. Additionally, it was noted that many organizations and community groups with seed, such as farmer associations, farmer cooperatives, and the Provincial Department for Agriculture and Livestock (DPAE), did not regularly participate in seed fairs.

Trader observations

At the end of the questionnaires, traders were asked if they had any questions or comments. A sample of their responses is given below.

- Why are you asking these questions? You asked these sorts of questions during the last seed fairs in February 2003.
- Why can't we receive vouchers too?
- Can CRS give us credit?
- We have realized that in identifying beneficiaries, you don't work in close collaboration with the local administration.
- We like the fairs. Organize more. We are partners; you should do more discussions with us so that in the end we can end this repetitive problem of lack of seed.

7. The data masks the actual number of traders and the actual numbers by gender as a trader attending every discrete seed fair event in a given agricultural season is counted each time they attend an event.

Lessons learned and recommendations

1. Traders are a specialized group but the barriers to entry for traders are not excessive

The study indicates that SV&F traders are an experienced and specialized group with formidable trading skills. Also, while access to credit or capital is an important start-up asset, it is not a prerequisite. Nearly one-third of the traders in this study started up with little more than their own production and support from family and friends.

Seed aid practitioners should make full use of the existing network of seed traders in designing and carrying out seed aid and agricultural interventions.

2. There is a need for a robust field-friendly seed diagnostic tool to distinguish access from availability, as these terms can vary in meaning

Although 75% of the traders interviewed said there was never a time when seed was "totally unavailable," those who made this statement were overwhelmingly large-scale traders with access to transport and cash or credit, who were able to source seed regionally. The definitions of access and availability appear to vary with the size of the trader and his or her access to transport.

Seed aid practitioners should develop a diagnostic tool that focuses on seed traders and looks at access and availability for different categories of traders. Such a tool should focus on the existing channels of seed supply, looking at the different categories, so that seed aid practitioners have a more robust view of the local seed supply channels before designing interventions.

3. Seed fairs support the local seed system, the predominant sourcing channel for seed in good and bad times, and have a positive residual impact on the local economy

Seed fairs have a positive impact on the local seed system by stimulating social capital and kinship ties between traders and buyers. The seed fairs provide a forum through which seed sourcing relationships are built and extended. This building of social capital is particularly important in cash-poor rural economies and in societies recovering from conflict.

Seed fairs also provide capital for the local economy, capital that is predominantly allocated to commercial and farm activity. The residual impact of the seed fairs include extending credit lines, both for traders and others, and stimulating expenditures, which has a knock-on effect on the local economy, such as supporting home construction.

Seed aid practitioners and donors should fund and support seed aid and agricultural interventions that have an explicit link to the local seed system, as opposed to being in competition with it.

Development and seed aid practitioners should pay particular attention to the efficiency and impact of demand-driven subsidies, such as vouchers, on rural-based livelihoods and economies.

4. Within the seed trade there is a female métier bias

Seed trading is more likely to be a primary employment and revenue opportunity for women. Female traders play an important role in the seed trade, accounting for a large share of the small and very small

traders. Female traders in this study appeared to have less access to land than their male counterparts, as reflected by only one of the 16 female traders identifying herself as more of a farmer than a trader.

Seed aid practitioners should pay particular attention to designing interventions that explicitly target female traders, particularly very small-scale traders, who are more likely to count seed trade as a main source of livelihood.

5. *Seed fairs provide a demand-driven mechanism for stimulating the spread of new varieties*

Promising new varieties may have a greater likelihood of propagation if local traders are leveraged and new varieties are introduced in more of a demand-driven fashion. The links between the formal and informal seed sector are underexploited and the seed fair is one forum where researchers, formal-sector seed players, and seed traders can work within the same milieu towards the same end, meeting the farmer's demand for seed.

Seed aid practitioners and researchers should focus more on local seed traders when exploring how to introduce promising new material into the seed system.

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Seed Vouchers & Fairs and Agrobiodiversity in Western Uganda

Robbert P. van der Steeg, Tom Remington, Mikkel Grum, Emilly Kemigisha[1]

Abstract

Rebel activities in western Uganda from 1996 until early 2002 displaced a large number of people a relatively short distance from their homes. Following a cessation of hostilities, people began returning back to their farms. Catholic Relief Services (CRS) organized seven seed vouchers and fairs to assist people in accessing seed. With seed vouchers and fairs, beneficiaries receive vouchers that they can exchange for locally sold seeds. The sellers, in turn, are reimbursed in cash for the CRS vouchers. These seed fairs were evaluated by the International Plant Genetic Resources Institute (IPGRI), which also did a detailed agrobiodiversity analysis. The study showed that sales at seed fairs were dominated by a relatively small number of crops and varieties Many more crops and varieties that exist in the region were not on offer. On average, beneficiaries bought only two crops and one variety of each crop. Within the wider community, no important varieties were lost during the war. The conclusion is that when an organization wants to include strengthening of agrobiodiversity in a seed aid activity, it needs to plan this thrust explicitly. One method, explained in this paper, is the seed diversity fair, where seed sellers can win prizes for having a diversity of seeds to sell.

Introduction

In 1996, rebels of the Allied Democratic Forces (ADF) began harassing people in the Ruwenzori Mountains of western Uganda, displacing an estimated 150,000 persons. In Bundibugyo (figure 1), people fled to nearby camps guarded by the Ugandan army. By February 2002, life had begun to return to normal and people began returning to their farms. During their displacement, their farms had been neglected, houses destroyed, and assets lost.

The climate of western Uganda supports the production of a wide diversity of crops. Cassava, bananas, and sweet potatoes are important food crops, and groundnuts, rice, and beans are grown for consumption and sale. The cropping system has been described as the "banana and coffee system," where coffee, introduced after the Second World War, replaced cotton, which had been predominant in the system (Parsons, 1970). Recently, however, coffee has been on the decline in favor of diversified cash cropping, with a bias towards cocoa.

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Figure 1. Bundibugyo is located northwest of Fort Portal in the Ruwenzori Mountains

In response to the conflict and repeated displacement, Catholic Relief Services (CRS) planned and implemented a series of seed voucher and fair (SV&F) events. (These events, developed by CRS, support seed demand, in contrast to direct seed distribution, which supports supply.) The International Plant Genetic Resources Institute (IPGRI), which has a special interest in biodiversity and experience with seed diversity fairs in Mali, was invited to carry out an external, real-time, evaluation of these events.

In the SV&F approach, vouchers are issued to farm families identified as seed insecure (as indicated by repeated or prolonged displacement). Voucher recipients then negotiate seed purchases with sellers at special seed markets or fairs. At the end of the day, sellers redeem the vouchers for cash. Communities benefit two ways: (1) the seed insecure are able to choose the seed they want, and (2) the seed secure are able to sell seed (Remington et al., 2002).

Planning and implementation of seed vouchers & fairs

Before the seed fair, local CRS staff conducted a survey in which 19 farmers were asked what assets had been lost and what assets they had succeeded in reacquiring. The interviewed farmers had been displaced an average of four years each. Nine out of the 19 reported the loss of crops and farms among their top three lost assets. When asked to rank their most important crops, rice, beans, soybeans, vanilla, groundnuts, and cocoa emerged as the top six. Farmers reported that in normal years, they acquired planting material for these crops from a wide range of sources, through social networks and from the government, as well as their own seed stocks. However, during the survey year, they responded overwhelmingly that they had had to source rice, beans, soybeans, and groundnuts in the local market.

In addition, 278 potential seed sellers (171 women and 107 men) were identified and interviewed. In addition to determining their supply of seed and planting material for different crops, this survey was used to inform potential sellers of the upcoming seed fairs. Of those interviewed, 93 responded that they would be able to sell rice, 117 had beans, six could sell maize, 23 had vanilla, 38 would be able to provide groundnuts, and one could sell cocoa. Women dominated the rice and bean sellers, and while the men had more vanilla than the women, men and women respondents indicated they were equally able to sell groundnuts. What made this group interesting was that the majority of them reported farming as their primary occupation (77% of the women and 85% of the men). The remaining 23% of the women sellers identified themselves principally as traders. In addition to traders, several of the men listed their occupation as carpenter. While many farmers cited seed insecurity as a result of displacement, many others were indeed able to provide the demanded seeds.

Over many years, farmer decisions and selections have resulted in a diverse cropping system in Bundibugyo. This combination of crops and varieties is referred to as *agrobiodiversity* in this article. Agrobiodiversity has three major advantages (Grum et al., 2002; IPGRI, 1999):

- It fulfils different uses. For example, not all banana varieties can be used for local brew.
- It optimizes different resources (labor, land, cash).
- It mitigates unpredictability due to water, soil, and pests.

Research questions

The scope of this study was to look at the impact of seed vouchers and fairs on agrobiodiversity, within the context of agricultural recovery from conflict. The central research question was

> What was the influence of the conflict and of the seed vouchers & fairs on agrobiodiversity?

The following questions related to the effectiveness of the seed vouchers & fairs were asked:

- How do farmers normally acquire seed?
- How did they obtain seed this year?
- How would they have acquired seed in the absence of seed vouchers & fairs?
- What crops and varieties did voucher holders acquire at the fairs?
- What did voucher holders want to purchase that was not available at the fairs?
- Did the people plant the seed they acquired in exchange for their vouchers?

Related to the impact on agrobiodiversity, the following questions were asked:

- What crops and varieties are available in the region?
- Why do people have specific crops and varieties?
- Have any new varieties been acquired recently?
- Have any varieties been lost recently?
- If so, what was the reason for the loss?
- What varieties were on offer at the fair and why?
- What varieties were not on offer at the fair and why not?
- Did the seed fair increase agrobiodiversity?

Methodology

Data was collected with two surveys. The first, "real time" survey was administered to the beneficiaries on the day of the fairs. The second survey was carried out two months later, using the four-square analysis method.

"Real time" evaluation

At each of the seed fair sites, six community enumerators administered the survey to departing participants. Responses were recorded for 183 beneficiaries (6% of the 3100 beneficiaries).

Four-square analysis

The four-square analysis is a method that helps obtain greater detail on agrobiodiversity at the village and farm level. In it, a group of farmers brings a sample of each variety he or she is growing. A large cross is drawn on the ground to distinguish four categories or squares (figure 2).

Large area Many households	Small area Many households
Large area Few households	Small area Few households

Figure 2. The four squares

A volunteer displays the first sample and the other farmers decide whether it is grown on a large or a small area and whether or not it is grown by many or by few households. After the first sample has been placed in the square, another farmer takes his/her varieties and puts them in the correct square. If there is already a variety in that square, the group has to decide if it is grown more or less than the first crop. This goes on until all crops are placed. Farmers quickly grasp the process and begin to coordinate it. After all the existing varieties have been placed, the farmers discuss and identify crops or varieties that have been lost.

For each variety, the following information was collected:

- What is the variety name?
- When was it first used?

- When was it last used?
- What was the geographical source of the variety?
- How was the variety first obtained (what was the initial source)?
- Positive traits of the variety
- Negative traits of the variety
- What was the normal seed channel?
- How was it obtained during the displacement?
- How was it obtained this current season?

This process results in a display of the present state of the plant genetic resources and history of each crop in the area—in this case, Bundibugyo. Important events that changed the number of varieties as well as the sources of new varieties also came out in our survey (Sthapit et al., 2001). The four-square analysis can be adjusted for different purposes (see box 1).

At one location the people in charge did not use the four-square analysis correctly and it was therefore not useful to include those results in our analysis. The results from only six locations have been synthesized for this report.

Box 1. Alternative four squares

The four squares can be used in many different ways. It can be used for animals (large/small scale by many or few households) or for crops in general, not just varieties. You can even explain why people drink a lot of Coca Cola and not so much Fanta citron. We have also heard people using it to look at low-input/high-input, low-output/high-output activities on farms. This was done in the case of labor restrictions and income possibilities related to HIV/AIDS (Ard Lengkeek, personal communication). Or if you want to compare how a system was 30 years ago, you divide the people into young and old. Men and women often have different perceptions. Possibilities are endless. In general, we see the four-square analysis tool as simple and understandable for everybody and therefore appropriate for a lot of participatory research.

Results

Three thousand one hundred families from three sub-counties were targeted in seven seed fairs. Each beneficiary received vouchers worth a total of US $7.50. From the farmers' perspective, a variety name is the basic unit for distinguishing varieties. The same variety can have a different name or varieties with the same name might perform differently in different villages. Within a village, different varietal names generally indicate a niche of use or growth. Research leads us to believe that diversity in names represents diversity within crops.

The four-square analysis provided useful information. In total, participants mentioned 35 crops and 231 varieties that they were currently growing in the region. Each village seemed to have a number of unique varieties, based on names alone. Adding six varieties brought to the fairs but not mentioned during the four-square analyses, we arrived at a total of 237 varieties.

Ten crops and 24 varieties were present at the seed fairs. However, the enumerators did not name cocoa, groundnuts, maize, soybeans, and vanilla by variety, which meant that diversity was undercounted. We estimate that there were in fact a total of 76 varieties on offer at the fairs.

Notably absent at the fairs were bananas, sweet potatoes, and cassava. Planting material of these crops is not exchanged in ordinary markets; during the preliminary survey, farmers explained that vegetatively propagated crops are usually sold *in situ*, so that you can get a perspective of the full crop when you are buying.

Based on the amount of money spent on each crop, one can see that beans and rice were the major crops purchased at the seed fair (figure 3).

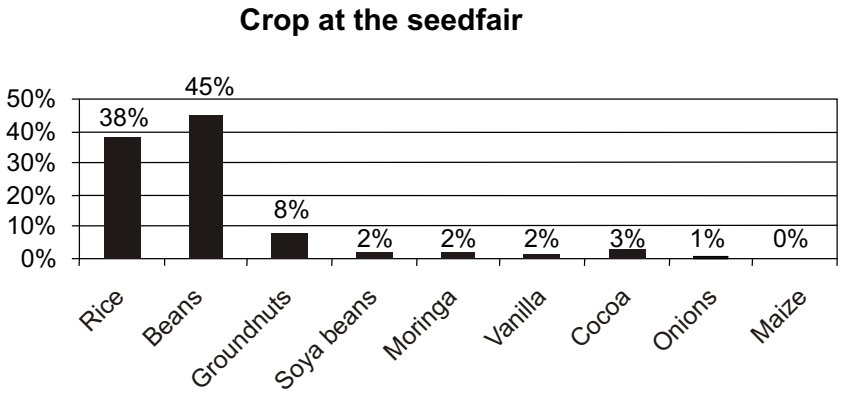

Figure 3. Money used on specific crops during the seed fair (The percentage is the percentage of money that was registered by the questionnaires.)

With rice and beans being the most traded crops (83% of the total), it is interesting to look at their distribution as described through the four-square analysis.

Table 1. Bean Varieties in the Four-Square Analysis

Crop name	Place in square	Mean number of varieties per location	Range	Mean number at the fair	% at the fair
Beans $n_{seedfair}$ = 130 (we registered a bean transfer 130 times)	Large area Many hh	1.67	0–3	1.17	70%
	Large area few hh	0	—	0	—
	Small area many hh	0.83	0–3	0.33	40%
	Small area few hh	3.33	1–5	0.67	20%

Note: The analysis is based on information from six locations. At each location, we compared what we saw in the four-square analyses with the data collected during the seed fair.

From the four-square analysis, we can see that most of the rice varieties are grown by few people on a small area, and only 20% of the varieties were seen at the seed fair. When a variety is common in one location, it is very likely to appear in another location as well, including the seed fairs. In fact, the more common a certain variety is, the more likely it is to show up at the seed fair. In table 2 one can see how this pattern emerged with rice.

Table 2. Rice Varieties in the Four-Square Analysis

Crop name	Place in square	Mean number of varieties per location	Range	Mean number at the fair	% at the fair
Rice $n_{seefair}$ = 99 (99 is the amount of transactions of rice recorded)	Large area Many hh	1.50	1–2	1.20	80%
	Large area few hh	0	—	0	—
	Small area many hh	0	—	0	—
	Small area few hh	2.17	1–4	0.40	18%

Note: The analysis was based on information from six locations. At each location, we compared what we saw during the four-square analyses with the data collected during the seed fair.

We can also see that rare varieties are less likely to show up at the fair. For example, rice has fewer varieties and there are also fewer varieties on the market. There were two rice varieties at the seed fair that were not mentioned in the four-square analysis. These were not widely traded (figure 4).

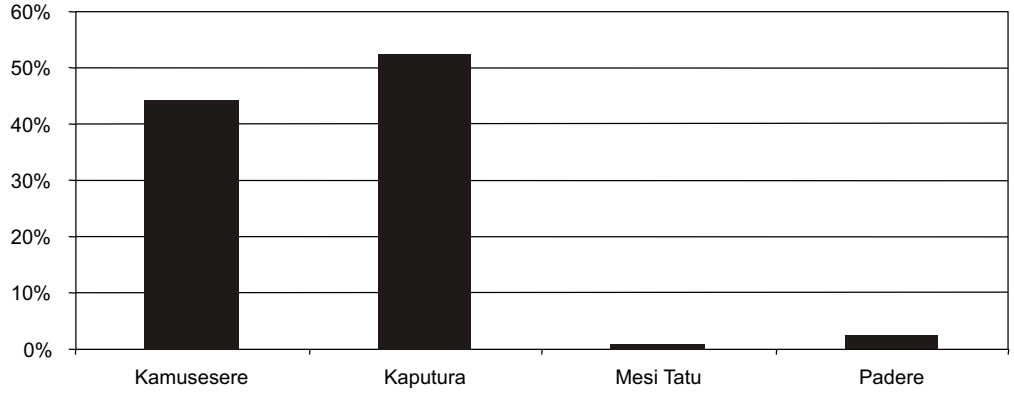

Figure 4. Money used on specific varieties during the seed fair (Note that the percentage is the percentage of money is registered by the questionnaires.)

It is interesting to note that during the four-square analysis, people did not mention four of the varieties of beans that were present at the seed fairs. While this is 27% of the number of varieties we recorded during the four-square analyses, financially each of these varieties represents less than 1% of the total amount traded at the seed fair, so their contribution is insignificant.

The conclusion concerning crop agrobiodiversity is that both demand and supply focus on the important varieties—those grown by many households in large areas. Rare varieties are either not sold by farmers, not purchased by traders, or they may be mixed with the dominant variety and therefore lost in a varietal mixture.

The varieties purchased at the seed fair

Most participants purchased rice and beans (table 3).

Table 3. Summary of Transactions at the Seed Fair

Crop	Number of Transactions (based on the 6% of the beneficiaries interviewed)	Estimated total number of transactions (extrapolated to 100% of the beneficiaries)	Number of different crops bought when buying this crop	Number of varieties bought when buying this crop	Percent women purchasing this crop
Rice	100	1694	1.97	1.97	35%
Beans	130	2202	1.75	1.97	45%
Groundnuts	39	660	2.21	2.21	38%
Soybeans	14	237	3	3.07	22%*
Moringa	11	186	2.91	2.91	11%*
Vanilla	8	135	2.88	3.00	50%*
Cocoa	7	118	1.86	1.86	20%*
Onions	5	84	2.8	3.20	40%*
Maize	2	34	3	3	100%*

*Sample size smaller than 15; sometimes the gender is not known.

Over two-thirds of participants bought beans, and more than half of participants bought rice. The table shows the average number of crops bought and the average number of varieties a participant acquired when buying a specific crop. In the case of soybeans, for example, this means that when a person bought soybeans, he or she also bought two other crops.

According to the survey, 37% of the participants were women. For rice, beans, and groundnut, there is no clear gender preference (Chi-square test, 0.90 reliability), although women seem to have a slight (not significant) preference for beans, vanilla, and onions (however, the sample size for vanilla and onions is small).

According to participants, 89% of all the seeds they bought were of good quality, 5% were average, and in 6% of the cases, quality was not determined. Almost all of the participants (98%) stated that they were already working full time on their farm. This did not mean, however, that they were not spending nights in the camps for internally displaced persons. Ninety percent stated that they would not have been able to get seeds for growing without the fair; the main reason given being lack of funds (52% of all beneficiaries). Eight percent claimed that the seed fair would help them pay school fees, indicating that the seed fair enabled them to divert money from buying seed to other priorities.

Availability of seed at the fair

Nineteen percent of the farmers claimed that they wanted a specific variety or crop that was either not available or not available in sufficient quantity to satisfy demand. In all cases, farmers knew where to obtain the variety. Therefore, we can conclude that no desired varieties were lost.

Seed source

During the four-square analysis, we asked where participants sourced their seed for each variety. Several sources were possible (figure 5).

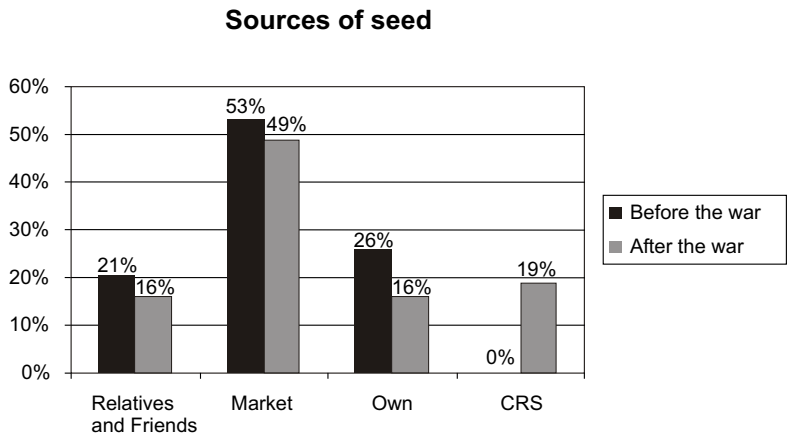

Figure 5. Plant sources of crops before and after the war, recorded at the seed fair (The percentages are the percentages of farmer groups that used the specific source. The total of the columns before the war makes 100% and after the war makes 100%.)

The year of our survey, participants received almost 20% of their seed at the seed fairs—a source that did not exist before. Own saved seed was reduced by 10%, seeds from social networks by 5%, and seed purchased at the market by 4%, indicating that the conflict and displacement resulted in a shift in seed sources, especially in a reduction of own saved seed.

Influence of the war and seed fair on agro-biodiversity

The crops and varieties that are available in the region

In table 4, one can see how the crops mentioned by participants were categorized in the four-square analyses.

Table 4 shows the crops grown in five locations. The maximum number of times a crop can be mentioned is therefore five. It is puzzling that there were only two maize transactions at the fairs because maize is grown on large areas by most households in the region. Although sweet potatoes are an important crop in four of the locations, cassava in three, and yams in two, they were absent from the fairs. This indicates a need to devise an alternative mechanism to facilitate exchange of these crops when promoting agrobiodiversity is a priority.

The varieties at the seed fair

During the four-square analysis, farmers mentioned most often the following characteristics of popular varieties:

- income generating
- a crop that also can be used as a food crop
- high yielding
- short duration

- good taste
- used also for firewood (cassava, coffee, cocoa)
- additional uses (oil, coffee, flour, lotion)
- resistant to diseases
- not labor intensive (no weeding)
- problems with drought, wind, or water logging

Although farmers maintained that the rice variety *kamusesere* was not grown before the war, it was in high demand at the fairs. It yields three times a year and provides a source of income as well as food. The fact that it emerged during the conflict indicates that conflict and displacement do not hinder access to new crops and varieties—and may actually present new opportunities.

Table 4. Crops in the Region

Large area, many households	**Small area, many households**
Rice (5), Sweet potatoes (4), Maize (4), Cocoa (3), Bananas (3,) Beans (3), Cassava (3), Yams (2), Palm oil tree (2), Pawpaws (1), Vanilla (1), Mangoes (1)	Moringa (4), Palm oil (3), Beans (2), Mangoes (2), Oranges (2), Fenensi (1), Cocoa (2), Cassava (2), Bananas (2), Groundnuts (2), Soybeans (2), Jackfruit (2), Vanilla (1), Dodo (1), Maize (1), Eggplants (1), Sugarcane (1), Pumpkins (1), Pawpaws (1)
Large area, few households	**Small area, few households**
Coffee (1)	Avocados (5), Tomatoes (5), Onions (5), Sugarcane (4), Coffee (4), Pineapples (4), Eggplants (4), Vanilla (3), Soybeans (3), Groundnuts (3), Yams (3), Oranges (3), Green grams (3), Passion fruit (3), Pumpkins (3), Mighobe (2), Sesame (2), Mangoes (2), Cabbages (2), Green dodo (2), Jackfruit (2), Pawpaws (2), Sweet potatoes (1), Irish potatoes (1), Pigeon Peas (1), Dodo (1), Moringa (1), Sorghum (1), Nswiga (1)
Not grown anymore	
Sorghum (4), Wheat (3), Sesame (2), Millet (2), Banana fruit (1), Pumpkins (1), Irish potatoes (1)	

Note: This exercise was repeated in five locations. The numbers in parenthesis indicate how often a certain crop was put in the specific square, which gives an overview of the importance of the crops across the five locations. The exercise was also repeated for each crop with the varieties placed in the different squares.

Change in agro-biodiversity

Farmers had stopped planting 2% of the 231 varieties that existed prior to the conflict, but had added 14 new varieties, which represents a 2% net increase in agrobiodiversity. No varieties were mentioned as having been lost due to the conflict; rather, it appears that old varieties were replaced by new varieties with superior characteristics (better yield, shorter maturation, higher market value, etc).

During the post seed fair evaluation, we also asked when a variety was introduced. We were able to trace 94 varieties (figure 6).

A stable ecosystem generally has more or less the same amount of species over time and we can regard the agro-ecosystem the same way. Change in agrobiodiversity is a normal process. We can see that every decade new varieties come into the system, and we may presume that others exit the system. This is called "variety turnover" or replacement (McGuire, 2000). Twenty-five of the 89 varieties that were introduced in the period from 1940 to the present were introduced by the government; five were introduced by NGOs. The rest, 59 varieties, were from individuals or the source was unknown. Variety turnover in an isolated area like Bundibugyo is dominated by farmer-to-farmer exchange, with a secondary contribution from the formal sector.

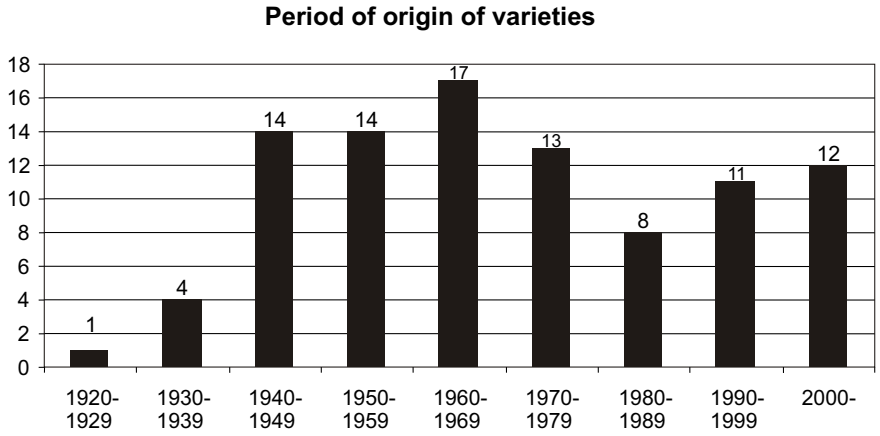

Figure 6. Period of origin of varieties in the Bundibugyo area (These are varieties that are still grown there. Varieties that were introduced in the same period but are no longer grown are not included in this graph. This probably means that in the period 1940–1969 many more varieties were introduced than are shown here.)

Discussion

Diversity at the seed fairs

The four-square analysis presented a very diverse farming system, but we saw that the majority of participants bought only two crops and varieties at the seed fairs. Although no farmer would have all or even most of the 237 varieties, every farm would have substantially more varietal diversity than the two varieties that farmers acquired at the fairs. Therefore, we can conclude that seed vouchers and fairs do not significantly contribute to an increase in the agrobiodiversity on the average farm.

It is not clear why varieties grown by many people on a small area were poorly represented at the seed fair. There are several possible explanations: it could mean that they are also poorly represented at regular markets, but it could also mean that a seed fair is an exceptional event and sellers bring a different set of varieties compared to what they normally would. This may depend on what they think they will sell on the basis of information they obtain before the fair. Alternatively, it might also be a question of demand since these varieties are cultivated on small areas for consumption. Without strong demand, sellers would not bring them to the fair. It might also be an issue of price. If rare varieties are more expensive, sellers might believe that the demand will be low.

There are no agriculture input stockists in Bundibugyo who carry commercial seed. It was not surprising, therefore, that commercial seed companies did not participate in the fairs and that the formal sector offerings were restricted to cocoa and coffee seedlings.

The question of whether farmers could have accessed seed themselves (e.g., bought or exchanged it without assistance) is problematic. Although 63% of the respondents stated that it would not have been possible, it is likely that difficulty obtaining seed was exaggerated in order to increase the likelihood of receiving assistance in the form of physical capital (seeds and tools) or financial capital (cash or vouchers).

Seed diversity fairs and seed vouchers and fairs

Reference to seed fairs is common in the literature. The more common form of seed fairs, known as "diversity fairs" or "seed diversity fairs," generally refers to special venues designed to encourage and facilitate agrobiodiversity through farmer exchanges. On the other hand, seed vouchers and fairs support farmers' demands for seed to assist with immediate recovery from a disaster. If the objective is to promote agrobiodiversity, perhaps in a follow-on recovery phase, then a "seed diversity fair" might be considered as the appropriate intervention. The difference between the two is explained in table 5.

As we have seen from this document, as a relief activity, seed vouchers and fairs help restore agrobiodiversity. It would be good practice to increase the resilience of the farmers' seed system by promoting agrobiodiversity or increasing agro-varietal turnover as well. We think this could be done by integrating the seed voucher and fair approach with some of the key elements of the seed diversity fair. This might be achieved by giving the most vulnerable group vouchers to buy seeds and, at the same time,

Box 2. Puppet Shows

During the seed vouchers and fairs around Bundibugyo, puppet shows were presented by a local puppet theater group, Dove Puppeteers, facilitated by Kabarole Research Centre in collaboration with Catholic Relief Services – CRD Program. The aim was to sensitize the beneficiaries as well as the buyers and the communities in the area about corruption, human rights, and domestic violence. This activity was useful for the community because it drew their attention to sensitive issues that concern them, and showed how they can be handled.

Puppet show at one of the fair sites
(Photo: Roger Furrer, CRS Uganda)

Table 5. The Difference between Seed Vouchers and Fairs and Seed Diversity Fairs

Seed vouchers and fairs	Seed diversity fairs (Rijal et al, 2000)
Objective	
Enable farm families access seed immediately following disaster	To strengthen seed security or support 'culture' by increasing the diversity of crops and varieties on offer and exchanged.
Concept	
Provision of vouchers to a target group of farmers increases demand for seed – from community seed sellers who, in turn, accept vouchers for later reimbursement in cash	Event organized for the exchange of seed of varieties and the knowledge related to these varieties. A supply side incentive (prize for the most varieties) used to increase the diversity of seed on offer.
Target group	
Households that do not have access to enough and/or appropriate seeds	All farmers in an area, whoever is interested in diversity, local knowledge and culture. Research organizations and commercial companies can also get involved
Type of seeds and other material involved	
No restriction on type of seed – demand for seed of principle food and cash crops. Focus on market and farmer seed, but includes research and commercial seed.	No restriction on type of seed – incentive used to increase diversity of crops on offer (including vegetative propagated). Focus on farmer seed, but includes market, research and commercial seed (Rareness and range of types is often emphasized.)
Other aspects	
Both events – seed vouchers & fairs and seed diversity fairs can be used for education and communication activities. For example, during seed voucher &fair events in Bundibugyo, a puppet show was organized (see box 2). In diversity fairs, drama, songs, poems and other cultural expressions are used to emphasis the importance and use of biodiversity.	

stimulating farmers to bring as much diversity as possible by awarding prizes to the one with the most varieties and associated knowledge.

When the target group involved in a seed voucher and fair activity is experiencing a less acute/more chronic stress situation, it might be useful to explore whether some aspects of seed diversity fairs could be included in the more emergency-oriented seed voucher & fair activity.

Conclusions

Seed vouchers and fairs enable seed-insecure farm families to access seed of preferred crops and varieties in the following ways:

- People are able to choose what they need.
- The material that is available is local, so it is adapted to the growing conditions.
- The local seed system is part of the relief effort

However, the seed vouchers and fairs carried out in Bundibugyo, western Uganda, did not specifically promote agrobiodiversity. While there was a fairly good representation of diversity among the main crops at the fair, there were unexplained gaps. Maize was hardly present at the seed fairs, in spite of its importance, and numerous minor crops and varieties were completely absent.

There are a couple of important considerations to keep in mind:

- New varieties have to be promoted along with knowledge. Accepting new varieties is always accompanied by risk because farmers do not know if the material is suitable for their region and their specific management practices.
- The introduction of new material is perhaps not suited to acute situations, but it is crucial in chronic situations.
- For the promotion of biodiversity, seed diversity fairs are a suitable option to promote both the new and the old.
- The combination of seed vouchers and fairs with seed diversity fairs can lead to increased variety turnover and, therefore, to a more productive and resilient seed system.

There is no clear indication that current seed sources are different from what there was before the conflict, but it appears that agricultural recovery is nearly complete. It also appears that farmers did not lose varieties worth keeping and that variety turnover is as good or even better (i.e., there are more and/or better varieties) than before the conflict.

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Comparison of Seed Vouchers & Fairs and Direct Seed Distribution: Lessons Learned in Eastern Kenya and Critical Next Steps

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Abstract

This report presents a comparative analysis of two different approaches used in emergency seed distribution in predominantly semiarid eastern Kenya: direct seed distribution (DSD) and seed vouchers and fairs (SV&F). The decade from 1992 to 2002 witnessed intermittent droughts in eastern Kenya, with major crop failures reported in 1993, 1996, 1999, and 2000. The Government of Kenya and other relief agencies responded to the disasters with DSD. Based on experience in northern Uganda, SV&F was tested in six districts in eastern Kenya and one district in central Kenya during the periods preceding the short rains in 2000 and 2001.

The results of the analysis show that more funds are invested in DSD and therefore larger quantities of seed are procured and distributed to more beneficiary families over a wider geographic area than in SV&F. However, DSD has problems of targeting and timeliness, and due to the wider coverage and broader targeting, less seed is distributed to each beneficiary family. In contrast, SV&F was better at targeting individual beneficiaries and was timed better: the seed reached the target beneficiaries prior to the on-set of rains. DSD seed is procured mainly from registered private seed companies that supply certified seed, although there are a few cases where "emergency-grade seed" was procured and distributed through the system. SV&F provides vouchers to identified seed-needy farmers who use them for the seed of their choice during organized seed fairs. The amount of seed received by each benefitting household was higher under SV&F compared to DSD. Varietal composition and number of crop species distributed was also higher under SV&F. Concerning the costs involved in the implementation of the two schemes, SV&F was associated with higher facilitation costs compared to DSD. However, the analysis of cost effectiveness revealed that SV&F was financially more attractive in benefit-cost ratios. Provision of seed through the SV&F also tends to enhance the local seed system.

The study recommends a policy change to facilitate a combination of the positive attributes of both approaches, as well as a policy change to allow procurement of "emergency-grade seed" of better-adapted drought-tolerant crops by relief agencies during drought emergencies.

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Introduction

Approximately 80% of Kenya's 583,000 km^2 is classified as arid and semiarid lands (ASALs), characterized by low and unreliable rainfall. The ASALs are spread over all seven provinces, covering 33 districts and supporting over 20% of the total population, 50% of livestock herds, and 5% of agricultural output. All 13 districts in eastern Kenya are ASALs and are categorized as agro-ecological zones 3 to 7 (table 1), based on Braun's (1982) classification

Table 1. Characterization of the Districts in Eastern Kenya Based on Cropping and Livestock Activities

Districts	Agroecological zones	Farming systems; Major crops and livestock activities; Chances of crop failure
Meru Central *Nyambene* *Embu*	Mainly zones 3 and 4: semi-humid to arid between 600 and 1100mm rainfall per year in two seasons	Mainly cropping Suitable for maize and beans Livestock, especially small ruminants and cattle Crop failures in 2 out of 5 seasons
Machakos *Makueni* *Mbeere*	Predominantly zone 4, but zone 5 also found	Agro-pastoral Crops and livestock: mainly maize, beans, cowpeas, pigeonpeas, green grams, dolicho beans, sorghum, millet, cassava, and sweet potatoes. Crop failures in 3 out of 5 seasons
Kitui *Mwingi* *Tharaka* *Meru North*	Predominantly zones 4 and 5; zone 6 is also found in some parts of these districts Mainly semiarid, receiving 450–900 mm of rainfall per year in two seasons	Agro-pastoral Crops and livestock: millet, sorghum, cotton, cowpeas, green grams, and pigeonpeas; some maize and beans Crop failures in 4 out of 5 seasons
Isiolo *Marsabit* *Moyale*	Predominantly zones 6 and 7 Mainly arid, receiving 300–550 mm rainfall per year	Mainly pastoral Very little cropping activity

Source: District Development Plans (1997-2001).

The livelihood of the approximately 3.8 million inhabitants of eastern Kenya is mainly from small-scale, subsistence-based agriculture. Both crops and livestock are important parts of the farming system and form the main sources of food and income for over 90% of the population. Farm size varies between two and seven hectares per household, larger in more arid zones. The land each family devotes to crops ranges from 30% to 50%, again depending on the zones; the remainder is used for livestock.

In the subsistence agriculture common in the ASALs, farmers produce a broad range of crops and varieties to meet their basic needs and also to avoid the risk of total crop failure. The major crops include cereals (maize, sorghum, and millet) and grain legumes (beans, pigeonpeas, cowpeas, green grams). Cotton, cassava, sweet potatoes, sunflowers, dolicho beans, castor beans, gourds, and chickpeas are also grown as part of the common mixed-farming system.

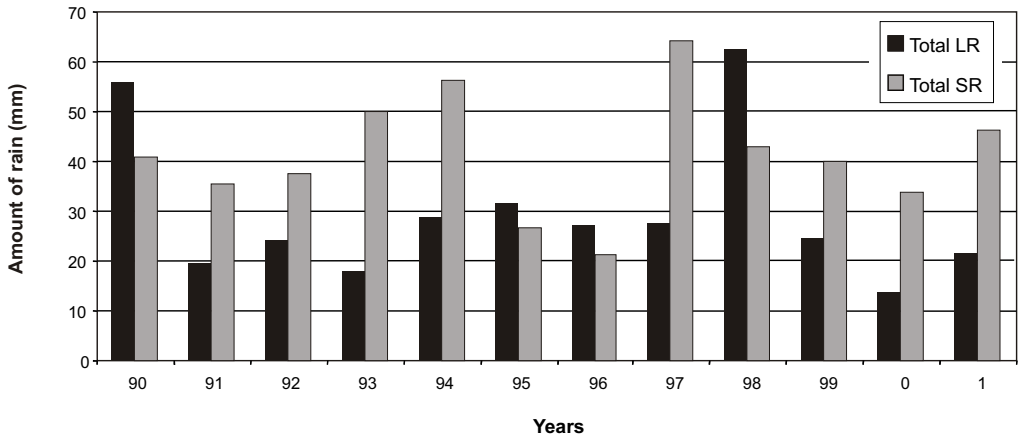
Several socioeconomic factors have contributed to the declining productivity of ASAL regions. Farmers face problems selling surpluses produced in good seasons because they are poorly linked to markets.

Few know where, when, and how to market their produce because they lack market information and have been unable to organize themselves into effective marketing groups. Consequently, they rely on local markets and middlemen who rarely offer attractive prices. Poor infrastructure further complicates the timely delivery of inputs and sale of produce. The problem is most severe during the rainy seasons because most roads become impassable. Transport is costly and often very unreliable. High transport costs inflate the cost of inputs and reduce profits from commodity sales. Although many producers have traditionally relied on family labor, availability is no longer guaranteed since most of the young people are either in school or have left in search of paid employment in urban centers. Few farmers can afford hired labor because of the need to finance education, health, food, and clothing, among other things. Although policies to improve the quality of living in the ASALs have been formulated, their implementation has been poor.

Drought and its effect on agricultural production in eastern Kenya

The ASALs of the eastern Kenya region are characterized by a bimodal rainfall pattern with peaks in April (the long rains) and November (short rains). Ranging between 400mm and 800mm annually, with a mean of 700mm, rainfall is scant, unreliable, and poorly distributed. The short rains receive a mean of 400mm and are more reliable compared to long rains, which have a mean of 300mm.

The seasonal rainfall during the 12 years from 1990 to 2001 is presented in figure 1 for Katumani Station, which is located in Machakos and is representative of ASAL areas. It can be seen that the long rains were below average in nine of the 12 years and above average only in three. The more-reliable short rains were above average in five of the 12 years, average in two, and below average in five.



Source: Kenya Metrological Department. Data collected from National Dryland Research Center (NDFRC-Katumani) 1990–2001.

Figure 1: Comparison of rainfall, short and long rains, Katumani Machakos, 1990–2001

The majority of the households in the ASAL agro-ecosystems depend on crops for their food security. The prolonged droughts that result from below-average rainfall, such as occurred between 1990 and 2001, compel most farm families to exhaust all their available grain, including what is normally kept for seed. Thus, food insecurity is usually associated with seed insecurity. For instance, in the year 2000, the estimated 178,978 households that required food in ASAL districts also required seed.

Seed delivery systems in Kenya

Two seed delivery systems, the formal and informal, are operational in Kenya.

In the formal seed production system, processing, packaging, labeling, and marketing of certified seed is done by registered producers. This normally involves private or public seed companies with outlets in many parts of the country, especially in town centers. Leading seed companies in Kenya include the Kenya Seed Company, East African Seed Company, Western Grain and Seed Company, and Faida Seeds. There are about 38 registered seed companies in Kenya, most of which produce seed for cereal crops, especially maize, wheat, barley, sorghum, and legumes (especially beans), and vegetables. Except for maize—which Kimenye (1999) says are mainly open-pollinated varieties (OPVs)—the commercial seed sector accounts for less than 5% of the seed sown in ASAL areas during the years with normal rainfall (personal communication, District Crops Officer, Tharaka District). Very little certified seed of open-pollinated crops such as pigeonpeas, cowpeas, sorghum, millet, and green grams (which are usually grown by resource-poor farmers who mainly live in ASALs) is produced by private seed companies, and 95% of what is produced is exported directly and/or sold to NGOs for distribution locally or in foreign countries (Kimenye, 1999). The private seed companies do not produce seed of vegetatively propagated crops either. They are profit-driven and consider the seed of crops adaptable to ASAL areas not only expensive to produce and market, but also subject to unreliable demand.

In the informal seed delivery system, production, processing, marketing, and/or distribution of seed is done by unregistered farmer seed producers. This seed is variable in quality and is not produced under a certification scheme. Production and marketing are often localized and based on low-input technology. Key players in this system include NGOs, farmers, farmer groups, researchers, and community-based organizations. The informal system produces local land-races, improved OPVs, and a blend of the two.

For most of the crops grown in ASALs, farmers obtain seed from local sources, especially their own saved seed, and social networks (relatives, neighboring farmers, and grain traders in open-air markets). The majority of farmers rely on seed saved from their own harvests and continue recycling seed as long as the harvest is "adequate" and they are able to keep some for subsequent seasons. Local traders play a critical role in rural communities by purchasing grain at harvest, storing it and later selling it back to the same farmers, either for food or as seed at planting time (Sperling, 2001). These traditional seed systems are critical to the livelihoods of poor households in the supply of both food and seed. During emergencies, relief and seed given as gifts become an important source of acquiring seed (Audi 2000). This is best exemplified by a Kamba saying, "*mbeu ndivatanawa,*" which, literally translated, means that "one cannot be denied planting seed." Seed bought from local markets also proves key (Sperling 2001, 2002).

The informal sector accounts for over 90% of the seed sown in ASAL regions. Because it is based on rain-fed cropping systems, it is highly vulnerable to drought stress, resulting in severe shortages. Although producers in the informal sector have limited access to breeders and basic seed of improved varieties, the local system has potential for sustainability partly because it is derived from traditional systems and has limited demand for external inputs.

Seed relief approaches: An overview

Seed relief is a relatively new development in Kenya. It began in 1992 as an effort to supply seeds to communities faced with food and acute seed shortages following drought. No record or report is available for an assessment of the seed situation in Kenya, but seed distribution has always followed

food distribution in the majority of locations. A number of factors have been considered in identifying geographical locations and potential beneficiaries for seed, usually provided by Ministry of Agriculture staff and including the following:

- the prevailing food/seed insecurity in drought-prone areas
- the actual number of households that are affected by food/seed insecurity
- the existing crop and farming systems in the targeted areas, including the crop planting density per population and cropping seasons (long- and short-rain seasons)
- suitable crop species and varieties, based on agro-ecological conditions and existing crop and farming systems
- the land area to be planted to different crops
- the total amount of appropriate seed in terms of quantity/quality required for the affected areas, and existing capacity for packaging and distributing the seed
- the potential sources of seed and their availability among the licensed merchants, approved stockists, and small seed enterprises
- weather forecasts and advice on suitable crops for the anticipated amount and distribution of precipitation

During droughts, governmental and nongovernmental organizations have responded not only with food aid, but also with "a package" that includes seed and, in some cases, tools for land preparation and other crop-husbandry operations. It has been anticipated that the seed distributed to farmers would serve as a boost in restoring their capacity to produce crops and seed for subsequent seasons.

In the 1990s, most of this seed aid followed a centralized tendering and distribution system to the affected areas, with little participation of the target groups. However, with the introduction of the World Food Program's (WFP) community-based food distribution system in 2000, Catholic Relief Services (CRS) started shifting their seed distribution policy towards strengthening community-based systems and promoting the use of seed of locally available and adapted crop species.

Two approaches, direct seed distribution (DSD) and seed vouchers and fairs (SV&F), have been used to distribute emergency seed in eastern Kenya. Many organizations (both NGOs and government agencies) have followed and continue to follow the DSD approach.

In this approach, the organizations request seed quotations from registered seed companies. Once the companies respond, the quotations are assessed, based on the unit cost and the ability of the company to supply the types of crop, varieties, and amounts required. Successful bidders transport the seeds to the district headquarters in the affected area, where it is received by the implementing agency for storage, awaiting delivery to the divisions and finally to locations where the seed is distributed to the beneficiaries. Officials from the Ministry of Agriculture and Office of the President have been used to distribute seed to beneficiaries. Where NGOs are involved, ground staff supervise the distribution.

CRS and its local partners used the SV&F approach to distribute seed to needy households in Kenya for the first time during the short rains of 2000 and 2001. This approach involves special markets (fairs) organized for farmers and local traders with surplus grain to be sold as seed. Seed stockists and companies are also invited to bring certified seed to the fairs. Seed-needy farmers are identified and issued vouchers of given monetary value, which they exchange for seed of the crops, varieties, and amounts of their choice, depending on the monetary value of the seed vouchers. When the fair is over, seed sellers redeem the vouchers for cash.

Comparison of DSD and SV&F systems: Basic features

The overall aim of emergency seed distribution is to contribute to food and livelihood security by ensuring that farmers, especially the vulnerable ones, have access to adequate seed and planting materials. An effective emergency seed distribution system should therefore ensure that a large number of seed-needy households are reached. The basic features (operational processes) of emergency seed distribution involve geographical and beneficiary targeting, identification of seed sources, procurement, transportation to distribution points, setting up the distribution procedures, and communicating extension information.

Descriptive features

Table 2 compares the operational features (processes) of the DSD and SV&F approaches. Most important to note is the fact that SV&F involves and empowers the community in all the stages, thus building their capacity. As opposed to DSD, where farmers have no option but to accept the seed brought to them, SV&F empowers the community to identify seed-needy households, choose the crop, variety, and amount of seed to plant, bring seed to be exchanged, and even participate in seed quality inspection and price setting. With DSD, the community is involved only at the receiving end—they receive the seeds that are distributed. The process of seed sourcing, acquisition, transportation, and distribution is done by the government and NGOs.

Comparison of operations

In Kenya, emergency seed distribution is mainly associated with drought whose effect is gradual in both geographical and population coverage. It usually starts from the most drought prone moving to the lesser drought prone districts as drought persists across seasons.

Geographical coverage

Between 1992 and 2002, Kenya suffered through three major drought periods (1992–1993, 1996–1997, 2000–2002), in which food and seed were distributed to the affected regions and population. During these major drought periods, over 42 districts benefitted from seed distribution in Kenya. In the droughts of 1992–93 and 1996–97, the government and other development organizations used the DSD approach to distribute seeds to seed-needy households. In 1992–93, seed was distributed to 32 districts, and between 1996 and 1997, it was distributed in 41 districts. In the period between 2000 and 2002, both the DSD and SV&F approaches were used to distribute seed in 42 districts in the country, out of which, the DSD approach was used in 34 and both DSD and SV&F in eight districts, mainly in eastern Kenya.

Data available from implementing organizations reveal that SV&F has only been implemented in three years in nine districts in Kenya. However, DSD has been implemented for over 10 years in all the 42 districts where seed distribution has taken place. The NGOs and the Ministry of Agriculture staff tend to agree that as long as seeds are available with seed companies and transport logistics are in place, the DSD approach is easily replicable and can cover a wider geographical area within a short time period compared to the SV&F approach. This is mainly because DSD is implemented through government and other development agency structures that already exist and which are easily mobilized for seed distribution. However, seeds and transport are usually not in place in the quantities needed at the required time. Although more of the targeted districts can be reached through DSD, the distribution of seed from the districts to the divisions, locations, and households is usually delayed beyond the necessary planting period.

The nature of the SV&F approach, which involves targeting the most affected locations or divisions within a district, may limit it to smaller geographical coverage. However, with time and more capacity building in the implementing institutions, SV&F may be a better approach since it targets the neediest locations.

Table 2. Comparison of Operational Features of DSD and SV&F

DSD	SV&F
Targeting of regions and locations	
Done at regional level based on drought. Little effort is made to identify the most affected divisions and locations	At district level targeting is based on food insecurity and occurrence of drought. Divisions and locations are selected based on rainfall data and crop performance in the current or preceding season
Targeting of beneficiaries	
Targeting depends on the distributing agency. Some NGOs do their targeting according to criteria set by officials within their grassroots networks. ALRMP at times offers blanket distribution mainly to satisfy political interests, though, theoretically, frontline extension officers are supposed to target needy households	Community sets criteria through sub-village committees to identify and rank seed-needy households
Seed sources	
Seed companies, and at times small-seed enterprises such as irrigation schemes and community seed bulking units	Farmers, local market traders, research institutions, community seed bulking groups, small- and large-scale seed companies
Seed procurement	
Requires a tendering process, or direct agreement with small seed enterprises	No tendering process required. Seed vendors bring grains and certified seed to the seed fair site
Seed transportation to distribution points	
Transportation has to be arranged by the implementing agency and seed companies or small seed enterprises for long distances	Transportation arranged by the seed suppliers (vendors)
Seed distribution	
Done by chiefs, assistant chiefs, extension agents and grassroots network of implementing NGOs	Beneficiaries are issued vouchers, which they exchange for seed
Decision on amount received by each beneficiary	
Centrally decided by extension and administration officials. Depends on the number of beneficiaries coming for seed, or households targeted by grassroots networks, relative to available seed	Made by each beneficiary, depending on the voucher value

Beneficiaries targeted and reached

The number of beneficiaries targeted and those receiving seeds through DSD and SV&F in eastern Kenya are presented in table 3. For the three drought periods, the number of beneficiaries reached through DSD in the affected districts of eastern Kenya exceeded the targets by between 15% to 23%. In 2000–2002, the distribution through both DSD and SV&F also exceeded the targets by 23%, indicating similarity in both approaches. The fewer number of beneficiaries targeted and reached by SV&F was determined by the project design and limited by project funds. However, if more funds could be made available for SV&F, more beneficiaries could be reached.

Table 3. Scale of Operation of Seed Distribution in Terms of Districts Covered, Number of Beneficiaries and Quantities of Seed Distributed during the Three Major Drought Periods in Eastern Kenya

Drought period and approach used	Number of districts covered	No. of beneficiaries		Quantity of seed distributed (M tons)	Value of seed distributed (Million shillings)	Percent achievem'nt (targeted/ achieved)
		Targeted	Achieved			
1992-93 (DSD)	10	79,050	90,907	1,741	157	115
1996-97 (DSD)	12	66,750	80,100	979	81	120
2000-2002 (DSD)	9	95,682	117,369	499	64	123
2000-2002 (SV&F)	8	33,800	41,583	1,020	23	123

Sources: Years 1990 to 2000 (Otado and Ingosi, 2002), Seed Fairs 2000 to 2002 (CRS/FAO, 2001–2002).

Discussions with those who implemented DSD and SV&F (Ministry of Agriculture and NGO staff) revealed that when DSD approach is used, even households that were not seed deficient received seed; SV&F is more efficient in targeting seed-needy households.

Types of crops/varieties distributed

DSD relies on the crop varieties and quantities of seed available with seed companies. These are mainly improved crop varieties, which are released for cultivation in specified regions. For most of the dryland areas of Kenya, only a few crop varieties have been released for cultivation (Omanga, 2002). This limits the number of suitable crops/varieties that are distributed to farmers through DSD. Nevertheless, maize, sorghum, beans, and cowpeas are the main crops that seed companies supply for emergency seed distribution.

Discussions with Ministry of Agriculture crop officers in the various districts revealed that the most common maize varieties supplied for distribution in eastern Kenya during drought emergencies were DLC, KCB, H511, H512, and H513. However, it is not uncommon to find that maize for high-potential areas, such as H512, H513, H614, and H614, have also been included in the supplies (Mohamed, 2001). Two varieties of sorghum, Seredo and Serena, are the most common, while, in beans, the seed companies usually supply mwatimania and rosecoco.

For drought-tolerant crop species like millet, cowpeas, green grams, pigeonpeas, and Dolichos beans, where few varieties have been released by research, the seed companies have been able to supply seeds but with no variety tag or label. In most cases, it is only the name of the crop that is written on the package. This indicates that some of the seed for these crops could be not certified but was purchased by seed companies from local markets.

A sample of crops, varieties, and quantities supplied and distributed to beneficiaries through DSD are presented in table 4 for Makueni District, which is representative of the other districts.

The crops and varieties/cultivars available during SV&F is representative of the cropping system of the area. In most SV&F distributions, various crops grown by farmers in the region were available (table 5). These included maize, sorghum, millet, beans, cowpeas, green grams, pigeonpeas, Dolichos beans, and chickpeas. Other crops that were brought to some of the seed fairs included cassava, sweet potatoes, and cotton. For each of these crops, farmers, traders, and seed companies brought completely differentiated varieties and cultivars. More crops and different crop varieties were brought for sale to farmers at SV&F events, compared to the number of crops and varieties that seed companies supplied through DSD.

Quantities of seed given in each approach

For DSD, the amount of seed supplied during the three drought periods largely depended on the availability of seed through seed companies, the price of the seed, and the availability of funds. Between 1992 and 2002, over 3219 tons of seed worth 302 million shillings were supplied and distributed by the government and NGOs in eastern Kenya using the DSD approach. During the drought period of 2000 and 2002, CRS and its partners distributed about 1020 tons of seed worth 23 million shillings using the SV&F approach in eastern Kenya. A total of 51 SV&F events were conducted. At these events, 2169 seed vendors (farmers, traders, and seed companies) brought over 2500 tons of seed and sold 1020 tons to voucher holders (table 6).

Despite the fact that beans and maize are not the best-adapted crops for the drought-prone areas of eastern Kenya, they still comprised the highest proportion of seed distributed by both DSD and SV&F. This is mainly due to taste preferences and suggests that a greater effort is needed in promoting drought-tolerant crop varieties through on-farm trials and demonstrations.

Quantities of seed given to each household

Generally, most of the stakeholders who are involved in emergency seed distribution rely on technical backstopping from Ministry of Agriculture staff to provide estimates of the amount of seed to be given to each household. This is based on the average area of land per household and prevailing agroclimatic conditions. For most districts in ASAL eastern Kenya, the average land holding is between two and seven hectares. The seed budget per household is about 10kg of maize, 10kg of beans, 5kg of sorghum or millet, and another 5kg of cowpeas, pigeonpeas, or green grams, according to district crops officers.

The amount of seed that each household got through government channels, in practice, depended on the number of members of each household who present at the distribution point. In most cases, the beneficiaries received between 3kg and 10kg of seed of various crop varieties (according to district crops officers). However, when NGOs were involved, the quantities received by each household ranged from 8kg to 25kg (table 7). Seed distributed through government channels went to everyone who came to the distribution point, but the NGOs were more targeted, giving seed to the already identified seed-needy households only. Through SV&F, the average amount of seed received by each beneficiary was 28kg.

Table 4. Summary of Diversity of Crops, Varieties, and Quantities Delivered and Agencies Involved in the DSD System in Makueni District

Year/Donor/ Season	No. of beneficiaries reached	Crop type and quantities supplied (tons)	Varieties of each crop and quantities supplied (tons)
1995, Drought Recovery Program (DRP), LR	No Records	Maize (63.0)	KCB, DLC1, and H511 (assorted)
		Sorghum (5.0)/ Millet (5.0)	Serena and seredo 5.0 (assorted); Bulrush and finger millets 5.0 (assorted)
		Legumes (18.0)	
1995, GAA/KFFHC, LR		Maize (30.0)	Beans (15.0), (mwitamania and rosecoco, assorted); Cowpeas (3.0) (M66 and kenkunde, assorted)
		Sorghum (9.0)	
		Beans (7.0)	KCB (30.0)
			Seredo (9.0)
			Mwitamania (7.0)
1996, DRP, LR	No Records	Maize (120.0)	DLC1, KCB, and H511 (120.0, assorted)
1996, WVK, GAA, DANIDA, &GTZ	No Records	Legumes (90.0)	GLP2, GLP92, GLP1004, kenkunde (90.0)
		Sorghum (5.0)	Seredo (5.0)
		Maize (48.8)	Maize (48.8)
		Legumes (52.0)	Beans, cowpeas, green grams (52.0)
		Sorghum (35.6)	Sorghum (35.6, assorted)
		Cotton (19.2)	Cotton (19.2, assorted)
2000, WVK,GAA, &MAP	No Records	Maize (15.1)	Maize (15.1, assorted)
		Sorghum (13.5)	Sorghum (13.5, assorted)
		Cotton (24.4)	Cotton (24.4, assorted)
		Legumes (22.8)	Beans, cowpeas, green grams, pigeonpeas, soybeans (22.8, assorted)
2001, DRP, LR	No Records	Maize (36.0)	KCB (36.0)
2001, FAO/AMREF, LR	No Records	Sorghum (24.0)	Seredo (7.0), serena (17.0)
		Legumes (6.0)	Mwitemania (4.0), kenkunde (2.0)
		Sorghum (13.0)	Sorghum (13.0, assorted)
		Millet (13.0)	Millet (13.0, assorted)
		Legumes (52.0)	Cowpeas (13.0), green grams (13.0), beans (26.0)

Source: District Agriculture Office Makueni (2003).
Note: LR = long rains. For other acronyms, see the list at the end of the chapter.

Table 5. Comparison of Varietal Composition of Seed Distributed through DSD and SV&F

	Number of Varieties Supplied/Available	
Crops	DSD	SV&F
Maize	7	5
Sorghum	4	6
Millet	2	4
Beans	6	8
Cowpeas	4	7
Pigeonpeas	1	4
Green grams	1	3
Chickpeas	—	2
Dolicho beans	—	4
Total	***25***	***43***

Source: CRS/FAO (2001–2002).

Table 6. Crops and Quantities (in MT) Distributed in Drought-Affected Districts of Eastern Kenya through the SV&F Approach, 2000–2002

Crop	2000	2001	2002
Maize	19.2	261.0	30.5
Sorghum	5.4	104.4	10.1
Millet	3.5	87.0	7.9
Beans	28.5	294.1	18.6
Cowpeas	3.4	69.6	8.5
Green grams	2.6	27.4	6.3
Pigeonpeas	1.5	22.2	3.6
Dolicho beans	0.3	3.5	0.5
Chickpeas	0.2	0.8	0.0
Total	***64.6***	***870.0***	***86.0***

Source: CRS/FAO (2001–2002).

Table 7. Quantities of Seed (kg) Received by Each Household through NGO Channels Using DSD, 2000

	Quantity of seed received by each household by crop					
NGO	Maize	Sorghum/ millet	Beans	Cowpeas/ greengrams	Pigeonpeas	Total
Red Cross	3	2		2	1	8
GAA	5	10	5		5	25
Catholic Diocese	5	2	5	4		16
DANIDA		10		5		15
ADRA	5	2	5	7		19

DSD versus SV&F: Process and product

An analysis of process and product compares the two approaches in emergency seed distribution in the context of logistics and timeliness, quantities supplied and delivered, capacity building, and process of seed acquisition. It also addresses spin-offs such as choice leeway, pricing, income redistribution, and gender composition of key players. In the product analysis, we addressed the appropriateness of types of crops and varieties distributed, adaptability of the seed to local conditions, quality of the seed—viability, purity—and the composition of the seed in terms of crop species and varieties.

Logistics and timeliness

For any emergency seed distribution, logistics have to be put into place to ensure a timely supply of seed to needy households before the onset of the rains. The two systems of emergency seed distribution (DSD and SV&F) differ markedly in terms of the logistics involved, which begin from the identification of drought-affected areas through to the procurement and distribution of seed to the targeted beneficiaries

(table 8). The DSD involves a lengthy time consuming tendering process. It also entails that the seeds have to be transported to the affected districts and locations. This is time consuming and more often the seed reaches the beneficiaries long after the onset of rains. For example, during the seed distribution of 2000 October short rains, most of the districts reported receiving seeds two weeks after the onset of rains and some more than one month later (Mohamed, , 2001).

In SV&F, most of the seed distributed comes from the affected areas. It only requires mobilization and sensitization of farmers, traders, seed stockists, and seed companies to take seed to selected seed fair sites that are closer to beneficiaries. The mobilization may take about two weeks. In fact, discussions with agriculture officials and farmers revealed that through SV&F, farmers received seed in time to plant before or at the onset of the rains in 2000 and 2001. This is further supported by Mohamed's (2001) evaluation findings.

Secondary benefits

Apart from the seed-needy farmers who are the purported beneficiaries of both systems of emergency seed distribution, other stakeholders also benefit. Table 9 gives a summary of various categories of beneficiaries in each system and the nature of benefits. Under the SV&F approach, the farming communities benefitted twice: once from seed received and also from money received by local seed vendors, which was injected into the local economy. On the other hand, under DSD, the farming communities only benefitted from receiving seed. The funds used to purchase the seed went to the seed companies. The active role played by the farming communities under SV&F helps enhance the sustainability of the local seed market system because local seed vendors and farmers play a key role in the actual exchange of vouchers for seed.

Quantities of seed received by each household

In SV&F, the amounts of seed the voucher holders received depended on the prices of the grain (seed) in the seed fair. With the voucher value of 700 shillings given to farmers during the seed fairs in 2001, most of the beneficiaries used 250 to purchase maize, 250 to purchase beans, 100 to purchase sorghum and millet, and 100 for other grain legumes (table 10). At an average price of 16, 38, 26, and 35 shillings per kilo of maize, beans, sorghum/millet, and other legumes, respectively, the beneficiaries took home an average of 30kg of grain to be planted as seed. Only 8kg of certified commercial seed could be purchased for 700 shillings.

In the DSD approach, the amount of seed received by households was decided by the implementing agency or the Ministry of Agriculture. In most districts, each household was to receive about 10kg of maize, 5kg of sorghum, 5kg of beans, and 2kg of either cowpeas, green grams, or pigeonpeas—a total of 22kg. However, the amount of seed finally received by the households depended on what was supplied to the location or division and the number of households at a distribution point. During 2000 and 2001, most farmers receiving seed through DSD, took home an average 3kg to 10kg of seed to plant.

Table 11 gives a summary of the seed distributed in each district, the targeted farmers, and the estimated seed per household under the two systems. The average amount of seed supplied under the SV&F system was 28kg. The highest amount of seed was received in Tharaka District, with each beneficiary receiving about 36kg of assorted seeds, while the lowest amount was received in Kitui, where each beneficiary received 21kg of assorted seed.

Table 8. Comparison of Logistics and Timeliness of DSD and SV&F Systems of Seed Distribution

DSD	SV&F
Identification of Scale and Scope of Disaster	
• Elaborate system that starts with frontline extension staff, village-level provincial administration, district-level officials, to national Office of the President (based ALRMP) and NGO head offices • For the case of seed from the government in Kenya, the system is time consuming because of bureaucratic red tape—hence not capable of quick response to an emergency. For the case of NGOs, they are more focused on certain target areas and have less red tape—hence capable of quick response	• Existing information used to determine areas that deserve intervention • Combination of existing information and sub-village committees used to target beneficiaries • Focused on specific disaster-affected areas—hence easy to react in time with appropriate intervention
Procurement and Distribution to Districts	
• Procurement achieved through an elaborate tendering system that involves decisions and goodwill of a number of stakeholders, such as members of Office of the President, Treasury officials, and Ministry of Agriculture officials for seed from the government, and top-level management of NGOs for seed distributed through NGOs or their grassroots collaborators • Availability of adequate and adaptable varieties of given crop species subject to stocking policies of major seed companies or small seed enterprises whose operations are independent of needs of Office of the President, Ministry of Agriculture, or NGOs • Transportation from source to target areas involves contracting transporters and loaders, with associated cost implications • Too many independent players involved—hence not capable of quick response to emergency situation	• High proportion of seed supplied comes from within the disaster area • Benefitting communities double as suppliers of some of the seed—hence limited transport and packaging logistics • Majority of the players in the exchange process are local • Minimal time required to sensitize the suppliers and organize potential beneficiaries to meet in a central place • Inherent ability to support quick response to disaster because of few independent and spatially distributed players in decision making
Distribution to Target Beneficiaries, Monitoring and Evaluation	
• Budget for distribution normally allocated to provincial administration yet Ministry of Agriculture officials are supposed to distribute seed to targeted beneficiaries. Individual NGOs involved in seed distribution organize their grassroots network for actual distribution to targeted beneficiaries • Most ALRMP lorries in the districts are in disrepair and no specific funds are allocated for hiring lorries from private transporters to carry seed to target locations • Some new districts lack adequate storage facilities for large quantities of seed sourced and distributed by the government. Most NGOs also lack storage facilities in target locations • Adequate time and properly planned logistics required to have the seed reach the beneficiaries—hence not capable of quick response to emergency	• No physical transportation by an independent transporter required to reach targeted beneficiaries • No officials of provincial administration nor extension staff required to supervise distribution • No elaborate packaging and storage facility required at grassroots/village level • Literally no time spent on distribution to target communities, as each beneficiary gets his/her share to carry home • Decentralized system with targeting on smaller scale—hence more accurate and easier to monitor and evaluate • Both buyers and sellers benefit—hence ensures targeting without creating conflict within the community • Information contained in vouchers allows implementation to be tracked, forming the basis for monitoring and evaluation

Table 9. Comparison of Benefits Accruing to Various Stakeholders under DSD and SV&F Systems of Seed Supply

DSD	SV&F
Benefits to Farmers	
Primary beneficiaries and the main recipients of the distributed seed	Primary beneficiaries of the seed purchased through the system: they comprise the majority of suppliers of seed and thus redeem vouchers for cash
Benefits to Seed Vendors	
Benefits only in situations where NGOs purchase locally bulked seed for distribution to farmers	Secondary beneficiaries from profits earned when they sell their grains as seed during the fairs
Benefits to Seed Companies	
Main secondary beneficiaries: they supply most of the seed distributed through DSD	Secondary beneficiaries: they supply part of certified seed purchased during the fairs
Benefits to Local Seed Stockists	
Secondary beneficiaries: normally benefit when NGOs choose to purchase seed locally	Secondary beneficiaries: they supply part of certified seed purchased during the fairs
Benefits to Community in General	
Benefit from agricultural outputs from the seed and, hence, food security; increased crop diversity occasioned by new species; small seed enterprises/community seed bulking agents sell part of their "seed" as emergency grade seed	Inject cash into local economy (70% remains in the community); capacity building in terms of issues relating to seed quality; capacity building in terms of seed bulking and seed exchange systems; contributes to sustainability of the local seed market system

Table 10. Amount of Seed That Each Beneficiary Took Home

	Seed Fairs			Commercial seed	
Crop	**Household seed budget (Ksh)**	**Unit price (Ksh/kg)**	**Average Amount of seed purchased (kg)**	**Unit price (Ksh/kg)**	**Amount that could have been purchased (kg)**
Maize	250	16	15.6	100	2.5
Beans	250	38	6,6	80	3.2
Sorghum/millet	100	28	3.8	70	1.4
Other Legumes	100	35	2.9	100	1.0
Totals	*700*		*30.0*		*8.0*

Source: CRS/FAO (2001–2002).

Table 11. Estimated Seed Distributed per Household under DSD and SV&F, 2000

	DSD			SV&F		
Districts	No. of Beneficiaries	Amount of Seed Distributed (kg)	Seed per Household (kg)	No. of Beneficiaries	Amount of Seed Distributed (kg)	Seed per Household
Tharaka	**6,125**	**45,642**	7.50	4,600	164,000	35.61
Mbeere	**8,307**	**49,900**	6.00	4600	93,000	20.22
Machakos	**41,100**	**1,014,100**	24.00	4600	150,000	32.60
Makueni	**7,700**	**129,492**	16.80	4600	146,000	31.74
Kitui	**13,530**	**50,150**	3.70	4600	98,000	21.30
Mwingi	**40,607**	**312,814**	7.70	3278	86,000	26.24
Average			10.95			27.9

Source: CRS/FAO (2001–2002).

For each of the dryland crops, there are a number of varieties/cultivars that farmers can easily differentiate by local names and preferred characteristics. Indeed, different locally adapted crops and crop varieties, which are not available in the formal seed sector but are important to food security in drought-prone areas, were brought for sale to the fairs. This helps develop an understanding of the biodiversity in crops and varieties and farmers' preferences for the various crops in each location. The seed fairs provided an opportunity for local seed vendors and seed-needy farmers to interact. It also provided an opportunity to gather information on the kinds of crops and varieties available for sale and farmers' preferences. In this way, the SV&F system strengthens the operation of local seed systems rather than undermining it.

The promotion of seed-quality issues related to seed preservation, selection, and management of good-quality seed during sensitization meetings and fairs, as well as the involvement of local vendors and farmers under the SV&F scheme, considerably enhances the local seed supply system. Conversely, under the DSD scheme, all seed is purchased elsewhere and brought in for distribution in target localities. The well-organized publicity and involvement of a considerable number of vendors, farmers, and commercial seed companies associated with SV&F make it possible to access a wider range of crops and varieties (see table 5). For example, during the implementation of the "Emergency Provision of Seeds to Drought Affected Farming Households" project in Kenyan ASALs, some 43 varieties of nine crops were bought at seed fairs, compared to only 27 varieties for seven crops provided through DSD. In the long term, the repeated provision of relief seed associated with DSD could unintentionally increase farmers' vulnerability by promoting false expectations, contributing to dependency on free assistance, and disrupting local seed markets (FAO, 2002b). In this context, SV&F is less "harmful" as it enhances the local seed supply. Seventy percent of those who bring their own seed under SV&F are from the local communities, which ensures that a larger proportion of the funds committed to relief seed remains in the benefitting communities. For instance, of the US$ 276,000 spent on vouchers in the six districts under study in 2001, approximately US$ 193,200 remained in the benefitting communities.

Flexibility

The SV&F approach presents a "level playing field" upon which the commercial seed sector (seed companies and stockists) and the farmer seed system (farmers and market traders) can compete.

However, the playing field can be easily tilted in favor of the commercial sector if farmers are lectured on the superiority of commercial seed of improved varieties. It can also be tilted towards the farmer system by encouraging voucher holders to buy locally so as to prevent the proceeds from the sale leaving the community.

The SV&F methodology provides beneficiaries a choice of crops, varieties, and seed quality. It is an open process in which commercial seed companies, stockists (input supply shopkeepers), market grain traders, and small farmers can all participate. With competent, experienced, and proactive management, SV&F can provide farm families with a choice between farmer and formal seed, as well as small quantities of seed of new varieties.

Beneficiary access to information concerning quality of the supplied seed

Interviews with representative farmers (FAO, 2002a) and officials of the Ministry of Agriculture (district crop officers) revealed that farmers have more leeway accessing information regarding adaptation to local environments and seed quality in SV&F, compared to DSD. This is mainly due to the fact that in SV&F, farmers have the freedom to choose the crop, variety, and amount of seed they want, within the constraint of the value of their vouchers. They also have the freedom to choose what to buy from a number of suppliers, who range from local stockists, seed companies, seed vendors, and fellow farmers. This way, they have control over the quality of the seed that they take home. Under SV&F, farmers are also in a position to choose the seed or combination of seeds that they prefer. The majority (over 50%) of those displaying seed for sale are fellow farmers and the beneficiaries are able to rate the quality of their seed based on experience because they live in the same community. On the other hand, under the DSD system, farmers are compelled to contend with what is provided to them, as they do not play any role in deciding either what is to be purchased or the crop mix in terms of what is provided to them.

Contribution to biodiversity

Interviews with various stakeholders (farmers and extension staff) revealed that both the DSD and SV&F systems of emergency seed distribution enhance biodiversity through the introduction of new varieties and, even at times, crop species. The DSD system brings in certified seed, some of which is totally new to the target areas and, thus, enhances diversity of the crop species in such areas. SV&F involves participation of seed companies and other seed merchants who introduce new crop species and varieties in target areas. For instance, Western Kenya Seed Company was able to display and sell new varieties of pigeonpeas, beans, millet, sorghum, and maize during the seed fairs in 2001, which is an indication that farmers in the region actually seek seed of new varieties.

Ability of supply to satisfy the estimated demand

Comparison of the two systems in terms of ability to satisfy the estimated demand revealed that the DSD system under ALRMP has rarely supplied the districts with the requested amounts. Using Machakos as an example (table 12), it can be seen that the amount of seed supplied for the much-needed varieties of maize, beans, cowpeas, and sorghum was far below the quantities ordered. On the other hand, the supply under SV&F is such that all vouchers are exchanged for seed and no farmer goes home with unused vouchers.

Table 12. Quantities of Emergency Seed Ordered and What Was Actually Received for the Seed from ALRMP, Machakos District, 1997

Crop/Variety	Quantity Ordered (kg)	Quantity Received (kg)
Maize H511	38,800	20,000
Maize H512	Nil	12,000
Kale	20	5
Onions	30	100
Tomatoes	40	180
Green grams	19,200	793
Maize (KCB)	317,400	115,000
Beans	304,600	2,000
Sorghum	4000	Nil
Cowpeas	37,160	2,080

Source: Ministry of Agriculture, Machakos District Annual Report 1997.

DSD versus SV&F: Financial analysis

In order to implement emergency seed distribution, funds are required to meet the costs of purchase, transportation, and distribution. Depending on the approach used to distribute seed, these costs vary with the types of seed distributed and the distances between the distribution locations and the district and seed company headquarters. At the NGO level, it was difficult to get information on the amount and value of seed purchased and distributed. However, some data were available from FAO Kenya, which coordinated seed distributions during the droughts of 2000 and 2001. Based on the available data, we used two methods to compare the cost implications of DSD and SV&F:

- information on the number of targeted beneficiaries and total project costs that was available for 2000 and 2001 from the FAO Kenya office, which provided the overall costs involved in distributing seed to each benefitting household under each of the two schemes.
- the estimated costs of seed procurement, transportation, handling, and facilitation, which addressed the cost effectiveness of each of the two schemes (adapted from a study on "Comparative Financial Analysis of the Seed Vouchers and Fairs Scheme," FAO, 2002b).

Overall costs

Table 13 compares the average cost and estimated amount of seed per beneficiary, and the estimated unit cost of seed for the DSD and SV&F distributions conducted in eastern Kenya during 2000 and 2001. Only the cost of purchasing seed was included in this analysis since it was difficult to get other costs related to transportation and facilitation for DSD.

The average cost of distributing seed to each beneficiary through DSD (545 Ksh) was almost identical to that of SV&F (560 Ksh) in 2000, but less by 102 Ksh for the 2001 distribution. However, the amount of seed received by each household was far less in the DSD distribution: 4.3kg through DSD in 2000, compared to 12.2kg in 2000 and 28.7kg in 2001 through SV&F. The estimated unit cost of 128.2 Ksh/kg of seed for DSD in 2000 was considerable more than the cost of a kilo of seed distributed through SV&F: almost three times more for 2000 and six times more for 2001.

Table 13. Analysis of Costs of Seed Distributed Using DSD and SV&F in Eastern Kenya in 2000 and 2001

Item	DSD	SV&F	
	Year 2000	Year 2000	Year 2001
Amount of seed distributed (MT)	499	98	870
Estimated value of seed distributed (million Ksh.)	64	4.5	19.6
Number of beneficiaries	117,369	8,027	30,270
Average cost per beneficiary (Ksh)	545	560	647
Estimated amount of seed per beneficiary (kg)	4.3	12.2	28.7
Estimated cost per kilo of seed (Ksh)	128.4	45.9	22.5

Source: FAO (2002b).

Considering the cost of seed, the DSD system is more expensive to implement than SV&F. The cost of the certified seed distributed in DSD is approximately six times more expensive than the local grain that dominates the seed exchanged in SV&F schemes.

Cost effectiveness

The relative cost-effectiveness the two schemes is presented in table 14, as adapted from FAO (2002b). Due to lack of data on all emergency seed distribution operations, the analysis was conducted on the basis of final reports and financial statements from AMREF, the implementing agency of DSD in Makueni District, and CRS, the implementing agency of SV&F in Mbeere, Tharaka, and Embu. Both schemes were implemented under the "Emergency Provision of Seeds to Drought-Affected Farming Households" project (OSRO/KEN/001/SWE) funded by DFID through FAO. The CRS financial budget and preliminary results for implementation of the "Emergency Seeds Distribution by Voucher System for the 'Long' Rains in Eastern Kenya" project (OSRO/KEN/101/UK) were also used.

The major costs involved in implementing DSD included procurement of seed, transportation, handling, and facilitation. There were also expenditures to cover the costs of procurement missions. In contrast, the costs of seed provision through the SV&F seed fairs involved facilitation and the value of the vouchers. In table 14, a summary of the cost comparison is given, revealing that the combined costs of facilitation and transportation per beneficiary (and therefore the total costs per beneficiary) are lower for SV&F than for DSD (US$ 1.0 and US$ 2.3 for SV&F projects OSRO/KEN/001/SWE and OSRO/KEN/101/UK, respectively, compared to US$ 3.3 under DSD). The total cost of US$ 13.8 per household for DSD is even more expensive when one compares the amount of seed that each household received.

It is evident in table 14 that the average price of seed was lower for SV&F in both 2000 and 2001, compared to the price for DSD. However, the average cost for SV&F in 2000 was twice that of SV&F in 2001. This was attributed mainly to a change in market grain prices between 2000 and 2001. The grain prices were higher in 2000 due to grain shortages and high demand.

Table 14. Summary of Financial Costs for DSD and SV&F

	Unit	Project OSRO/KEN/001/SWE[a]		Project OSRO/KEN/101/UKE[b]
Description		**DSD**	**SV&F**	**SV&F**
Implementing NGO		AMREF	CRS	CRS
Number of benefitting households (hh)	No.	6,217	8,027	30,278
Quantity of seed distributed	Kg	74,604	64,678	956,324
Costs of seed acquisition	US$	65,262	42,103	243,589
Costs of seed facilitation	US$	12,108	8,282	69,800
Costs of seed transportation	US$	8,530	0	0
Costs of seed transportation &facilitation	US$	20,638	8,282	69,800
Total costs[c]	US$	85,900	50,385	313,389
Costs of seed per hh[d]	US$	10.5	5.2	8.0
Average quantity of seed per hh	Kg	12.0	8.0	31.5
Average price of seed	US$/Kg	0.9	0.6	0.3
Cost of seed facilitation per hh	US$	1.9	1.0	2.3
Cost of transportation and facilitation per hh	US$	3.3	1.0	2.3
Total costs per benefitting hh	US$	13.8	6.2	10.3
Cost of seed facilitation as % of seed value	%	19%	19%	28%
Cost of seed facilitation as % of total costs	%	14%	16%	22%
Cost of seed facilitation and transportation as % of seed value	%	32%	19%	28%
Cost of seed facilitation and transportation as % of total costs	%	24%	16%	22%

a. "Emergency Provision of Seed to Drought-Affected Farming Households in Kenya," actual numbers.
b. "Emergency Seed Distribution by Voucher System for the 'Long' rains in Eastern Kenya," estimated numbers.
c. FAO monitoring and evaluation costs are excluded.
d. The SV&F seed package under OSRO/KEN/101/UK project does not include the cost of promotional seeds.

Lessons learned, reflections, and next steps forward

Lessons learned

Although direct seed distribution is based on the assumption that after a drought disaster, farming communities do not have enough seed, the experience with seed vouchers and fairs in eastern Kenya shows that despite the intermittent droughts that lead to repeated acute stress, the main constraint is one of access to seed as opposed to local seed availability. This is evidenced in the fact that during SV&F activities, over 70% of the seed supplied was by local seed vendors and/or farmers who double as suppliers of "seed" during such fairs. This implies that the local seed system is capable of providing the required seed even in situations of acute stress. Lack of access, which might be a result of widespread poverty, is the most likely exacerbating factor for the seed-related problems observed under conditions of acute stress.

In the normal planting season before any prolonged drought, farmers in drought-prone areas prefer planting landraces from their own sources and/or open-air markets (Audi, 2001). This implies that there is a built-in tendency for communities in ASALs to keep their own seed for planting or for sale to others through open-air markets, a factor that further supports the theory that during acute seed problems, the required seed is available in the communities but not accessible to all.

The normal supply of seed for distribution through DSD has been come from governmental or commercial sectors. This has led to a narrow range of crops and varieties available to beneficiaries. The commercial seed sector produces mainly for the reliable markets in medium- to high-potential agroecological zones, which means that they are not likely to have adequate stocks of species or varieties adapted for ASAL districts. A shift towards empowering local bulking and availability of crops and varieties that are appropriate to local conditions could facilitate the procurement of seed for emergency seed distributions, if only the donors and relief agencies could be convinced to be more flexible in their seed-sourcing policies. There are many cases where locally produced "emergency-grade seed" has been sourced and distributed. For instance, farmers in the Yala Division, Siaya District in Kenya (in collaboration with KARI, CIMMYT, and KEPHIS, and with financial support from the Rockefeller Foundation) are currently bulking and selling unpacked and unbranded "semi-certified seed" among themselves in a cluster of 20 farmer groups. The same arrangement could be replicated in the ASAL districts of eastern Kenya.

The fact that interventions have been needed each time there has been prolonged drought in eastern Kenya means that intermittent interventions have not resulted in establishing a more resilient seed system that could sustain itself through periods of acute stress without external intervention. There is therefore a need for a deeper understanding of the impact of relief seed on the rehabilitation of the seed system and promotion of system stability.

At present, seed fairs are only used as a means of enabling seed-needy farmers to access seed for the crop or variety of their choice in desired quantities, subject to the constraints of the value of the seed vouchers. However, the SV&F approach holds the potential for stimulating local seed enterprises because it empowers even the small-scale sellers to participate. The approach could be modified to facilitate seed fairs on a regular basis, where those with vouchers and those willing to buy with cash could be brought together. This would help exploit the inherent empowerment and economic support of the approach, resulting in a more resilient and stable seed system in the drought-prone ASAL districts.

Reflections and recommended way forward

The use of DSD and SV&F in emergency seed distribution in eastern Kenya reveals that both approaches have strengths and weaknesses. DSD has been in existence longer and is therefore more familiar to donors, relief agencies, and government departments—both at top levels and grassroots. This means that it is easy to access funds from donors for DSD and to implement it on a wider scale. Also, the seed distributed through DSD is obtained mainly from commercial seed companies, so it is of known quality. An analysis of the cost effectiveness of the two approaches reveals relatively lower facilitation costs associated with SV&F compared to DSD. Further more, the DSD approach also suffers the weakness of being implemented from the top down, with little room for participation by players in the local seed system. This has the potential of undermining local seed system and its stability. The reliance of DSD on seed from commercial seed sources means that it might fail at times to get species and varieties suitable to the target areas. The inherent bureaucratic red tape in procurement and distribution also has a negative impact on the timeliness of delivery and targeting of actual seed-needy households.

Providing seeds through SV&F has the potential of enhancing the local seed system by giving the farmers the opportunity to choose seeds of the crops and varieties they want, which can save for following seasons; contributing to the development of social capital by recognizing the dignity of the beneficiaries and empowering them to choose seed of their preferred crops and varieties; using and supporting local crop diversity; linking to development through their capacity to choose, competitive seed markets, and development of agro-enterprises; enhancing local seed marketing systems by reinforcing existing market mechanisms and reducing external dependence; and strengthening the local cash economy because it provides financial injections into the communities.

The inherent weaknesses in SV&F include the inability to ascertain seed quality; its lack of familiarity to most donors, relief agencies, and beneficiaries; and the risk associated with moving large amounts of cash.

The study team is of the opinion that there are inherent strengths in both DSD and SV&F that could be built on to enhance the capacity of the interventions not only to bring the local seed systems back to their feet but to rehabilitate, stabilize, and sustain the systems. This study recommends that the program designs in emergency seed distribution should always include capacity building at all levels, which provides the recipients with the required skills and experiences necessary to maintain the stability and sustainability of the local seed system.

SV&F operates on the premise that the seed is available in the communities and it is only access to that seed that creates a problem in a situation of acute stress. To ensure the sustainability of SV&F, small-scale production of open-pollinated varieties for sale as "seed" needs to be enhanced and strengthened in order to facilitate jump-starting small-seed enterprises, as well as influencing policy on the production and sale of "emergency-grade seed."

More resources are currently being used under the DSD scheme, compared to SV&F. DSD also has a wider geographical reach than SV&F. However, comparative analysis of the two schemes reveals some inherent weaknesses in DSD, particularly with regard to targeting, timeliness, and lack of support for local seed systems. This study proposes that the key stakeholders in the implementation of the two schemes should work collaboratively with a view to incorporating the positive attributes of both for enhanced targeting, timeliness, and stability of local seed markets.

Activities for backstopping and institutionalization of small-seed enterprises in the production of standard or "emergency-grade seed" should be encouraged and supported. The government, through ALRMP, has shown its willingness to purchase and supply such seed (for example, the purchase of sorghum in Turkana). Stakeholders and other policymakers should exploit the precedent set by ALRMP and start lobbying for legalization of purchase and distribution of such seed by all relief organization during emergencies occasioned by droughts.

Acronyms

ADRA	Adventists Relief Agency
AMREF	African Medical Research Foundation
ALRMP	Arid Lands Resources Management Programme
ASAL	arid and semiarid land
CDTF	Community Development Trust Fund
CRS	Catholic Relief Services
DANIDA	Danish International Development Agency
DRP	drought recovery program
DSD	direct seed distribution
FAO	Food and Agriculture Organization of the United Nations
GAA	German Agro Action
GoK	Government of Kenya
GTZ	German Technical Cooperation
KARI	Kenya Agricultural Research Institute
KCB	Katumani Composite B
KEPHIS	Kenya Plant Health Inspectorate Services
KFFHC	Kenya Freedom from Hunger Council
LR	long rains
MAP	Makueni Agricultural Project
MoA&RD	Ministry of Agriculture and Rural Development
OPV	open-pollinated varieties
SIDA	Swedish International Development Agency
SR	short rains
SV& F	seed vouchers & fairs
WVK	World Vision Kenya

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The Use of Informal Seed Producer Groups for Diffusing Root-Rot Resistant Varieties during Periods of Acute Stress

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Abstract

This case focuses on key aspects of the spread of root-rot–resistant bean germplasm in western Kenya. It evaluates the provision of new varieties as an emergency response, as well as the varied seed channels used for reaching farmers in crisis. The case started from a premise that informal seed producer groups played an important role in moving new varieties. This could not be verified. Whether the groups produced seed or grain proved secondary to the observation that they moved only limited quantities of beans. The study developed a secondary focus on local market channels, as this conduit proved to be a nexus for moving larger quantities of the resistant varieties for food, seed, or both. Analyses of a broad range of local markets showed the resistant varieties to be available throughout the region, and in large quantities.

Quality of seed was also examined. If markets are used as a significant diffusion channel, what are the implications in terms of seed purity, germination, and health? Two separate collections and laboratory analyses showed that seed from local markets in western Kenya, including that routinely produced by farmers, is good in terms of purity, germination, and overall seed health.

Finally, the study shows that to move new varieties, seed production models need to be carefully evaluated. At least as important as quality is the socioeconomic organization of production: who produces, at what scale, for whom, and with what strategies for distributing or marketing. Seed production models have to be (a) sustainable and (b) affordable and (c) must have an explicit impact-oriented outreach focus.

Introduction

Background

Agriculture forms the core livelihood in western Kenya. Maize is the main staple food, with the predominant farming system being the maize-bean intercrop. Bananas, vegetables (both exotic and

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local), cassava, sweet potatoes, sorghum, and finger millet are also widely sown, and there are a few cash crops: tea, coffee, snap beans, and sugar cane.

Western Kenya produces 12% of the total bean production in Kenya, although cultivation is largely concentrated on small plots and among small-scale farmers. Crop production has been constrained by low soil fertility and a build-up of pests and diseases. This is mostly due to continuous cultivation, with very little use of fertilizer, soil amendments, or chemicals (for pest/disease control).

Starting around 1989, bean production (and particularly yields) started to drop dramatically in western Kenya. About 10% of farmers gave up bean production altogether in the more severely affected areas (Addend et al., 2004:10). One of the causes of the decline was soon identified as bean root-rot, a complex of fungal pathogens which often emerges in depleted, intensively used soils.

A great deal has been written about the response of research institutions and development collaborators alike to the "bean root-rot crisis." Among the more notable partnerships has been the collaboration of the Kenyan Agricultural Research Institute (KARI), The International Center for Tropical Agriculture (CIAT), and the Organic Matter Management Network (OMMN). Within a fairly short period, this group jointly diagnosed the root-rot problem and tested several options for pathogen control, both on-station and with farming communities. One of these options, the sowing of bean varieties resistant to root-rot, subsequently achieved widespread adoption. A formal survey in 2001 showed 35%–80% of farmers using the resistant bush-bean germplasm in the two districts in question, Kakamega and Vihiga (figure 1) (Addend et al., 2004).

This case study focuses on key aspects of the spread of the root-rot resistant bean germplasm in the context of the overall OFDA-funded project. More generically, it examines the provision of new varieties as an emergency response and analyzes the varied seed channels for reaching farmers affected by stress. In particular, this case study was spurred by the observation that informal seed groups in areas in western Kenya Kakamega and Vihiga Districts) that had been devastated by root-rot seemed to be diffusing the resistant varieties widely and quickly. The starting point of analysis was to understand how these informal seed groups functioned and how effective they were in a stress period such as the Kenyan one, where there was severe pathogen infection. The investigations were subsequently expanded to look at the role of local markets as well as the formal seed supply, asking how well each channel was reaching affected farmers and assessing the quality of the product on offer.

Diagnosis of the stress and initial responses

The stress

While the build-up of root-rot is a gradual problem, its manifestations on-farm were perceived by farmers as rather abrupt. This may be because a certain pathogen threshold has to be reached before there is a marked drop in production. Starting about 1989–1990, farmers and extensionists alike started to perceive this drop as dramatic. In participatory rural appraisal exercises (KARI, 1997), farmers vividly described the yellowing (and then death) of plants just weeks after first emergence. Declining soil fertility, which aggravates the severity and enhances the manifestation of bean root-rot, was also increasingly evident at this time: subsidies of fertilizers for maize had just been withdrawn and many farmers who had regularly used fertilizer with maize (in a routine maize/bean intercrop) had to do without. A survey carried out in 2001 reported that bean root-rot did reach calamitous proportions in the 1990s, with 76% and 80% of the farmers in Kakamega and Vihiga, respectively, reporting clear experience with and destruction of the bean crop due to bean root-rot (Addend et al., 2004). Note that

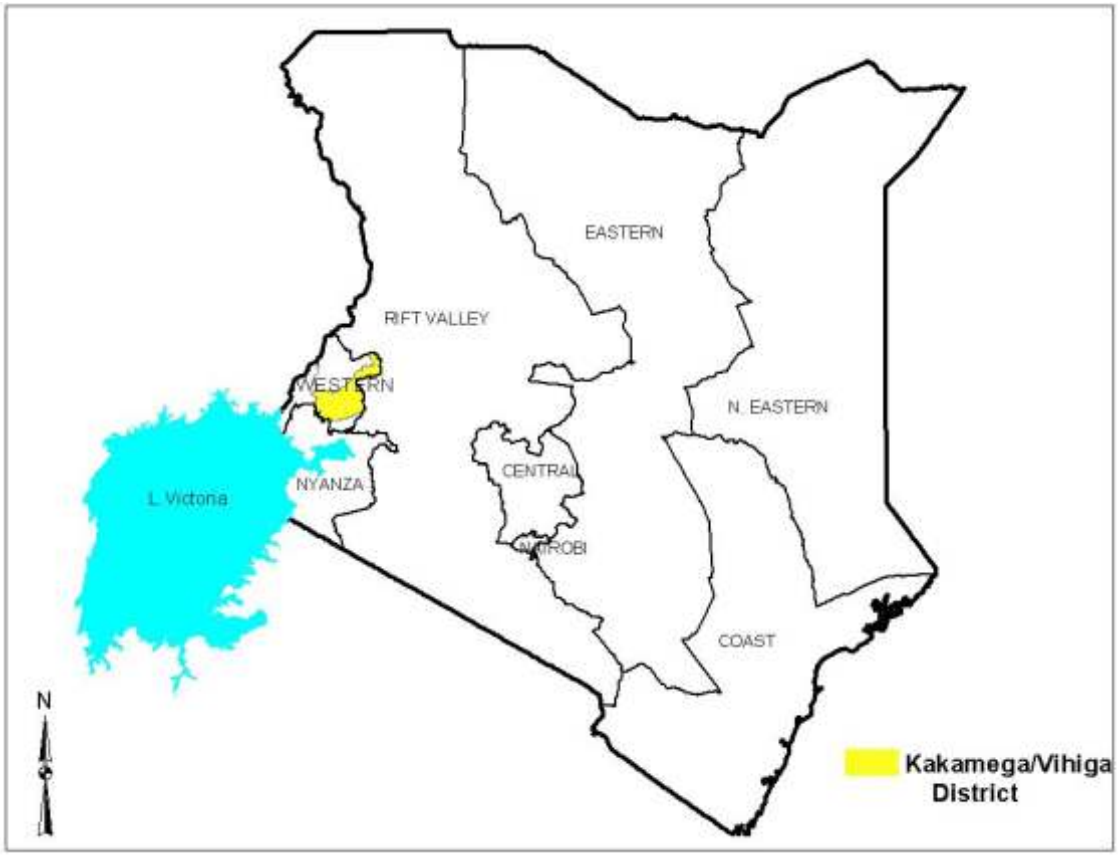

Figure 1. Location of study areas in Kenya

farmers did not necessarily understand the specific causes (e.g., witchcraft was sometimes postulated as the agent), but they had learned to recognize the symptoms of root-rot.

Diagnostic surveys followed—formal and informal (KARI, 1999; Nderitu et al., 1997; Nekesa et al., 1998)—along with an array of on-station trials and laboratory tests (Otysula et al., 1998). The complex of fungal pathogens causing the root-rot was eventually isolated into its varied forms: *Fusarium solani* fsp *phaseoli, Rhizoctonia solani, Scelerotium rolfsii,* and *Pythium* spp *(*Buruchara et al., 2001). These diagnoses were made by varied actors, using both qualitative and quantitative methods, and moving in time toward greater scientific rigor.

It is not easy to characterize this type of stress within the larger set of emergency scenarios. The root-rot epidemic probably straddles the acute/chronic stress divide. The build-up of soil pathogens and subsequent rot, while technically a gradual process, manifested itself on-farm and, as perceived by the farmer, as a dramatic, acute decline in production. Many varieties in use at the time, including the most popular, GLP2, simply no longer produced yields. However, the causes of the rot and decline in yields have been shown to be firmly systemic. Poverty, leading to no use of inputs or land rotation, meant that farmers had chronic production problems, which could be lessened by variety/seed inputs that, alone, could not solve the problem.

This case also straddles diagnostic categories in terms of a seed-security analysis, which theoretically distinguishes between seed-related problems of availability, access, and quality (Remington et al.,

2002). The complete dropping of bean cultivation by some farmers suggests the degree to which seed simply was not available locally (that is, nothing was available that would grow). Some farmers did buy a local variety from northern Tanzania (around Lake Victoria), *ipunda*, from the market. This variety had some root-rot tolerance, so a limited amount of seed was accessible—if farmers had the funds. The fact that this bean did subsequently produce indicates that the issue of varietal quality could be solved, by some. However, since many local farmers dropped beans altogether, rather than sowing the Tanzanian option, the problem (lack of availability? access? quality?) is not clear-cut.

In sum, this case study contains elements of acute and chronic stress, in which all constraints of a seed security framework might be brought forward as concerns: problems with availability, access, and aspects of seed, such as varietal quality.

Mitigating options

The districts of Kakamega and Vihiga are typical of regions affected by root-rot: farm sizes are small, (2.6 ha in Kakamega and 2.0 ha in Vihiga), population densities high (404 persons/km^2 in Kakamega and 938 in Vihiga [GOK data reported in Addend et al., 2004]), and crop rotation is virtually nil. Farmers generally plant beans in both of the two seasons: March to July (the long rains) and August to November (short rains). Beans are their main source of protein.

When it was recognized that there was a problem, researchers and development personnel mobilized relatively quickly (in research terms) to identify options for helping farmers control and mitigate the root-rot stress. From 1990 to 1995, experiments were undertaken on three basic thrusts. The first concentrated on improving soil fertility (to counteract soil pathogens and enhance plant tolerance). Experiments were conducted with green manures, mulching, inorganic fertilizer, and ridging. All proved somewhat effective. The second thrust focused on enhancing existing seed, either coating the seed itself (employing local varieties) or using certified seed of already released materials. Neither of these had marked results. The third thrust, the promotion of varieties resistant to root-rot has been the most effective and most widely adopted.

Kenyan researchers screened hundreds of bean lines locally and found no resistance (Otsyula et al., 1998). However, they had an advantage in that as promising varieties had already been identified through regional breeding programs and in the pathology nurseries of neighboring countries where root-rot pressure had come earlier and with great severity. From among these varieties (originating from the Great Lakes region), researchers and farmers selected several promising lines, among them KK8, KK15, and KK22 (*KK* standing for KARI Kakamega). These eventually emerged as both resistant to the root-rot and acceptable to users in the western Kenyan region. They differ in seed color, maturity, and yield potential (see annex 1), but all have been widely adopted, largely due to a single factor: their resistance to the root-rot stress.

Focus of this case study

This case study seeks to understand the opportunities and constraints of using varied diffusion channels to spread new varieties. The study started with a focus on one particular conduit, the informal (farmer) seed producer groups, as these were among the least understood of the diffusion channels in the region of interest and because initial observations suggested some potential impact. Seed production among small farmers in East and Central Africa, in general, is becoming a popular implementation option (especially during post-disaster recovery periods), so it bears closer scrutiny.

Practically, the study seeks to gain insight into how these KK varieties actually spread. As of mid-2004, they still have not been formally released. This means that, in theory, these varieties cannot be increased or sold by government agents or in certified seed stores (commonly know as *stockists* in Kenya). Certified bean seed has never been in strong demand in such formal channels because farmers find the cost high and feel they can control the seed quality sufficiently themselves. (Certified bean seed contributes about 1% of the total bean crop sown in Kenya.) However, farmers usually need an initial infusion of genetic materials to spur the broader diffusion process. In this case, without formal release, a first infusion was not available.

Case-study methods

Fieldwork for this study was primarily carried out in the districts of Kakamega and Vihiga in western Kenya. Select market surveys were also carried out in these districts, as well as in Mumias-Butere.

Four basic methods were used for gaining insight into the general agricultural context and conducting specific seed system analyses.

Literature review

Documents, mostly in refereed journals and gray literature (annual and progress report publications), were reviewed to give a background of 10-year trends. The themes pursued included (a) agriculture in the western Kenya region in general, (b) research and experimentation results in on-station and on-farm trials, (c) diagnostics on farming systems (including participatory rural appraisals (PRAs), and (d) adoption surveys of bean varieties in relation to root-rot.

Interviews

Interviews were carried out among different types of seed suppliers and seed clients. These included *groups of seed producers* trained by KARI or OMMN (N=6), as well as *individual seed producers* (N=20), some of whom stated that they had received outside training. Those buying seed from these seed producers, *seed buyers* (N=30) were followed up in the chain. A third major group, those in the more *formal sector*, were also interviewed (N=8) to record their views on types of seed and seed sources. This formal-sector group included extension personnel, private seed company managers, and representatives from farmer cooperatives. All interviews used semi-structured questionnaires and elicited qualitative and quantitative insights.

Market surveys

Surveys were carried out in eight regional markets in the six-week period prior to sowing time (from the end of January to mid-March). All bean sellers (N=202) were visited and their products inventoried, with 30% (N=61) directly interviewed. The purpose was to understand the profiles and sources of seed being sold and differences in beans for sowing versus eating. Market analysis also aimed to assess the overall availability of the resistant KARI varieties in public fora.

Seed quality analysis

Finally, formal analyses for seed quality were carried out in two separate research laboratories to compare standards among varietal materials (KK8, KK15, and KK22) and among seed from a variety of sources (seed produced by trained farmers versus untrained farmers versus KARI seed versus seed procured on the open market). Samples were tested for purity, germination, and seed health, including

both seed-borne pathogens (relating to disease, per se) and saprophytes (relating largely to infection introduced in post-harvest handling, which subsequently affects rates of germination). Annex 2 describes in some detail the laboratory analyses carried out at KARI /Kakamega (Kenya) and CIAT/Kawanda (Uganda).

Research strategy

In brief, the overall aim of the research strategy was to trace the main channels by which new varieties (and seed) might be accessed (markets, individual seed producers, groups of seed producers, etc.) and to compare and contrast their effectiveness along varied criteria. Seed quality is one of these criteria. It was added because quality is often perceived as an obstacle to allowing development or emergency aid groups to use more local channels.

Survey findings

Market analysis

The market analysis gives an overview of the extent of diffusion of the root- rot–resistant KARI varieties. It bears emphasizing again that these varieties have yet to be formally released and, in theory, are not available from any of the formal channels with which research might normally interact (i.e., government stockists, extension agents, or private seed companies). The KARI station itself has produced limited quantities of these materials for the public, between about 100kg and 300kg per season, since 1995 and at least through 2003 (KARI-Kakamega, Seed Unit, communication).

The eight markets surveyed represent an area of about 90 kilometers (55 miles) in radius. Each was visited for a single day, chosen because it was the principal selling day for that particular market—but with no other bias. As stated in the methods section, for all those selling beans, the products on sale were inventoried.

Table 1 shows that across these markets, 43% to 77% of all bean sellers had some of the resistant KARI varieties on sale. In six of the markets, all three varieties were found, and in the other two, KK15 and KK22 were available.

The findings are unexpected; in such a short period (1998–2003), an impressive network of market sellers has been moving improved varieties, resistant to root-rot. Market analysis was also done on the full range of beans on offer among a subset of sellers (N=61) chosen randomly from the whole group. Within this subset, inventories were made of all the bean baskets on display, separating beans according to whether they were (a) research generated (improved) or “local” and (b) root-rot tolerant or not. It is important to note that some “local” varieties (non-research generated) do show some tolerance to root-rot (see annex 1).

Table 1. Market Surveys, Western Kenya Region: Focus on KARI-Generated Root-Rot– Resistant Beans, January–March 2003

Market	Date of survey	Total bean sellers	# Sellers with RR resistant varieties	% Sellers with RR Resistant varieties	Varieties at Market	# Sellers interviewed
Kakamega	25/1/03	51	38	74.5	KK8, 15, 22	6
Mudete	30/1/03	8	5	62.5	KK8, 15, 22	8
Luanda	30/1/03	40	20	50	KK15, 22	8
Serem	8/2/03	23	11	43.5	KK8, 15, 22	8
Mbale	7/2/03	13	10	76.9	KK8, 15, 22	7
Lubao	20/2/03	24	16	66.7	KK8, 15, 22	8
Shinyalu	22/2/03	14	9	64.3	KK8, 15, 22	8
Butere	17/3/03	29	15	51.7	KK15, 22	8
Total		**202**	**124**	**61.4**		**61**

Table 2 shows the profile of beans for this market subset (with proportions expressed in terms of "baskets," rather than volume or weight). During this sowing period, January to March, relatively equal sets of beans that were root-rot tolerant and those that were not were on offer. As traders explained, "There are beans for food and beans for seed—and customers know the difference—and they need both."

Table 2. Full Set of Beans on Offer among 61 Sellers in Eight Markets, Western Kenya, 2003

Category of beans	% of baskets on display (N=211)
Improved, root-rot tolerant	33
Improved, not root-rot tolerant	26
Local, root-rot tolerant	13
Local, not root-rot tolerant	26

Interviews with individual sellers indicated the degree to which varieties resistant to root-rot are particularly valued for sowing. Their preference was also reflected in the price analysis, with resistant material sometimes fetching up to 20% to 35% more than the nonresistant material at peak planting time. Traders were quick to remark, however, that some of the local varieties are still considered among the tastiest and that post-sowing, the prices of root-rot materials tend to drop quickly. In several markets, sellers commented that KK15, though black and traditionally not preferred, remains a highly demanded item as it appears to be early maturing and fast cooking, and homemakers can easily remove the black coat for food preparation.

Where did the market sellers obtain their stocks?. Interviews with traders and sellers showed that the sources were varied and, most of all, dispersed. No single source provided all the varieties on sale; rather, they were sourced from farmers in the countryside, middlemen, and even other market sellers. No market seller specifically mentioned specialized groups of seed producers as a source.

Seed-producer groups

Rural groups of seed producers were originally postulated to be an important means of diffusing these new varieties in the countryside. Five such groups were identified, all having been facilitated by some outside agency and having received some training related to seed production techniques. Table 3 summarizes the size and composition of the groups, when they started, and the breadth of activities in which they were engaged. It is important to note that these groups might be considered to be "informal" seed producers: seed was just one of several enterprises they pursued, and they had received seed production training only once.

Table 3. Informal Farmer Groups Involved in Seed Production: Selected Sample from Western Kenya, 2003

Group	Affiliated with	Starting date	Starting members	Current members	Activities
Ebusoli	AHI	1999	25	46 (36 women, 10 men)	Horticulture
Shihingo	FARMESA/FAO	1998	40	18 (8 women, 10 men)	Maize vegetables, chickens
Chavakali	RPK	2000	25 (including men)	18 (all women)	Soil conservation, poultry, vegetable production
Lunyu	FARMESA/FAO	1998	—	44 (36 women, 8 men)	Composting vegetable farming
Esiekuti	OMNN	1995	21	17 (9 women, 8 men)	Bee-keeping

Note: AHI = African Highland Initiative; FFS = Farmer Field School: FAO-supported Project; FARMESA = Farmer Research Management in East and Southern Africa; OMMN = Organic Matter Management Network; RPK = Resource Projects Kenya.

As Table 3 shows, all groups started between 1995 and 2000, with between 25 and 50 members, and all but one seem to be in membership decline. All are also engaged in multiple activities in addition to seed production to give them income and greater sustainability.

Interestingly, all groups clearly stated that they embarked on bean seed production because the new varieties became available and because, due to the big disease problem, there was a strong demand for them. So, they started producing seed because of a varietal opportunity, not because there was a demand for clean seed or because seed quantities overall were low.

In terms of organization for seed production, the actual joint (or group) activities seem few. Most of the production is still done on an individual basis on farmers' home plots, although one group experimented with renting land together and, at the time of research, were waiting to see harvest results. In terms of seed, group activities seem limited to pooling for purposes of sale. In general, however, members each seem to decide their price alone and dispose of the beans (seed or food) as they wish.

In group interviews, farmers described in detail how the resistant beans were being produced. All groups had received some seed-related training (two of them having been instructed by KARI scientists), yet, across the five sites, farmers described no special treatment between grain and seed in the field. As several of the groups had also been instructed in "better agricultural practices," they were starting to add manure and to plant beans in rows. After harvest, some used ashes or actellic to coat the beans. When sorting for their own use, farmers picked out the healthier beans at sowing time; such sorting was also sometimes done with beans destined for sale.

Their recounting of distribution specifics gave further insight into how these groups function. All stated that at the beginning, the new beans they sold brought higher prices than those available locally, but no longer ("at the beginning, 100 Kenyan shillings (Kshs) per kilo; now, maybe 30 Kshs/kg"). Among their constant buyers have been the schools, who use this "seed" as food for their pupils, and hotels, who serve bean meals on a continual basis.

None of the groups has done any financial analysis of their operations, although most of the farmers sense they are making money individually. Farmers variously described how bean production helped them to pay school fees (about 2000 Kshs/year) and buy school uniforms, fertilizer, chickens, a bull, health care, and other necessities. The issue of scale of sales is pursued below, under "individual seed producers," because it was easier to get quantitative data on bean distribution when farmers were interviewed one by one. In short, supply was neither sustained, nor very large: those who sold the largest quantities moved beans destined for consumption—and sold to schools and hotels. Some also sold the beans they did not immediately need for their own use.

The conclusions to be drawn from speaking with the seed-producer groups are the following: they function little in terms of direct collaboration, the beans they produce can be considered equally as grain or seed, and the amounts delivered tend to be modest. Financially, it seems clear that the groups themselves perceive that bean production (whether for seed or food) results in profits, but alone, such production cannot give them a stable income—a variety of additional income-generating activities is required.

Individual seed producers

The case study identified individual seed producers through local word of mouth. All 20 individual seed producers interviewed were local farmers, integrated within the rural countryside. All had also devoted themselves to "special bean production" when the new KK varieties arrived on the scene. Like the seed producers associated with groups, these individuals saw a niche or a new demand because of the build-up of bean disease. About 40% of the individuals had further been involved in the production of seed for other crops, including maize, local beans, cowpeas, and local vegetables. When asked if any special qualities made them seed producers, 75% said no, but the other 25% indicated two strengths: their other seed experience and, especially, the fact that they had larger plots and, in a few cases, more fertile land.

The analysis of the individual seed producers' profiles adds insight to the information on those who are associated with groups (who also seem to work primarily as individuals). Individual producers saw the demand for a new variety, not for seed, per se. Sixty per cent indicated that their production methods in the field were exactly the same for bean seed and food. The other 40% indicated that they did separate varieties when planting for seed, and 5% used fertilizer and planted in rows. The main treatment specifically for seed was applied post-harvest, when farmers sorted out the inert material along with the physically damaged and immature beans, and when they dusted the beans with ash or actellic.

The individual producers indicated that, at the beginning, the price for the new beans was higher than that of local varieties, but this was no longer true (five to six years later) as the new varieties had become more common. They were also not always clear whether their buyers were acquiring beans for seed or for food (and the use did not seem to make any difference to them because they did not demand a price differential). In terms of the quantities distributed, the figures were highly variable. Taking the long rains of 2002 as an example, 20% did not distribute at all, and the four farmers (again 20%) who distributed most—an impressive 195kg, on average—sold the beans entirely for food to schools and hotels. On average, those who distributed or sold beans that were "possibly used for seed" sold about 20kg per season either to other farmers or middlemen. Assuming optimistically that half of this is planted, each seed producer provided 10 kg of KK materials per season.

Ninety percent of the individual producers perceived this production to be profitable, again using milestones of purchase (e.g., paying school fees or purchasing livestock). They also indicated that the demand for beans is always there: "Even when the new varieties are known, there is the demand for food." In terms of seed, per se, several of the producers anticipated an ongoing set of customers: "When a farmer buys from another farmer, s/he knows what is being received—and can count on that quality. Also they may have seen it in the field." Some further observed that traders mix GLP585 and KK22 (both small red-seeded types), whereas farmer producers don't.

In sum, it is not clear that the individual seed producers were specifically producing seed, or whether they even considered their goal as selling seed, rather than food. It appears that only limited quantities of beans are moved as seed, per se. Having said this, the individual producers, like those associated with groups, saw their bean transactions as profitable and aimed to continue producing and selling.

Seed-buyer analysis

The research agenda subsequently followed the chain to those who actually bought seed from the well-identified seed producers. Thirty farmers, all of whom were traced through specific producer links, were interviewed on-farm to assess the importance of the root-rot–resistant varieties in terms of their total bean sown, and to assess their satisfaction with the purchased seed product.

Varieties

In some respects, the seed buyers interviewed (N=30), seemed to have made radical changes in their bean production over the previous five years. Ninety-three present (28 out of 30) were sowing *only* the resistant KK varieties, having completely dropped local types because of their poor performance. This step could be quite risky for such farmers, putting all their beans in one basket, so to speak.

Seed sourcing

In other ways, however, these farmers seemed typical of small-scale holders. Their modest holdings meant that they sowed, on average, limited amounts of seed: 7.25kg during the short rains of 2003, with a range of 0–22kg). Further, as table 4 shows, they tended to source their seed (nearly completely) from their own home-saved stocks: 88% of the quantity sown came from home stocks, with five farmers using solely home stocks. The farmers all commented that although they had at one time purchased the seed of the new variety from the seed producer (buying small initial quantities of 0.05kg to 1kg), they had not purchased it again (and had no intention of doing so). These farmers simply re-sowed what they themselves harvested, again and again.

Table 4. Sources of Seed Planted in the Short Rains, 2003, by Those Who Had Bought New Varieties Resistant to Root-Rot from Specialist Producers (N=30)

Source	Amount in kilograms	Percentage
Home saved	191.5	88.0
Local market	4.0	1.8
Stockist	0.0	0
Relatives/neighbors	22.0	10.1
Others	0.0	0

Seed quality

Most buyers assessed the quality of seed received from seed producers as "good" (better than average). However, most also felt that it was not particularly different from the seed they themselves routinely produced (table 5).

Table 5. Buyers' Assessments of Quality of Seed Received from Specialist Producers, Compared to Seed They Routinely Produced Themselves (N=30)

How would you assess the quality of seed obtained from the specialist producer, overall?	*% of responses*
Good	86.6
Average	13.4
Poor	0
How would you compare the quality of the seed purchased in relation to that you usually produce?	
Same	56.6
Better	40.0
Worse	3.4

Finally, each of the one-time buyers was able to list several sources where she could obtain these resistant varieties again, if needed. Getting a future supply simply was not perceived as a problem.

Formal-sector analysis

Diverse representatives from the formal sector were also interviewed, for two major reasons: the resistant varieties were not released and, hence, this sector was not officially responding to the stress. Second, varieties were being moved through uncertified channels and uncertified seed has a varied reputation within formal-sector circles. The formal seed sector (and formal research sector, in general) is often contrasted to farming communities in terms of types knowledge—and viewpoints—on offer. Formal-sector personnel (seed and otherwise) are in charge of giving expert advice and steering communities to options. It is of interest to examine how formal-sector personnel perceive the rot

problem, the varieties on offer, and the seed channels though which the varieties could presently be accessed.

Eight professionals from different formal-sector institutions and levels were interviewed: Four worked directly with certified seed: representatives from the Kenya Seed Company, the National Cereal Board, L'Agrotech (a private company), and the Kenya Farmers' Association (KFA). The other four give advice to farmers on a regular basis: district extension officers (DEOs) or the district agricultural and livestock extension officer (DALEO).

There were some commonalities in the eight sets of responses: all knew of the root-rot problems in their zones of action. All but one also knew about the root-rot–resistant varieties being tested by KARI and also that they had not been released (the exception was the Cereal Board representative who dealt only in maize).

The differences emerged when discussing whether farmers themselves produce seed of resistant varieties for sale, and when evaluating its quality.

As table 6 shows, two specialists from the formal sector (seed-production company representatives) felt that farmers should not be producing seed for sale, and that what they were producing was not of good quality: "It is grain." "Seed production practices are not followed: there is no isolation and no separating of off-types." The representative from the KFA, which also sells inputs to farmers, felt otherwise, and asserted that he himself, on his own plot, sowed bean seed from the market.

Table 6. Formal-Sector Views on Farmer Production of Resistant Seed

Representatives from	Should farmers produce seed for sale?	What is the quality of farmer seed?
Kenya Seed Company	No	Quality not good
National Cereal Board	N/A	N/A
L'Agrotech (private company)	No. It is grain, not seed	Not good
Kenya Farmers' Association	Yes (but there is no demand)	Good
DEO	Yes	Good
DALEO	Yes	Good seed: the problem is that varieties are sometimes mixed
DALEO	Yes, as a stopgap	High, when some supervision
DEO	Yes	Good, but should be monitored

In contrast, all four extension agents expressed the need for farmers in the region to have the resistant varieties quickly. They knew the varieties were not released but stressed that this was a bureaucratic issue and that they needed to focus on raising productivity—and quickly. All agents supported farmer production, either as a continual process or a stopgap measure (to be bolstered by outside monitoring).

The extension agents further gave insights into the positive and negative attributes of formal versus farmer channels—and how farmers in their zones perceived both. Agents emphasized that formal channels may also not be within geographic reach of farmers. Such channels supply a few varieties

(GLP2, GLP24, GLP585, GLP1004, GLPX92) but farmers like many others in addition to these. Most fundamentally, the agents reported that farmers perceived the seed from the formal sector as not germinating well (it is not handled well post-harvest).

As assets of farmer-produced seed, the extension agents offered the following insights: farmers in the countryside can provide good channels of distribution because seed can be given as a gift to friends and relatives, exchange is possible (seed for grain), and the channel is physically nearer to farmers.

In terms of quality, all considered farmer seed as viable. However, they stressed that some farmers are known for producing better seed than others. The only real caution for the resistant varieties was that farmers might mix resistant and susceptible varieties (KK22 and GLP585). It is interesting to note that this is the same complaint farmer seed producers made against traders.

So, in general, the seed-sector companies did not value farmer seed, except for the representative from the Kenya Farmers' Association (a nationwide body) who said he sows it himself. The extension agents generally felt it was "okay" in terms of health, but warned about mixing. However, they also saw great advantages of using local channels in terms of distributing a range of varieties, making seed available financially, and easing the logistics of distribution.

Seed quality analysis

As "quality of seed" seems to be a pivotal point for implementers deciding what kinds of production and diffusion channels to support, in the final step, laboratory analyses were carried out to assess key aspects of the quality (purity, germination rate, and seed health) of seed procured from a variety of sources. Seed from four sources was compared and contrasted: seed produced for KARI (the formal sector), purchased from the market (local traders), produced by farmers trained in seed production, and produced by untrained farmers. Two separate batches of seed were collected and analyzed at two different laboratories, one in Kenya (KARI-Kakamega) and one in Uganda (CIAT/Kawanda). See annex II for more methodological detail.

Laboratory analysis, KARI-Kakamega

The tests carried out at KARI-Kakamega were conducted on 36 samples of beans (encompassing the three KK varieties from four sources). Key results appear below (see annex II for detailed methodology).

Purity

The mean purity percentage of seeds tested was 97.5%. There was no significant difference ($p > .05$) in bean purity between the three varieties (KK8, 15, and 22), but there was a significant difference ($p \leq .05$) between local market samples and KARI samples (figure 2). Having said this, all groups produced seed with purity above 95%—quite acceptable levels, even for commercial producers.

Germination

The mean percentage germination of seeds tested was 71.6%, with a maximum germination of 98% from KK15 and a minimum of 34% for the same variety. Figure 3 shows the seed germination percentage from seed samples collected from the four groups. There was no significant difference in germination in bean samples among the four groups (nor, in another analysis, between the three varieties).

As the recommended minimum limit of germination is 70% (Aggrawal, 1994), on average, the germination rate of the seeds was good, both for seed produced formally and otherwise. In this analysis from KARI-Kakamega, the higher mean germination of seeds from the local market can be attributed to the long exposures in the sun during selling. When selling beans, sellers put them on traditional trays or

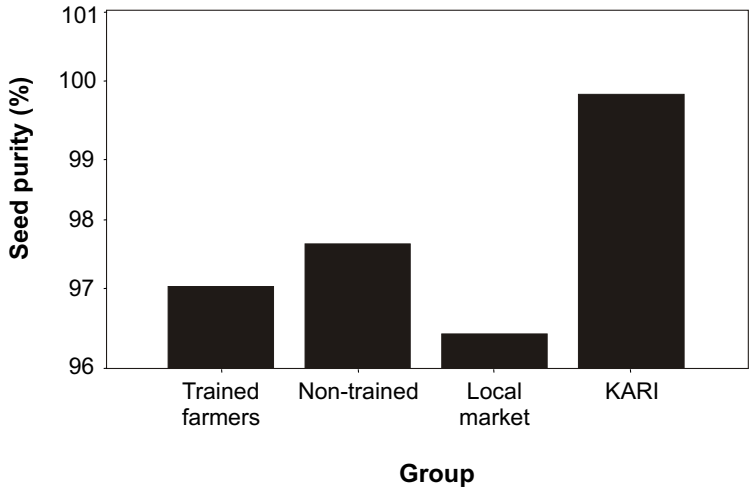

Figure 2. Purity (%) in samples of bean seed from different groups

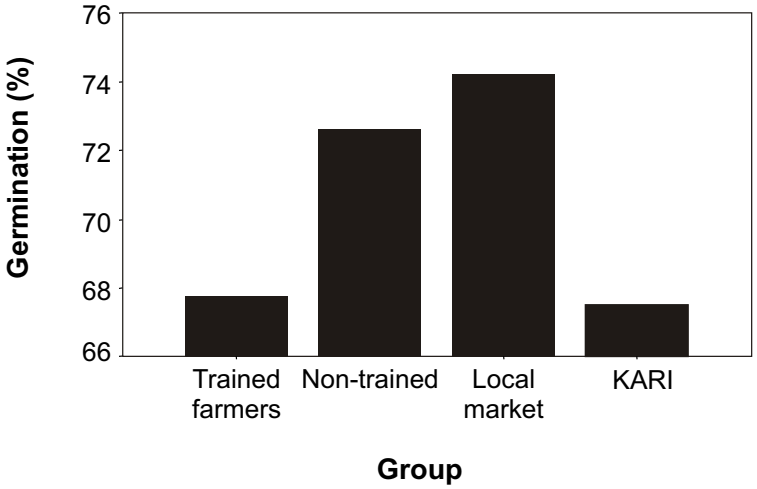

Figure 3. Percent germination in bean seed samples from different groups

sacks in the open. Such sun-dried seed is less prone to infection by storage pathogens, which attack seeds stored under high moisture levels, that reduce viability and ability to germinate.

The relatively low germination rates of the KARI-produced seed are noteworthy.

Seed health

Seed health in the KARI analyses gave the most unexpected results, with infection rates running from 0 (from a KK8 and KK22 sample) to 24.0% (from a KK8 seed sample sourced from KARI), with a mean seed infection of 9.24%. Figure 4 illustrates the proportion of infected seeds infection in the bean samples collected from the four groups in the study. (Note that in this first analysis, disease counts did not separate pathogens and saprophytes, *per se*.)

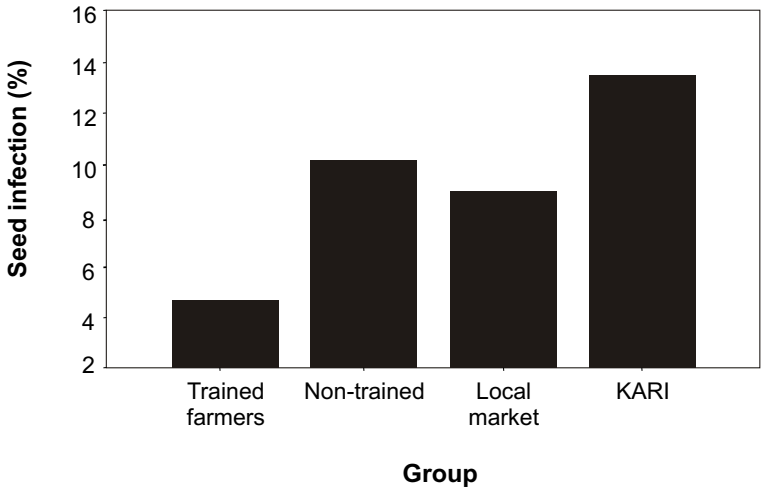

Figure 4. Percent saprophyte/pathogen infection in bean seed samples from different groups

There was a significant difference ($p \leq .05$) between the infection rate in KARI seed samples and those of the trained farmers, in particular, with the formal sector having higher rates of infection. (Another analysis showing no significant difference between the varieties themselves.) Seeds were especially affected by storage-related pathogens, such as *Penicillium* spp. The high mean rate seed infection in the KARI samples was thought to be the result of one set of seeds that had very poor germination and were also highly infected. This was attributed to inadequate drying, which encourages storage problems (and saprophytes). In addition to the large quantity of seed harvested by KARI, drying is difficult because it is usually done using sunlight only. The area has a great deal of rain, and therefore drying can only be done for a few hours.

Laboratory analysis, CIAT/NARO-Kawanda (Uganda)

The observed high rates of infection in the KARI bean samples spurred a re-collection of bean seed and re-analysis of germination qualities and seed health. This second analysis was done at the laboratory of CIAT/NARO (National Agricultural Research Organization) in Kawanda, Uganda. There, laboratory facilities allowed analysis to distinguish between seed-borne disease, per se (i.e., true pathogens), and infections caused primarily by post-harvest handling (manifest by saprophytes). Salient insights are abbreviated below. Again, refer to annex II for more detail.

Germination

The analysis showed that seed from the market had a lower germination rate than seed from other sources, but it was still within an acceptable mean of 73.3%. Farmers remarked that they can raise this level by sorting market seed (a procedure, which, unfortunately, the researchers failed to orchestrate prior to analysis). There was also wide variation in germination between different market samples and KK15: 17% to 84%. Overall, there was no significant difference in mean values between the other sources (figure 5).

Seed health

Pathogens: A wide range of pathogens associated with bean seed were identified in the more focused CIAT-Kawanda study: *Fusarium solani* (which causes root-rot), *Colletotrichum lindemuthianum* (anthracnose), *Phoma exigua* (ascochyta blight), and *Macrophomina phaseolina* (ashy stem blight).

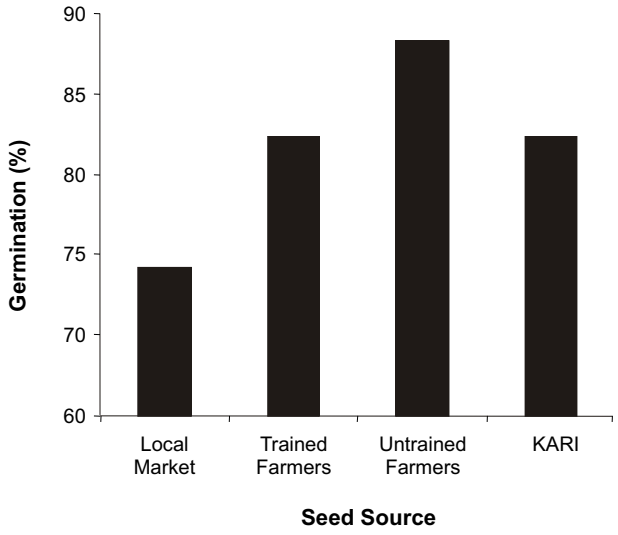

Figure 5. Percent germination of seed from different sources

Others identified included *Fusarium oxysporum* and *Rhizoctonia solani,* which are soil-borne pathogens. However, the mean level of seed infection for different pathogens from all sources was low. The highest mean value (5.2%) was observed with *Phoma exigua* on KK8 (table 7).

Table 7. Mean Percentage Infection by Major Seed-Borne Pathogens and Saprophytes of Different Varieties Collected from Different Sources

		% Seed infection, by seed-borne pathogen		% Seed infection, by seed-borne saprophyte			
Source*	Variety	*Fusarium solani*	*Phoma exigua*	*Aspergillus* spp	*Penicillium* spp	*Rhizopus* spp	*Cladosporium* spp
1	KK15	0.86	1.1	46.4	30.3	18	2.0
	KK8	1	1.4	11.5	13	0.7	7.8
	KK22	2	3.1	6.1	10.1	0	2.3
2	KK15	0.25	2.8	10.5	4.9	0	8.1
	KK8	0.8	3.2	6.6	3.8	6.7	13.4
	KK22	2.8	1.3	5.3	3.2	0	6.8
3	KK15	0.08	1.2	6.9	4.3	0.3	8.4
	KK8	1.2	0.5	4.2	13	2.5	12.9
	KK22	0.2	3.6	4.3	7.7	0.2	13.1
4	KK15	0.83	1	6	7.8	0	9.8
	KK8	0.1	5.2	10.5	8.4	8	12.8
	KK22	1	1.3	19.4	15.4	0	3.4

*1 = Market; 2 = untrained farmers; 3 trained farmers; 4 = KARI Kakamega Station.

Saprophytes: The major saprophytic fungi observed were *Aspergillus*, *Penicillium*, *Rhizopus,* and *Cladosporium* spp. Market seed fared less well than it did in the KARI-Kakamega analysis, but still showed generally low infection levels. The high level of saprophytic infection in certain samples from the market may have been due to poor post-harvest handling or storage. Poor storage conditions, seed not well dried, or attack by insects (mainly bruchids) may lead to high levels of secondary infection by saprophytes. Although saprophytes do not cause diseases on crops, they do lower germination rates (see figure 5).

Seed from trained farmers also fared less well in that there was no significant difference in infection rates between trained and untrained producers. Again, overall, the seed looked healthy.

Seed quality: Overall reflections

Both sets of analysis showed that all four sources delivered seed that can be considered "acceptable," not only by farmers' standards, but also by extensionist and even international standards (such as those of Quality Declared Seed of FAO).

None of the bean seed sampled reached the levels of certified seed for germination and health, not even that produced by KARI. However, farmers, extensionists, and most of the formal-sector representatives interviewed did not sense that certified seed was needed. Farmers can obtain very good-quality seed from local channels—at a fraction of the price of certified seed.

Summary and conclusions

The aim of the study was to examine channels for diffusing seed in a period of crisis. We started from a premise that informal groups of seed producers played an important role in moving new varieties. This could not be verified. Whether the groups produced seed or grain proved secondary to the observation that they moved only limited quantities of beans. This raises the issue of whether a focused group of small rural producers, with small landholdings, can be expected to produce the "excess" needed to move new varieties quickly in a crisis.

The study then developed a secondary focus on local market channels, as this conduit had proven to be a nexus for moving a larger quantity of the root-rot–resistant varieties for food, seed, or both. Traders' sources for obtaining local varieties were varied, including purchasing directly from farmers in the countryside and from other small traders, and even self-production.

Analysis of a broad range of local markets showed the resistant varieties to be on easy offer throughout the region, and in large quantity.

The quality of the seed then came to the forefront as a defining issue. If one is to use markets as a significant diffusion channel, what are the implications in terms of seed purity, germination, and health? Is the product on offer supporting livelihoods in crisis? Two separate collections and laboratory analyses gave firm results that the seed in local markets in western Kenya, including that which farmers routinely produce in the countryside, is good in terms of purity, germination, and overall seed health.

In terms of the wider issues, the study showed that an injection of new varieties can make a difference to the stability of the farming system. Farmers did shift the profile of varieties sown (many dropping local varieties altogether), and wide price differentials among bean types at sowing time provided strong evidence that farmers place a high value on varieties that will grow in the context of root-rot stress.

However, the study also suggests that one seed channel is not necessarily as effective as another for moving new varieties, although both may be locally based. Large numbers of farmers do not seem to have been reached through the intervention of training for seed producer groups. The evidence is also mixed on whether these groups produced higher quality seed than those who had not been trained.

The unexpected prevalence of the root-rot–resistant varieties in the local markets raises the question of building on channels farmers routinely use—in emergencies and otherwise (assuming these channels can function in stress periods). Traders, like farmers, recognized the value of the KK varieties relatively quickly and scooped them up from a wide array of farmer suppliers in the countryside. Suppliers were not initially concentrated, but the number grew through time. Normal farmers (at all levels—large, medium, and small), who had not been trained, seem to have supplied the core of the available seed. So building on local channels in a period of stress can pay off.

The work also shows that to move new varieties, seed production models need to be carefully evaluated beyond their technical dimensions (e.g., beyond the quality of seed). At least as important as quality is the socioeconomic organization of production: who produces, at what scale, for whom, and with what strategies for distributing or marketing the seed. Seed production models have to be built that are (a) sustainable, (b) affordable, and (c) which have an explicit impact-oriented outreach focus.

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Annex 1. Bean varieties generally found in western Kenya region

Variety	Improved/local	Reaction to bean root-rot	Characteristics
GLP 2 (Lipala) (Lwakhakha)	Improved (released)	Very susceptible	Commercially grown High yielding Large seeded, preferred by farmers Rosecoco type
GLP 585 Red haricot Wairimu	Improved \(released)	Susceptible	Commercially grown Small seeded Red haricot type (preferred) High yielding Indeterminate (grows over maize and farmers do not like this)
GLP 24	Improved (released)	Susceptible	Commercially grown Canadian Wonder type 1 High yielding
GLP X92	Improved (released)	Tolerant	Commercially grown Pinto type 3 High yielding Early maturing
Punda (Okwoto)	Local from Tanzania (around Lake Victoria	Tolerant	Grayish Small seeded (type 1) Late maturing
Alulu (Rosecoco)	Local	Susceptible	Moderate yields Preferred by farmers (taste)
Mugasa	Local (yellow type)	Susceptible	Yellow type Early maturing Small seeded (type 1)
Rosebella Shiyigwa	Local	Susceptible	Rosecoco type: black mosaic Large seed Medium maturity Preferred by farmers (taste)
Nylon	Local	Susceptible	Rosecoco-type Large seeded Medium maturity
KK 22	Improved	Resistant	Red haricot type Small seeded Late maturing High yielding (deliberately mixed sometimes with red haricot)
KK 15	Improved	Resistant	Black Large seeded Early maturing High yielding
KK8	Improved	Resistant	Medium seeded Rosecoco type High yielding Sometimes mixed with GLP 2 (accidental)

Annex 2. Analysis of bean seed quality

KARI/Kakamega analyses

At the KARI seed-quality laboratory in Kakamega, Kenya, parameters of purity (analytical and inert matter), germination rate, and general rates of pathogen infection (seed health) were examined. For the first set of laboratory analyses, 34 seed samples of bean varieties KK8 (10), KK15 (13), and KK22 (11) were obtained from individual seed producers, both trained and untrained, and six local markets in Vihiga, Kakamega, and Mumia Butere Districts (the six being serem, luanda, mbale, shinyalu, Kakamega municipal, and butere). The majority of the seed samples were from the harvest of the previous season (short rains 2002), while a few samples were from the long rains harvest. Laboratory analysis of the seed was done at KARI-Kakamega on blind samples (samples were submitted for analysis without identification).

Purity test

The purity test was to first determine the percentage composition by weight of the samples. The working samples were separated into three component parts: pure seed, inert matter, and other crop seeds, which included varieties of beans other than the one that was being tested. The percentage of each part was determined by weight. The second objective was to identify various species of seeds, including the species being tested and other seeds found in the samples, such as weeds and other crops.

Germination test

The objective of the germination test was to determine the maximum germination capacity of the seed samples. In this test, sand was used as the substrate. The working samples were made up of 100 seeds and divided into five replicates of 25 seeds each. The seed samples were kept at room temperature (20° to 25°C. The first count of germination for crotalaria was after seven days, and the second count was after 14 days. The germination test involved taking the percentage by number of hard seeds, non-germinated seeds, abnormal seeds, germinating capacity, and pure germination capacity, which is obtained through the calculation of (P * G/100), where P = purity and G = percent germination capacity (ISTA, 1999).

Seed health test

The seed health tests were done to determine the state of health of the seed samples. Instead of a full sample of 400 seeds, only 100 seeds were used to test seed health. This is because samples collected from farmers were relatively small and therefore would not be enough for the usual working sample of 400 seeds. The samples were divided into four replicates of 25 seeds each. Blotters, which were used as substrates, were soaked in water and placed on petri dishes. Seeds were not subjected to any pre-treatment; they were directly plated on blotters and then incubated in 12 hours ultra-violet light alternating with 12 hours of darkness for seven days. After seven days of incubation, the seeds were examined for the presence or symptoms of disease organisms. The incubated seeds were then examined thoroughly under a stereo-microscope for growth of different types of fungi and bacteria, but not all of the fungal and bacterial diseases were identified.

Data collected from purity, germination, and seed health tests were analyzed using ANOVA to determine any differences between the varieties. The means of the purity, germination and health results were also analyzed and compared with the standards for bean seed, as given by Kenya Plant Health Inspectorate Services (KEPHIS).

CIAT- Kawanda-Uganda analysis

Seed Source and collection

For the second set of analyses, 59 seed samples were collected, and farmers and bean-seed traders were interviewed. Only those whose seed samples were collected were interviewed. The minimum number of samples required for each variety in each group was five.

Collection sources

Local markets: Seed collectors went to local markets, identified the bean varieties, and then purchased them if the traders were willing to sell.

Trained farmers: Farmers who had been previously trained by KARI staff on bean-seed production were individually visited and asked if they had the required varieties and if they were willing to sell samples to the collectors. A few had all three; others had only one or two of the desired varieties in sufficient amounts.

Collection from untrained farmers: Farmers who had not been formally trained by KARI staff were also visited individually and asked for samples of the required bean varieties. The bean collectors found some individual farmers who had all three varieties, while others had one or two.

Collection from KARI-Kakamega: Collection was made from two seasons' planting of the bean variety KK8.

Germination test

The germination test was done using the roll paper-towel method on 200 seeds per sample. Ten days later, samples were evaluated for germination and were categorized as normal or abnormal seedlings, rotten, or fresh ungerminated seed.

Seed health test

Seed-borne infection was determined using the standard blotter method. Two hundred seeds per sample were incubated at 20°C for seven days in petri dishes containing moist filter papers. Seeds were then examined under a stereo-microscope for fungal growth, and identification was made on the basis of fungal characteristics.

The Case of Cassava Brown Streak Disease in Coastal Areas of Northern Mozambique

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Abstract

This study presents the case of a disease on a vegetatively propagated crop: cassava. During the 1990s, farmers in northern Mozambique became aware of problems with root rot on cassava, a disease later identified as *cassava brown streak disease* (CBSD). In the District of Memba in the Province of Nampula, where this study was undertaken, CBSD was disastrous for both the livelihoods and the seed security of the people depending on agriculture. The dominance of cassava in the production system made farming communities particularly vulnerable. In addition, genetic uniformity and reliance on varieties very susceptible to the disease made cassava production even more precarious. Farmers were unable to obtain either appropriate cassava planting material or sufficient amounts of seed for alternative crops, such as sorghum and maize. The onset of the crisis was slow, starting in the '90s and developing into an acute situation of food insecurity by the autumn of 2002, by which time the situation was considered critical and there seemed to be a need for external action.

Two separate operations were launched in November-December 2002: one by Save the Children USA (SC/USA) and one by the Provincial Government of Nampula (PDA). Both aimed at giving farmers alternative and tolerant varieties of cassava or alternative crops as a supplement to the cassava. SC/USA based their intervention on assessments of the impact of CBSD both on the cassava and on the livelihoods of the people, while the PDA assumed seed insecurity on the basis of livelihood measurements only. Both are working in collaboration with a wider national and regional scientific network aimed at solving the problem of CBSD in southern and eastern Africa.

The case shows how the formal scientific sector can be essential in the process of identifying resistant and tolerant planting material when coping with a disease in vegetatively propagated crops. As, at this point, only tolerant varieties have been identified, the case also indicates the importance of diffusing *knowledge* about the disease and effective cultural practices to ensure clean planting material—along with the new plants themselves.

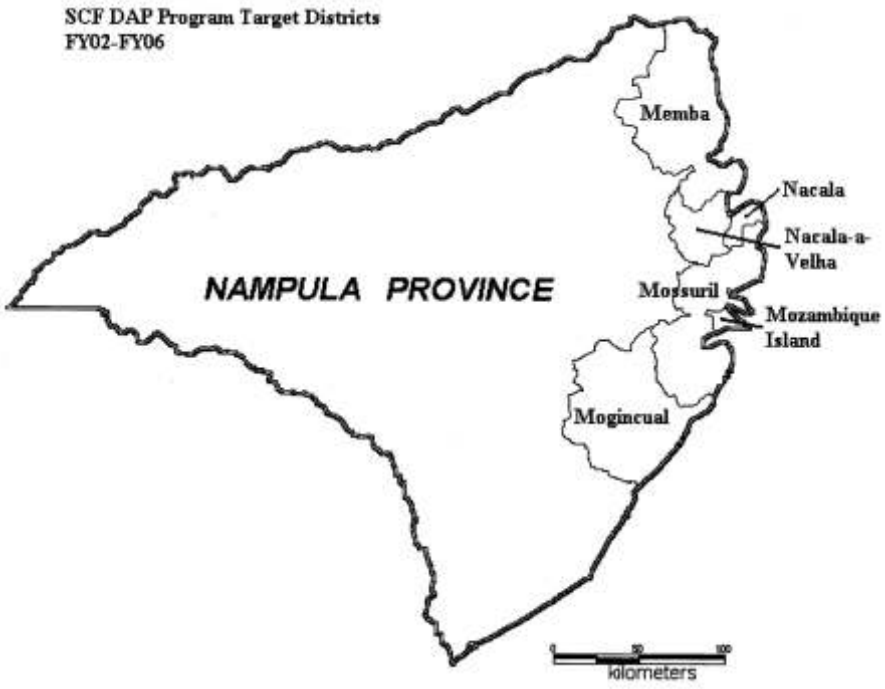
The government strategy of distributing cuttings on credit does not seem feasible because of the low quantity and (very likely) low quality of returned material. Supporting local seed systems to produce adequate cassava planting material (i.e., quantity and quality) might be a strategic focus for future institutional support.

Introduction

When disasters have affected farming areas, rehabilitation is commonly constrained by a lack of seeds. But aid agencies often fail to address seed issues appropriately in relief operations, which can slow down and complicate recovery. Many agencies clearly need education on how to analyze the problem of seeds

and how to contribute to restoration of seed supply systems. For that purpose, the review of cases is a necessary learning process. The case of a crisis caused by a virus disease in cassava, the most important subsistence crop in coastal areas of East Africa, represents one kind of disaster for which relevant authorities and aid agencies must be prepared.

This case study compares the relief and rehabilitation strategies of two different agencies—Save the Children USA (SC/USA) and the District Directorate of Agriculture (DDA) in the Memba District of northern Mozambique (figure 1)—in responding to an outbreak of *cassava brown streak disease* (CBSD) in cassava, the staple crop in the area.



Source: SC/USA Nampula.

Figure 1. Nampula Province, Mozambique, indicating the six districts where the SC/USA DAP2 program is run

The outbreak of CBSD in northern Mozambique started in the 1990s, affecting only a few cassava plants at first. But in a few years, rotted roots were observed over a wide area. The disease had been building up year by year until it finally devastated whole fields. Farmers lost both the food harvest and their reproductive materials. Since the disease occurred over a wide area, many affected farmers had nowhere to go for new planting materials: accessible cuttings were also likely to be infected.

Methodology

Fieldwork for this report included one visit immediately before planting time in December 2002, when the crisis was assessed. Various group interviews were conducted with farmers in Memba District and with representatives from the SC/USA and DDA. Another field visit in July 2003 allowed for study of the interventions and their impact.

In July 21–31, 2003, data were collected using semi-structured interviews with both farmers in the impacted area and representatives of SC/USA and different levels of the government. Various reports and documents of relevance to the operations were consulted. In addition to collecting information on the experiences of both the implementers and beneficiaries, the main goal of the fieldwork was to get information on the background, scale, and impact of the operations.

Information was also gathered in semi-structured interviews with individual farmers in communities that had received assistance from SC/USA, in communities that had received assistance from DDA, and in communities that had not received any seed assistance, although it was difficult to find communities that had not received any assistance at all. Interviews were carried out in one community (Chipene) where no distributions had taken place, but it appeared that this community was not affected by any production crisis in the year 2002 season. CBSD is not a problem in all of Memba; north of Mazua (see figure 2), the disease is not considered a problem. Communities in Memba that were visited and that are referred to in the text were Mekuta, Chopite, Chipene, Yamene, and Muipia (figure 2).

During interviews with individual farmers, other members of the family or neighbors often also participated. Thus, some of the interviews took the form of group interviews, which sometimes enriched the information but other times limited the value of the interview.

Guides were developed for interviews with the implementers (SC/USA and the government), but those interviews were generally carried out as informal conversations and discussions.

Limitations of the data

The difficulty finding communities that had not received assistance from any relief operations does not mean that such communities were nonexistent; the district is large, and we were only able to visit communities along the roads. The distribution of seeds and cassava sticks depended on road transport, so it might not have adequately reached the more remote areas—communities that may be the same ones we were unable to visit. Thus, our sample may not be representative of the overall impact of the disaster or the scale and impact of the relief operations.

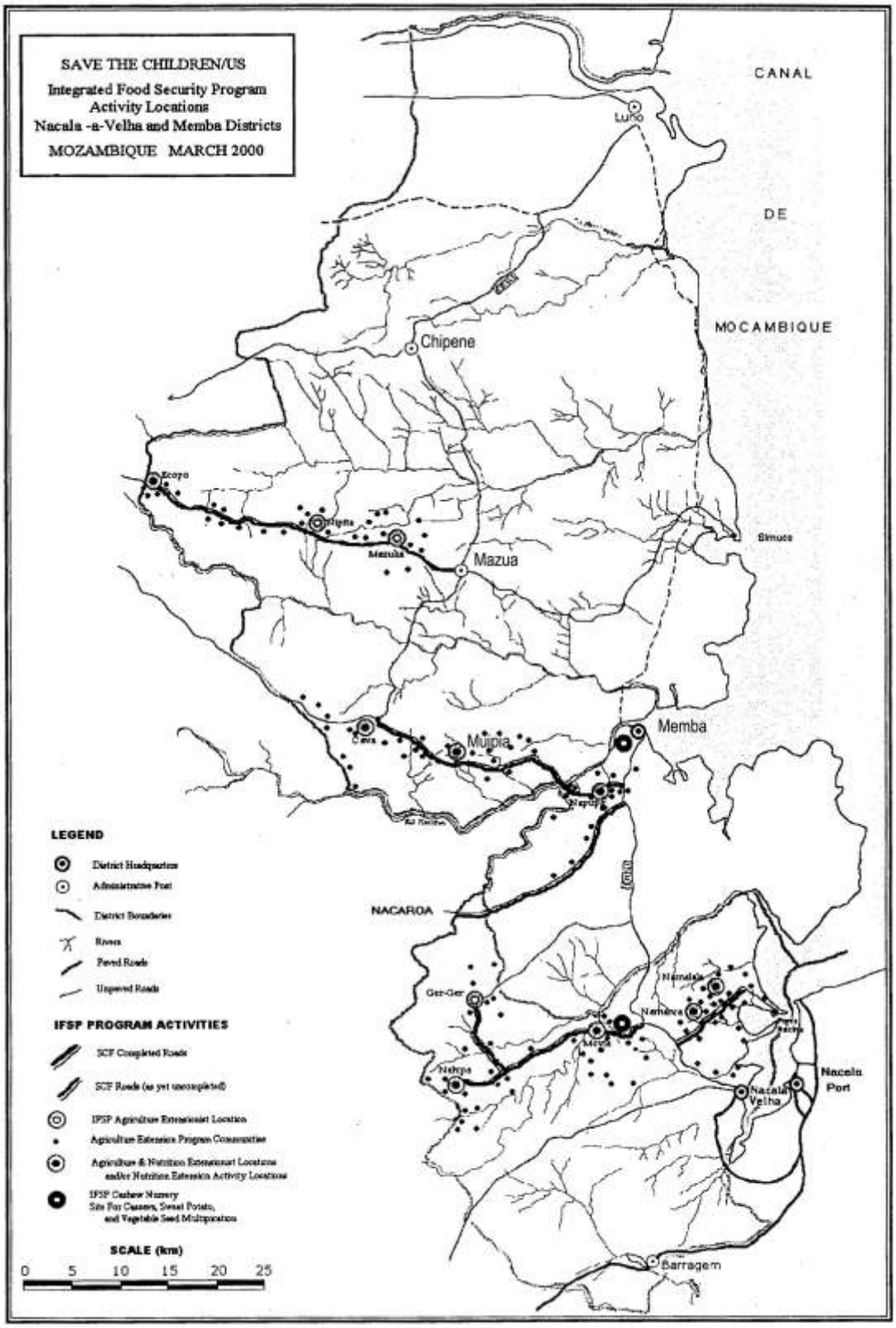
The context of the crisis

Farming system

Farmers in Memba practice bush fallow in various rotations but usually with fairly short fallow, commonly two years—a system that people said had not changed during their time. There is enough unoccupied bush land for farmers to take as much land as they can manage for cultivation, which is done by hoe only. They burn the bush during the dry season. Family members work together or separately, according to traditional gender roles.

The primary crop is cassava. In addition, the farmers grow maize, sorghum, and some pearl millet. Grain legumes are grown mostly in small amounts and include groundnuts, cowpeas, pigeon peas, beans, green grams, and bambara groundnuts (*Voandzeia subterranea*), of which, cowpeas are probably the most important. Mixed cropping is common with these crops. Other crops include sweet potatoes, bananas, and at a few places, rainfed lowland rice. A little cotton is also grown in the north of the district.

People do not invest money in production since it is primarily for subsistence. Sources of income are from the sale of surplus cassava, maize, groundnuts, and cashew nuts. However, the cashew trees are



Source: SC/USA Nampula.

Figure 2. Memba and Nacala-a-Velha Districts (fieldwork for this study took place near Chipene and Muipia to the west of the district capital of Memba)

poorly maintained and produce little. Those living near the sea also fish, and for them, fishing is the main source of money. There is no integration of crop and livestock production, and livestock seem to be quite insignificant in the farming and food system. Only a few farmers keep goats and poultry.

Food security

The people say that this system normally produces sufficient quantities of food for their subsistence needs. This was the case even during the exhaustive civil war from the late 1970s to the Rome Peace Accord in 1992: "During the war we were disturbed, but we had enough to eat." Unfavorable weather, such as droughts and cyclones, sometimes causes local problems, but when the cassava disease struck, the district experienced its first widespread hunger crisis.

The farming system has not experienced any major transition in recent history. There has been some turnover of varieties and introduction of new crops, but technology—cultivation by burning, the use of hoes and *pangas*, and no use of inputs—has not changed. In such subsistence economies, there is little surplus capacity to meet major calamities.

Seed supply and genetic resources

Note that we use the word *seed* here in a broad sense, covering any means of reproduction of crop plants. Thus, using cuttings for reproduction of cassava and sweet potatoes has been included in this description of the seed supply system.

Cassava

In the past, cassava stems were abundantly available for making cuttings. Traditionally, farmers saved cuttings from their own fields, but if they lacked planting materials, they could ask anybody and they would get them for free. Cassava cuttings had no price. However, that system collapsed with the cassava disease. At present, sources of new, clean planting materials are so far away that farmers in the affected areas cannot get them on their own.

At the time of the CBSD outbreak, many farmers were growing only a single cassava variety. As in many other parts of Africa, there has been some turnover in varieties over time. New ones have been introduced and old ones discarded, often because of damage caused by pests or diseases (Tresh et al., 1994). The current dominant variety in Memba was introduced (together with other assistance) after 11 April 1994, when the area was devastated by a cyclone. Because of the circumstances of its introduction, people called the variety *calamidade* (calamity), although that name might also have been attached to other varieties associated with severe crises, such as cyclones in the 1980s. Some suspect that the variety referred to as *calamidade* is the one that brought the virus into the area. But initially it was found to yield well and most farmers stopped growing other varieties, which meant that there was an extreme degree of genetic uniformity in locally grown cassava when the disease later started to build up.

Calamidade appears to be very susceptible to the disease. When farmers were asked if any of the previously grown varieties could have resisted the disease, one group said that they had other varieties when the disease came and that all of them were equally affected. However, when farmers were asked to name cassava varieties that had been grown before the introduction of *calamidade*, they mentioned 11 different named varieties, some of which were still being grown when SC/USA surveyed the area for varieties to screen for disease tolerance.

Farmers in many communities knew these varieties and some expressed regret that they had been lost. Farmers in this region have traditionally cultivated both bitter and sweet varieties of cassava, although

currently, bitter varieties (like *mulapa*) seem to dominate the farming system. Most farmers claimed that the bitter varieties yield better than the sweet ones, while others claimed that the sweet cassava have other advantages that the bitter ones lack. The sweet variety can also be eaten raw, whereas the bitter one is preferred for cooking.

In some places people said that they never grew more than one variety at a time. When a new introduction came and did better, the older variety was discarded. Others said that they grew several varieties at a time and had them in separate fields. One farmer group said they had a few varieties until recently but that the disease had devastated all of them.

Such stories suggest that virus diseases could have been around for a long time. If viral infections build up year by year, new introductions from unaffected areas would naturally appear more vigorous than infected materials grown locally. If that is the case, they have replaced *varieties* instead of getting disease-free cuttings of existing varieties. The tragedy is that farmers switched to the new introductions before these varieties were sufficiently exposed to the virus to assess their degree of disease tolerance.

Seed crops

Before the cassava crisis, maize was only grown to a limited extent. There used to be many local varieties, but few are left now (e.g., *kanyangulu* and *calamidade*). To help farmers expand maize production, the commercial varieties *matuba* and *manica* have been distributed in recent years.

The only local sorghum variety mentioned was *lannla,* but all farmers have some sorghum. Relative to maize, sorghum is more reliable on the local soils and under the uncertain rainfall pattern of recent years. However, birds are considered a serious problem with sorghum.

Various local varieties of pearl millet, cowpeas, and bambara groundnuts (both black and white) are cultivated. There are also several named varieties of sweet potatoes.

The seed crops are normally maintained through on-farm seed saving. Grains intended for seed are selected and stored separately from food grains by the women, who have the main responsibility for this process. They decide on how much of the harvest should be kept for food and how much should be kept as seed for the next season. The interviewed farmers said that some people do not separate seeds and food but keep it all together and plant whatever is left in the granary at planting time. However, the separate storage of seed is considered the norm.

While food grains are vulnerable to insect damage during storage, farmers said they were able to maintain their seeds well. They described a number of storage and protection methods, some traditional and some learned from government and SC/USA extensionists: (1) keeping unshelled/unthreshed cobs/panicles/pods on the roof, (2) tying the seed in grass bundles and keeping it on the roof, (3) tying it in grass bundles and suspending it in trees, (4) storing it in *celeiros* (granaries), or (5) sticking it under the ceiling near the cooking area so that it is exposed to smoke. Threshed seeds may also be kept in sealed bottles or pots, in which case some protective agent, such as ash, sand, cooking oil, hot pepper, or leaves from a certain wild plant, is mixed with the seeds. Hot pepper can be added whole or dried and pounded. Leaves from the wild plant can be pounded and mixed in or burned and added as ash.

In normal times, most farmers are able to save all the seeds they need for the next planting. They do not keep reserves for replanting because one planting is considered to be enough. If some farmers do not have seeds, they can go to other farmers and offer work for seeds. They then have to help with the hard

work of hoeing the land to prepare it for seeding, but they would get the seeds they need as payment. That was the traditional "safety valve" that ensured access to seeds for everybody.

Considering that cassava used to occupy most of the land and therefore only small amounts of seeds were needed, it seems likely that this system provided reasonable seed security for all before the demise of the cassava. In inland Nampula, however, where farmers depend less on cassava (see IITA, 2003, indicating approximately 50% of the land in Nampula was planted to cassava in the 1997/98 season) and more on seed crops, farmers save twice the normally required amounts of seed.

In Memba, selling and buying seed is very limited. A significant market for seed has not developed and certified seed from the commercial sector is not available in the district. However, local shop owners in Memba have started buying grain seed from farmers at harvest time and selling it back at planting time. Unlike commercial seed companies, the shopkeepers deal with local seeds only—mostly sorghum, maize, groundnuts, sesame, and green grams. They "rescue" small quantities of local seed from being consumed, but currently, this is just a few sacks, far from a solution to the district's seed problem. Even when farmers are desperate for seed, they may not have the money to buy it. One shopkeeper said that few farmers are able to buy, and those who do, can only afford small amounts, 1kg to 2kg. Some visitors from outside the area buy larger quantities. Thus, some of the traded seeds were exported from Memba during a time of critical seed shortage.

The nature of the crisis

This was a crisis of slow onset. According to Hillocks (2003), the disease was described in Tanzania as early as the 1930s. When it spread to Mozambique is uncertain, but many farmers blame the introduction and wide distribution of susceptible varieties that occurred during the 1980s and 1990s. The first local report of the disease was in 1998. In 2002, the impact of the disease had reached a level that threatened people's livelihoods in a number of coastal districts. The problem went beyond known coping mechanisms; there was no experience with that sort of crisis, and little was known about sources of disease-resistant cassava material. Communities faced a major challenge in identifying and multiplying disease-tolerant cassava.

Because of cassava's dominant position in the cropping system, it was difficult for farmers to compensate with other crops. On the contrary, the food shortage caused by the cassava disease made it difficult for farmers to save enough seed. By the planting season of December 2002, when the first field visit took place, households in the district were facing shortages of cash and seeds in addition to the lack of cassava cuttings. Food stores were running dry and many families depended on bush food for their subsistence.

Since everybody had the same problem, there was nowhere to go to get seeds. In the group interviews, only one farmer group said they knew about a place where seeds could be obtained. But that place was far away, and the owner would only give seeds after having seen that his own fields had germinated and been successfully established.

By autumn 2002, the situation seemed to be acute for the livelihood security of many households. If not dealt with in a proper way, it was feared that the situation would cause widespread chronic food and seed insecurity. The need for a response was apparent. However, the total population in Memba district at that time was almost 110,000, of which 95% were living on farms (figures provided by District Agricultural Office). That makes a farm population of slightly more than 100,000. With an average family size of

around five persons, the number of households would be approximately 20,000. So identifying tolerant varieties and multiplying them to meet the needs of all the farmers in the area would be a major undertaking. Even with the disease only seriously affecting the southern part of the district, the total requirement amounts to 50 million cuttings if we calculate 10,000 farms in need of assistance, and if each of them plants half a hectare of cassava and uses 10,000 cuttings per hectare. In addition, there were similar needs in other affected districts. Since cassava cuttings do not constitute a regularly traded commodity, all of this would have to be produced and distributed in a separate operation organized as a response to this particular crisis.

Seed interventions

As mentioned above, the situation at the 2002 planting season was considered critical in several coastal districts in the Nampula Province, and development actors decided to distribute planting materials, including cassava stems and seeds of cereals and legumes. In Memba District, SC/USA Mozambique and the District Directorate of Agriculture (DDA) were involved.

The seed operations carried by SC/USA and DDA are described in terms of (1) the diagnosis made by the implementers about the food and seed situation in the area before the distributions, (2) the actual process of implementing the distributions in the communities, and (3) experiences with the distributions from both the implementers' and the farmers' points of view.

Diagnosis of the situation

Both SC/USA and the DDA based their interventions on qualitative and quantitative assessments and assumptions about the food and seed security in the area.

SC/USA diagnosis

A "strange phenomenon" affecting cassava in Nacala-a-Velha and Memba Districts was reported in 1998 (*Noticias*, Maputo, 13 October 1998). In 1999, a farmer contacted SC/USA asking for pesticides to use against the root decay on cassava, symptoms that were later identified as cassava brown streak disease. However, farmers recounted that they had observed the symptoms for the first time in 1994. According to the SC/USA assessment, the disease multiplied by eight- to tenfold per year through the use of cuttings taken from infected plants. It reached a disastrous level during the first SC/USA development activity program (DAP) in the period 1996–2001. This USAID-funded program was operational in Nacala-a-Velha and Memba. Its main goal to strengthen food security and nutrition among farmers in those two districts. Since CBSD was identified as a huge problem for farmers in these districts during this period, the disease was given a central position in the DAP2 proposal (SC/USA, 2002a). As early as 1999, SC/USA Mozambique had started small-scale multiplication of cassava to find resistant varieties.

Two formal assessments of the disease's impact on the production system were carried out: first, leaf symptoms were assessed in 2000. That involved 19 extension workers, each investigating at random 20 plants per farm, and covering 391 farms in six districts. Second, an investigation of root symptoms took place in 2002, which showed that the disease affected 75%–85% of the plants in the area. In addition, a baseline survey was carried among farmers in early August 2002, mainly focusing on food availability, access, and utilization. In this survey, 587 households were interviewed (about 2.3% of the estimated number of households in the program area) (SC/USA, 2002b). The investigators concluded that there was low availability of appropriate cassava material in the area and that there was therefore a need to

identify and distribute resistant varieties of cassava. Furthermore, in DAP2, SC/USA identified a need to make farmers less reliant on bitter cassava.

DDA diagnosis

Parallel to the SC/USA operations, in December 2002, the Provincial Directorate of Agriculture (PDA) also organized distributions of cassava sticks and seeds in coastal areas of Nampula, including the District of Memba. This operation was based on reports that had come in from governmental field technicians in 2002 on food security problems and problems with too high a consumption of bitter cassava (which can cause death from dietary cyanogen exposure). In this context, the provincial Technical Secretary on Food Security and Nutrition (SETSAN), a governmental group in Nampula, made a crop assessment survey, where farmers were asked questions on access to food, amounts of food in storage, availability of food in markets (including prices), alternative sources of income, general local livelihood strategies in stress situations, and movements of people caused by the famine and reasons for their move (which was asked of community leaders).

The report described the food security situation as critical, particularly in Nacala-a-Velha and Memba (SETSAN, 2002). Recommendations were divided into two categories: long- and short-term interventions. Among the short-term interventions, distribution of seeds was considered as an appropriate measure to help farmers cope with the critical situation. To encourage self-reliance, the government prefers measures that stimulate production rather than distributing free food, so food aid was not considered an alternative. For the long-term diversification of the agricultural sector, the introduction of alternative crops adapted to local soil and water regimes was proposed (SETSAN, 2002).

Implementing the operations

The diagnosis made by the SC/USA and the Provincial Directorate of Agriculture (PDA) in Nampula resulted in two separate seed operations in December 2002. In the following more details on the main goals of these operations, their scale and scope, and the processes of selecting beneficiaries are presented.

SC/USA distributions

Objectives

Seed distributions by SC/USA are part of the second USAID-funded development activity program (DAP2) with the overall objective of improving "household farming systems and food consumption by introducing sustainable technologies and nutrition practices" (SC/USA, 2002a:1). An expressed goal of the program, which is being run during the period 2002–2006, is to eradicate the current threat of CBSD by having disseminated disease-resistant cassava material to 50,000 households by the end of the DAP period in 2006 (SC/USA, 2002a). In addition, SC/USA aims to diversify the agricultural production system by presenting other, more nutritious and marketable, crops as alternatives for the farmers.

Identification of material for distribution

As mentioned above, SC/USA Mozambique had started small-scale experimental multiplication of cassava in Memba and Nacala-a-Velha Districts to find resistant varieties shortly after the disease was identified in 1999. As part of DAP2, four more districts (Nacala, Mossuril, Ilha de Moçambique, and Mogincual) were included in the program. In each of the six districts, primary multiplication fields (PMF), ranging between one and two hectares in size, were established under the close supervision of an SC agronomist for multiplication of cassava sticks. In Memba the average PMF is 1.37 ha (SC/USA, 2003a).

Cassava materials being multiplied include both local varieties and materials that are provided through the South African Rootcrops Research Network (SARRNET) and IITA networks. Resistance to CBSD is tested, and four varieties (*nikwaha*, *m'povatakwa*, *chigoma mafia,* and *nachinya*) are under multiplication. The first two are of local origin, and the last two are from the Province of Cabo Delgado north of Nampula. These are all sweet varieties except for *m'povatakwa*. They have been identified as tolerant, implying that they show only leaf symptoms. The roots are not affected and can be used as food. Infected leaves still have value as food and can be used for making the traditional local sauces, which are prepared from stamped cassava leaves, often mixed with different kinds of legumes, such as groundnuts, bambara groundnuts, etc.

Identification of beneficiaries

In December 2002, cassava sticks of the *nikwaha* variety were distributed to farmers for further multiplication in secondary multiplication fields (SMFs). *Nikwaha* was chosen because it was considered tolerant and, at the time, was the one most readily available. The distributed material was from both SC/USA's PMFs and material collected from Namina, Nampula Province. Within each community, three to four groups of 15–20 farmers were established under the supervision of SC/USA's local extension workers, and each group was given a plot for the cultivation of the distributed cassava sticks. Each farmer received 20 sticks of cassava (in 1-meter lengths), which in turn, were cut into four pieces of 25 cm, giving each farmer approximately 100 cuttings. The leftovers after the cultivation of the SMF were for farmers' own private fields. In the interviews, farmers said that they had between five and seven one-meter sticks left after the SMF cultivation.

Distributions in Memba included 10,400 sticks from SC/USA's primary multiplication fields in December 2002 and another 14,500 sticks from SARRNET in February 2003 (SC/USA, 2003b). Facilitated by SC/USA's extension workers, meetings with farmers were held in each community before the distributions. The farmers who received the sticks volunteered for the project. They got no monetary compensation but had the rights to the produce of the SMF after harvest without any further obligation. This supplied both roots and leaves for eating and disease-tolerant planting material for the next season. The only condition was that farmers had to participate in SC/USA's training programs, where they were trained in identifying CBSD symptoms, crop lining and spacing, and mixing of crops in the field. In addition, farmers had to form groups to cultivate the SMFs. The groups were responsible for cleaning the fields, harvesting the produce, and weighing and distributing the produce among themselves after harvest (which was not yet finished at the time of the field visit in July 2003).

According to SC/USA records, the total number of farmers trained in the groups in the program area was 5236. In Memba, 1108 farmers were participating in the program (SC/USA, 2003a).

DDA distributions

Objectives

As a response to the critical food security situation in the coastal area of Nampula, the Provincial Directorate of Nampula established a three-year project, running from 2002 to 2005. The overall objective is to increase agricultural production and improve food security by diversifying agriculture in the area. The project has been implemented in the districts of Memba, Nacala-a-Velha, Mossuril, Mogincual, Erati, Nacarôa, Nacala Porto, and Ilha de Moçambique.

One important element of the project is to replace some of the bitter cassava with sweet varieties, as well as replacing some of the cassava production with alternative, more nutritious, short-cycled crops (Furede, 2002), which are adapted to local soil and water regimes (SETSAN, 2002).

A further objective, which has influenced who the beneficiaries of the project would be, has been to promote cultivation of the most fertile land.

Identification of material for distribution

In November 2002, based on the knowledge of CBSD tolerance accumulated by SC/USA, IITA, SARRNET, and INIA, the *nikwaha* variety of cassava was provided from the District of Ribaue; most of the other seeds were improved varieties of millet, maize, sorghum, cowpeas, and groundnuts from SEMOC, the Mozambican seed company. The exception was millet, which was of local origin. While most of the seeds were sourced from the commercial sector, most of them were known and had been cultivated before by many farmers in the area (interview with the Provincial Director of Agriculture in Nampula, E.M. Furede, 31 July 2003).

The intention has been to provide 1000 cassava sticks, 3 kg of maize, 1.5 kg of sorghum, and 3 kg of cowpeas to each family (table 1); however, it was difficult to verify the actual amounts distributed, particularly the number of cassava sticks. Amounts of millet and sorghum are not mentioned in the project description. The project has an ultimate goal of reaching 3000 families (households) during the three-year project period (Furede, 2002).

Table 1. Seed Distribution in Memba by DDA: Amounts Distributed in December 2002 and Returned by End of July 2003

Crops distributed	Amounts distributed in December 2002	Amounts returned by end July 2003	Varieties distributed
Maize	7911 kg	5486 kg (69.3%)	Manica, matuba,* kalahari
Sorghum	4000 kg	237 kg (0.6%)	Macia
Cowpeas	8799 kg	958.5 kg (1.1%)	Brown mix
Millet	1564 kg	570.5 kg (36.5%)	Local variety
Groundnuts	345 kg	249.5 kg (72.3%)	Natal comum

Note: The amounts indicated here as having been returned are percentages of the amounts distributed. Since farmers were expected to return *twice* as much as they received, their repayment of their commitment is even less than indicated here.

* Matuba was the variety distributed in Memba. Because of its short growth cycle, it does not need a lot of rain to grow well and was considered the best-adapted variety for the sandy soils in Memba.

Identification of beneficiaries

It has been difficult to get clear information on the exact process by which beneficiaries were selected in this distribution. In the project description, farmers were to be selected, on the one hand, on the basis of interest, experience, and responsibility and, on the other hand, on the location of their farms (Furede, 2002). It appears that in most places, farmers were selected from government lists and provided with a bag containing a certain amount of seeds of different kinds. In other places (as in Yamene), only farmers who were members of farmers' associations were provided seeds. The farmers were given the seeds on the condition that after harvest they return 200% of the amount of seeds they received. The intention of this was to establish a seed bank that could provide farmers with seeds each planting season. Ideally, in this way the DDA could reach more farmers in their seed distributions at the time of the next planting season.

In Memba, farmers with the best soils were favored in the distributions. This was part of a government strategy to get the farmers with the poorest soil to abandon their land and move their production to other fields with more favorable conditions (interview with District Director of Agriculture in Memba, Aiupa Abudo, 22 July 2003). There is little social stratification in the area, so no other criteria were applied to the selection of beneficiaries.

Evaluation of the operations and problems faced

Agricultural development in the Memba area is constrained by an unfavorable environment, particularly poor soils and unpredictable rainfall. The dry, sandy soils are extremely dependent on good rains to produce well, and a shortage of rain can seriously affect farm production and farm livelihoods. The distribution of cassava sticks and seeds by SC/USA aimed at decreasing the farmers' vulnerability to stress situations, whereas the concurrent DDA operation aimed at both decreasing farmers' vulnerability and relieving the situation of acute food insecurity.

At the time of the study, neither the SC/USA nor the DDA had yet made any formal evaluations or reports regarding the degree of success or failure of their seed distribution operations. Since the distributed cassava had not been harvested at the time of the fieldwork (July 2003), it was too early to assess success or failure.

Still, it was possible to get an impression of the operations by talking with representatives from both SC/USA and DDA and by talking to farmers in the different communities. Some important experiences from the operations, both in terms of the perspectives and parameters of the implementers and as seen by the targeted farmers, are presented below.

The SC/USA operation

A major problem faced in the SC/USA DAP has been to find CBSD-resistant cassava material, which was formulated as a goal in the DAP2 Proposal (SC/USA, 2002a). No resistant or immune varieties have been found and, according to the SC/USA Assistant Agronomist, it is not likely that any resistant varieties will be found within the program period (2002–2006). However, some varieties that are only slightly affected by the disease are considered to be tolerant and have been selected for multiplication and distribution. It is hoped that the currently identified tolerant varieties (*nikwaha*, *m'povatakwa*, *chigoma mafia,* and *nachinyaya*) will be sufficient to overcome the crisis.

Lack of diversity

Problems encountered during the search for tolerant varieties have included genetic erosion, where many traditional varieties have been discarded and have disappeared from the area, leaving the cropping system with a narrow genetic base. It was also difficult to get farmers to share information on disease tolerance. In the hope of being provided with assets from the project staff, farmers have been reluctant to say that they still have good or tolerant varieties of cassava. For farmers to share this information with the SC/USA, a relationship of trust and close collaboration between extension workers and farmers is necessary. There may also be a problem of knowledge: linking the leaf symptoms to the root rot may not be obvious to the farmers; they keep planting stems from infested plants, thereby multiplying the problem.

Even though only a few varieties of cassava dominate the farming system in Memba, quite a few of the old varieties still exist and are cultivated by the farmers. In an SC/USA survey in 2002, 6900 cassava plants were investigated on 345 farms in the six program districts, and some of the less common

varieties, such as *Garcia, vinte, nacamula, namahava* and *nassuruma*, showed low levels of infection (SC/USA, 2003b). All of these have been included in on-farm trials with the farmer training groups.

Stealing cassava

There have been reports from farmers of problems with theft of cassava from the PMFs. At night, other farmers (or farmers from within the groups) visit the plots and steal cassava. It is claimed that this happens because farmers are desperate for food. However, other farmers disagreed with this view, claiming that there has been a change in people's mentality:

> In the old days people could trust each other. People were also hungry at that time, but they would never steal from the fields.
> (Elderly farmer in Mecuta)

Still, the scale of this problem is unclear, and as stated by SC/USA's Agronomist, Steve McSween: "The tolerant distributed cassava material is still out there amongst the farmers." Nevertheless, due to problems with theft of the distributed sweet cassava, it is reasonable to question the feasibility of distributing sweet varieties of cassava. It was the farmers who adopted and developed a preference for the bitter varieties, in the first place, possibly because theft of sweet cassava had been a problem in the past. A study by Chiwona-Karltun in Malawi showed that social factors were the main reasons for farmers preferring bitter cassava: the need for processing roots before consumption confers protection from theft and vermin (Chiwona-Karltun, 2003).

It is important for indigenous knowledge and preferences to be learned and utilized in order to accelerate the process of transferring agricultural production technologies. In the process of fighting cassava mosaic virus in Uganda, in order to secure prolonged and sustainable cultivation, the farmers identified resistant genotypes before they were released (Otim-Nape et al., 1994). This has not happened in the present situation. Farmers in Memba have been involved to a very limited degree in the process of identifying and selecting preferred tolerant varieties of cassava.

Logistics

The distribution process was constrained by a number of problems: some communities cannot be reached by road, it was not possible to reach all the beneficiaries by the best planting time, and unfavorable weather conditions were also mentioned as a constraint. The rain came as expected in January and February but stopped early in March. Furthermore, a cyclone made cultivation difficult for some farmers.

In the whole program area, 6162 households were reached by the SC/USA cassava distributions (SC/USA, 2003b). The ultimate goal of reaching 50,000 households by the end of the program period in 2006 is still far away. The SC/USA Assistant Agronomist is worried that at the program's current pace, it will be difficult to reach that goal. However, calculating the 2003 nurseries covering more than 25 hectares with 10,000 plants per hectare and each plant producing 10 cuttings, 2.5 million cuttings can be produced. That would be enough for 100 cuttings to each of 25,000 households. Adding the customary free exchange of cassava cuttings makes it likely that distributed varieties will diffuse through the region once the farmers have enough for their own needs.

The DDA operation

So far there has been no formal evaluation of the DDA distributions. The only available indicator of their degree of success is the amount of seeds paid back by the farmers (table 1). It appears that the distributed sorghum has not performed well, probably due to late distributions and lack of rain late in the cropping season, while the distributed maize and groundnuts seem to have done better. Still, there are reasons to

believe that many farmers have not yet paid back the agreed amounts in spite of good production. As one farmer said, "I have not yet paid back the amounts of seeds demanded by the government because no one from the government has been here asking for them." Here, the government faces a logistical problem in that neither the government nor the farmers have the means to transport the seeds to the seed bank.

The government distributed seeds on credit to avoid farmers getting used to receiving support for free. However, the farmers who benefitted from the government distributions generally (and not surprisingly) were not pleased by having to pay back twice the amount that they had received:

> It does not make sense that we have to pay back the seeds. If I had kept the seeds, I would have distributed the seeds to persons in other areas, but now this is impossible.
> (Farmer in Chupite)

Timing of the distributions

The local authorities relied on central funding for the seed distributions, which may have contributed to late distributions in some of the communities. The seeds and the instructions were given by the provincial ministry in Nampula, and the framework given for the operations was perceived by the DDA in Memba as a limitation:

> The operation was emergency assistance, and that should not be a government task. . . . We [the DDA] did what was possible within the framework given by the Government.. . . The main problem that we faced in the distributions was reaching all the people. In addition, seeds were not enough, and some of them arrived too late, and did therefore not perform well in the fields.
> (Aiupa Abudo, District Director of Agriculture in Memba)

Logistics

Reaching people was another problem. In the end, the DDA was assisted with transportation of the seeds within the district by SC/USA. The problem of late distribution was most pronounced in the case of sorghum, which was hampered by a short (but heavy) rainy season. In addition, there were not enough seeds for all the communities to receive the whole package:

> The government told us that 200 people should clear their land because we were about to receive seeds for planting. In the end they only brought cowpeas in small amounts, only 50 kg (2.5 kg to each of 20 people). There are still 180 people here waiting for their seeds.
> (Farmer in Muipia)

Discussion

Seed security

Seed security can be defined as a situation where farmers have or can access enough seeds of desired species and preferred varieties, of good quality, in time to fully exploit the potential of their farms. The cassava disease disrupted the entire farming and seed supply system in Memba in a way that undermined seed security, as defined by all of these criteria.

The failure of cassava affected not only the food supply. There is a shortage both at individual farms and generally in the community, and when there is lack of food, people cannot save enough seed. Seed security accompanied the food insecurity.

In Memba there were many farmers who had not saved enough seeds or, in the case of cassava, lacked disease-free cuttings. There were no other farmers to go to for seeds and they could not buy sufficient quantities. Thus, there is strong evidence that in this situation external assistance was needed.

The slow-onset slow-recovery nature of the crisis

A plant disease that does not kill its host and is transmitted through vegetative planting materials would tend to increase from year to year, eventually resulting in total infection of susceptible varieties. If the disease causes serious yield loss and resistant varieties are not available, a crisis situation will gradually develop. It may take time, maybe years, until farmers and authorities see the danger. This kind of situation could also occur in other vegetatively propagated subsistence crops such as potatoes, bananas, sweet potatoes, and yams. We are therefore discussing not only a specific incident of cassava on the coast of East Africa, but a general problem that could affect subsistence farmers in many parts of the world.

The case of a disease in cassava also shows the difficulties and long-term nature of recovery. The problems include the search for resistant alternatives and the practical task of multiplication and distribution of disease-free planting materials. That cannot be done in a one-season operation. Recovery takes time, and several years must be allowed for the restoration of affected cropping systems. Relief operations with short-term budgets are therefore inadequate as a response to such crises.

Vulnerability and lack of alternatives

Agricultural history provides many cases of catastrophic outbreaks of plant diseases. From history we know of the late blight in potatoes in Ireland in the 1840s and the demise of the Gros Michel banana in the 1960s. In most cases, the outbreak has been preceded by genetic uniformity. Vegetatively propagated species are particularly vulnerable because the growing of one or a few favored varieties results in an extreme degree of uniformity. In the case of bananas, the industry has continued with the same degree of uniformity, based on a single new clone (Cavendish).

There are other examples of cassava diseases in Africa, cassava mosaic virus (CMV) being the most striking. The situation of CMV in Uganda is very similar to the one we find in Memba: widespread cultivation of a few popular but very susceptible varieties of cassava was identified as one explanation for the sudden upsurge of the disease in Uganda (Thresh et al., 1994). The pandemic had its greatest impact in areas with limited genetic diversity, where the main varieties were vulnerable to infection. In contrast, areas of high diversity experienced a marked shift in the relative importance of different varieties (Otim-Nape and Thresh, 1998).

As in these examples, in Memba the cassava disease could spread unhindered in areas with only or mostly susceptible plants in the fields. According to farmers' experiences, a switch from growing several varieties to only one variety took place at many farms in the years preceding the disaster. Most likely this happened because the virus was already there making new, "clean," introductions appear more vigorous than the old varieties. This points to a need to organize the supply and maintenance of virus-free planting materials.

Examples from other parts of the world show that low cost *in vitro* propagation of cassava is possible. In northern Cauca, Colombia, an NGO (FIDAR) together with CIAT have carried through a collaborative plan, involving the establishment of a tissue-culture laboratory and training of farmers. By using low-cost alternatives, the tissue-culture laboratory was set up for 20 times less than the cost of a conventional laboratory (Restrepo et al., 2000). In order to speed up the propagation of disease-tolerant

cassava varieties, this example may also be relevant for development actors working with the problems of CBSD in Nampula.

The soils of the most severely affected areas of coastal Mozambique are unfavorable for typical seed crops and make it hard for farmers to mitigate the problem by switching to other species. This added to their vulnerability before the crisis and made a quick recovery after the crisis very difficult.

Lack of knowledge about the virus

Cassava brown streak disease has been little studied and only superficially described in the available literature. The disease is spread through infected planting materials, but there must also be a mechanism whereby plants grown from clean cuttings become infected in the field. A booklet about cassava diseases issued by IITA (Msikita et al., 2000) says that the virus is "believed to be spread from plant to plant by insects." But the lack of exact knowledge how the disease is spread, the lack of systematic screening of germplasm for disease tolerance, and the nonexistence of breeding programs with a focus on the disease was a poor starting point for agencies that took up this challenge when the problem first became known.

This situation is repeated every time a disease or pest appears for the first time in an area. Preparedness in the form of capacity to quickly start research on new diseases or pests and to integrate the search for resistance in plant breeding programs is needed but generally inadequate or nonexistent for many important subsistence crops in tropical countries.

In such situations, local authorities and development agencies need to link with professional experts for collaboration. The experts are needed for technical support and they, in turn, need the local projects for surveys and testing of materials.

In this case, SC/USA has established links to the national research center in Mozambique (INIA), to the regional network (SARRNET), and the International Institute of Tropical Agriculture (IITA). In addition, they have networked with organizations and projects that work with cassava in other affected coastal areas in East Africa. Having to develop solutions in that way, however, explains why the recovery has been slow and must be accepted as a long-term undertaking.

The shortcomings of local knowledge and traditional coping mechanisms

Seed crops that are managed through on-farm seed selection may maintain some degree of resistance to old diseases and quickly build up resistance to new diseases. In cassava, however, each variety is a clone and not amenable to such selection. On the contrary, farmers' local management tends to erode the existing base for selection when serious diseases start appearing in their varieties.

In the Memba case, reliance on one crop and few varieties made farmers vulnerable to CBSD. The fact that the staple was a vegetatively propagated crop with poorly developed informal systems (integration in markets, etc.) made the system even more vulnerable. In this case, solutions require access to new germplasm, a capacity for testing and multiplication—or the technology to generate and maintain disease-free planting materials. All of this is outside the reach and beyond the capacity of local farming communities.

Avoiding dependency and encouraging self-reliance

As a matter of policy, both the government and SC/USA have self-reliance as a main objective and therefore want to avoid free handouts. In the case of the government, this means no food distribution, and seed distribution on credit. For SC/USA, it means collaboration with farmer groups in multiplying

and making tolerant cassava varieties available in affected areas. *Since the implementers have identified only varieties of cassava that are tolerant to CBSD (not resistant), some kind of knowledge transmission (of disease and cultural practices to ensure clean planting material) has to go with the material as part of the distribution process.*

The local people are clearly going through extremely hard times but seem to be able to survive by their own means. In both the SC/USA and DDA operations, the farmers' own capacities and preferences have been addressed to a limited degree. For example, the distribution of the *nikwaha* variety was not based on farmers' preferences, but because of its disease tolerance and availability; it is still an open question whether the farmers in the end will adopt this new sweet variety. Farmers' preferences are more complex than just disease tolerance; other sociocultural factors, such as taste, cooking qualities, and protection from theft, are important. Thus, there is no guarantee that farmers will adopt the *nikwaha* variety.

The government gives out seeds on credit and demands repayment in kind in order to establish a seed bank for redistribution in coming years. This requires organization and an infrastructure for administration of such a credit scheme, for recovery of seed loans, and for storage and redistribution of the seeds. The DDA does not appear to have the capacity and resources to manage all of that. The wisdom of combining credit recovery and extension services may also be questioned, and the interest is rather high: return of twice the amount of borrowed seed after one cropping season. The requirement of repayment by weight does not encourage the return of high-quality grain as seed. *Thus, "seeds on credit" does not seem to be a viable scheme because of the low quantity and (very likely) low quality of the returned material.*

Traditionally, seed security is ensured by mechanisms of redistribution of seeds and cuttings within the community. Those mechanisms are only marginally commercialized and based on free gifts, in the case of cassava, and seeds for work, in the case of seed crops. This mechanism broke down with the cassava crisis. Post-disaster recovery should ideally restore on-farm production and household food security, genetic resources, and the seed supply system with the traditional mechanisms of distribution and exchange within the community. But it is too early to assess whether the recovery will bring back the old mechanisms of seed exchange. A local seed trade is emerging and may, over the long term, replace the old ways of acquiring seeds for those who do not have enough.

Operational issues: the question of cooperation and trust

Because of the nature of this crisis, *ad hoc* operations cannot solve the problem. Only projects with a long-term presence and long-term commitment can deal with the difficulties of finding and implementing solutions. A long-term presence is also necessary to build relations of trust in order to mobilize communities for active involvement. The way SC/USA operates in collaboration with local and regional scientific networks seems in this case to be a relevant model.

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Acronyms

CBSD	cassava brown streak disease
CIAT	International Center for Tropical Agriculture
CMV	cassava mosaic virus
DAP	development activity program
DDA	District Directorate of Agriculture
IITA	International Institute of Tropical Agriculture
INIA	National Agricultural Research Institute
PDA	Provincial Directorate of Agriculture
PMF	primary multiplication field
SARRNET	South African Rootcrops Research Network
SMF	secondary multiplication field
SC/USA	Save the Children USA
SETSAN	Technical Secretariat for Food Security and Nutrition

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Relief Seed Assistance in Ethiopia

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Abstract

For more than 30 years, the international community has been assisting Ethiopia in recovering from recurring disasters. A continual need for emergency agricultural assistance as a response to droughts, conflict, and famine has led many to question the effectiveness and sustainability of the current interventions and to search for alternative approaches. This paper describes the approaches used for agricultural recovery in Ethiopia, including problem diagnosis, design and implementation of interventions, and evaluation. Furthermore, lessons from one specific case, based on fieldwork in East and West Hararghe, are presented to assess the need for and appropriateness of the approach used. The study reports results from a review of assessment and evaluation reports, literature reviews, interviews with key informants, and questionnaires given to farmers and government officials in East and West Hararghe.

The crop production system in East and West Hararghe is very diverse with very limited use of inputs. Farmers' seed security is based on domestic supply and availability of assets to access the market. Productivity is inherently low and the drought of the last two years has reduced supplies of own saved seed. Access to seed in the market is limited due to lack of cash or other assets. However, even in drought, the supply of seeds from the market has been adequate to meet the demands from both farmers and the relief seed system.

In East and West Hararghe, between 75%–79% of the households surveyed had received seed assistance in the previous three years. Direct seed distribution is the standard agricultural emergency or recovery response to repeated crop failures in Ethiopia. The use of seed aid has been institutionalized with the formation of a "relief seed system" with clearly defined roles and procedures that define how seed needs are identified and how seed is distributed. Farmers have a need for assistance in order to recover from very complex, chronic emergencies but the continual application of the standard response has not always met this need. Improved approaches for diagnosing seed needs and taking lessons from past experiences are needed, and there is a need to explore new approaches that ensure that local strengths and opportunities are employed. A need to look beyond the short-term perspective of relief operations and focus resources on long-term development is urgent.

Introduction

For more than 30 years, the international community has been assisting Ethiopia in recovering from recurring disasters. A continual need for emergency seed assistance as a response to droughts, conflict, and famine has led many to question the effectiveness and sustainability of the current interventions and to search for alternative approaches.

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The main objective of this case study is twofold. First, it aims to describe the approaches used for seed relief in Ethiopia. This will include issues of diagnosing the problem and designing, implementing, and evaluating interventions. Changes in the seed relief approach over time have also been reviewed. Second, lessons from one specific case, based on fieldwork in East and West Hararghe, are presented to assess the need for and appropriateness of the seed relief approach used.

Food security and disasters in Ethiopia

Ethiopia has a long history of drought and famine (EM-DAT, no date). Droughts that resulted in major famines occurred in the years 1972–74, 1976–1978 1983–84, 1987, 1989/91, 1993/94, 1997, and 1999/2003. In eight of the past 15 years, the number affected from drought ranged between 5–14 million people. In two of those years, 2000 and 2003, the number of people affected exceeded 10 million. Except for 1985/86, 1988, and 1995/96, the need for disaster response has been constant since the 1983/84 drought.

Poverty is both a cause and an effect of the Ethiopian disasters. In appeals for emergency assistance, the various famines that have occurred since 1996 are all blamed on a combination of a drought emergency and poverty. On the other hand, the chronic vulnerability of the Ethiopian rural population is seen as the effect of repetitive crop failures that have gradually deprived farmers of their assets. Dercon (2002) found that communities affected by the 1983/84 drought had barely recovered to pre-drought levels by 1994/95. Poor communities have repeatedly had to adopt survival mechanisms that deplete their long-term strategies and assets. Droughts have caused the less poor to become poor, and the poor to become destitute. The lack of productive assets and savings, along with small plots of land and a weak and poorly educated work force means that people are very vulnerable to shocks.

A World Bank Country Study (World Bank, 1998) suggests that the share of a household's income spent on food is a key indicator of poverty. In Ethiopia, this averages 75%. Both on-farm production, markets, and gifts/loans/wages from friends and relatives contribute to household diets. More than half (53%) of the food consumption is obtained through purchases in local markets. A survey by Dercon (2002) found that most households rely on the market for food during certain times of the year, even for crops cultivated on their own land. On average, households reported that they have no homegrown food in stock during about 10 weeks per year.

Agricultural policies

Dercon (2002) analyzed the impact of the political and economic reforms in Ethiopia from a feudal system, through a communist-inspired controlled economy, to a market-based economy (supported by the International Monetary Fund and the World Bank). He studied changes from 1989 to 1994/95 in households that were affected by the 1984/85 drought. The study concluded that the reforms had not been universally pro-poor. The nearly 50% of households that had good rains, good land, and access to infrastructure contributed to more than 80% of the overall estimated reduction in the poverty gap. The poorest households stayed poor and had a lower growth rate.

In the mid-1990s, the Ethiopian government adopted an initiative for agricultural development called "agricultural development led industrialization." Through nationwide promotion and dissemination of agricultural extension packages, this approach contributed to increased food production. Many farmers were able to produce a surplus that could be marketed. However, since markets are underdeveloped, the high supply resulted in very low cereal prices, especially for maize, sorghum, and wheat. Wholesale prices for maize in Nekempt plummeted by 75% from August 1999 to July 2002 as the number of plots that participated in the extension package program in East Wellega Zone increased from 600 in 1995 to

133,017 in 2001 (Raymakers and Sewaonet, 2002). This has led, in turn, to an inability of farmers to repay loans for the extension packages. The loan repayment has forced farmers to sell parts of their assets, household items, livestock, or oxen (Raymakers and Sewaonet, 2002).

Guinand (2002) concluded that "many cash crop and surplus-producing farmers . . . say they are better off not using the so-called government agricultural extension package that is not helping them any more." The use of farm inputs has been significantly reduced, and the productivity achievements of the late 1990s have been reversed (EC/LFSU and WFP, 2002). Seed sales from the formal sector (including the ESE, the Pioneer Company, and farmer-based secondary seed multiplication units) fell from 35,000 metric tons (Mt) in 2001 to 20,000 Mt in 2002. For 2002, an FAO/WFP assessment concluded that about 97 % of the seed used was local.

Food and seed assistance

Development economist Amartya Sen's analysis of the 1972 Ethiopian famine led to his Nobel prize-winning theory of entitlement (Sen, 1981). The entitlement approach switches the focus from a problem of food availability, addressed through food distributions, to one of food entitlement, addressed through poverty reduction and market reform.

Emergency relief in Ethiopia has not proved able to adopt Sen's new paradigm. The Disaster Prevention and Preparedness Commission (DPPC, 2002a) indicated that, in terms of relief food aid, the food inflow to regularly mitigate famine has expanded progressively by over 600,000 Mt per year in the period from 1994 to 1999. Paradoxically, these imports have coincided with an increase in domestic cereal production but very low cereal prices to farmers. Programs for food aid are repeated every season (Raisin, 2001), and due to constraints of time or other factors, evaluations of the long-term impact of assistance on food security are rarely undertaken. This hampers the possibility of finding a way off the treadmill. However, seed assistance has been widely adopted, with the intent of reestablishing production, and thereby ensuring food security in the long run.

The predominant approach for seed assistance, direct seed distribution, is generally based on the assumption that most households in a food insecure area are also seed insecure, i.e., that they do not have sufficient seed of their own or sufficient capacity to acquire seed locally (Longley et al., 2002). However, repeated provision of seeds in vulnerable areas might disrupt traditional household strategies for managing and accessing seed. Seed markets (both formal and informal) may also be disrupted. In effect, local systems and capacities for coping with harvest failures may be undermined, which may prolong the need for "emergency" assistance. Approaches that are employed to diagnose local seed stress and guide interventions are often simplistic. Assessments of local seed security are seldom carried out before interventions are planned or implemented. Differences across households are seldom explored, and it is often assumed that all crops are equally affected. Remington et al. (2002) presents a framework for assessing seed security and diagnosing seed systems. This framework describes three parameters of seed security: availability, access, and quality. *Availability* is related to seed supply. A sufficient quantity of the seed of desirable crops must be found within reasonable proximity to people and in time for critical sowing periods. To benefit from available seed, people must have *access* to it, which means they must have adequate resources to secure seed through purchase or barter. And last, seed must be of appropriate *quality,* that is, it must be for desirable varieties and of acceptable standards (seed health, physiological characteristics, and varietal integrity).

Seed distributions generally contribute to seed availability by creating an artificial supply of seed within a limited period of time. However, questions may be raised at this approach, as seed is hardly ever totally

unavailable. Certain areas may provide surplus production, or seed of alternative crops may be available. For instance, recent food aid imports to Ethiopia have coincided with high cereal production in certain areas of the country (Guinand, 2002). The problem may be more one of access or quality: seed may not be accessed because it is beyond the purchasing power of the impoverished, shock-susceptible population. Alternatively, farmers may be forced to use seed of inferior quality. However, Remington et al. (2002) concluded that, "In summary, the precedence for the determination of food unavailability, the complexity of diagnosing a lack of seed access, and the challenge of addressing access all contribute to the avoidance of the access determination."

Methodology

The case study consisted of three main sources of evidence. A review was made of all relevant reports that are available publicly on Relief Web, reports given during interviews, literature searches carried out in the UN Emergency Unit of Ethiopia (UN-EUE) library, and reports from FAO and NGOs. Interviews were conducted in Addis Ababa in September 2002 with 20 key informants representing four government agencies (the Ethiopian Agriculture Research Organization [EARO], Disaster Prevention and Preparedness Commission [DPPC], National Agricultural Input Agency [NAIA], and Agricultural Input Service Corporation), three of the largest donors (USAID, Government of Norway, and EURON-AID), two UN agencies (UN-EUE and FAO), two disaster-assessment agencies (European Commission/Local Food Security Unit [EU-LFSU] and Food Early Warning System-Network [FEWS-NET]), five NGOs (including the Christian Relief Development Agency [CRDA], the umbrella agency for most of the local NGOs in Ethiopia), one parastatal (Ethiopian Seed Enterprise [ESE], and one private trader involved in seed procurement (ODA Share Company). The focus of the interviews was knowledge of the farming systems in general, the formal and farmers' seed systems, the impact of the disaster on agriculture and seed systems, experiences with emergency and recovery responses, and experience with seed based interventions in emergencies or for development.

Different types of data were collected in fieldwork in nine *woredas* (districts) in the specific target area, East and West Hararghe, in April-June 2003. Surveys were done with farmers while interviews were conducted with grain traders and government officials. The farmer survey involved between 30 and 216 households per agroecological zone in each *woreda*. Nineteen grain traders were interviewed. *Woreda* administrative officials were interviewed in every *woreda* except Mieso. One *woreda* agricultural development officer (ADO) was interviewed in each of the nine *woreda*s. Officials of peasant associations were also interviewed in each of the nine *woreda*s, for a total of 66 officials in 60 villages.

Seed aid in Ethiopia

A review of recent seed relief projects in Ethiopia reveals that disasters are all blamed on a combination of a drought emergency and chronic vulnerability. Over the years, direct seed distribution has become a typical response to these seed stress situations.

In 1999 an appeal was made for food and seed distributions because of "the poor 1998 *meher* [main and long rainy season] and 1999 *belg* [short rainy season] harvest as well as increasing vulnerability from previous years" (UNDP-EUE, 1999). The appeal was justified further because "many farmers have consumed or lost their grain seeds and have been forced to sell agricultural tools and oxen to buy grain." In 2000, an appeal was made for food and nonfood assistance due to repeated poor rains and the failure of the 1999 *belg* and the poor *meher* (UNDP-EUE, 2000). Another appeal in 2001 stated that the

objective of the project was to "save lives and to support the recovery process by protecting and building productive assets." Furthermore, it was stated that "an essential component of the approach will be . . . the provision of seeds and tools for the upcoming *belg* cropping season" (UN/OCHA, 2001). A new appeal in 2002 requested more than $15 million for the provision of local and improved seed for the *belg* season in response of a failure of the previous *belg* rains and the poor *meher* (DPPC, 2002b,c). The appeal gave the following description of the situation: "Seed stocks are required in many crop-growing areas for the coming planting season. Seed availability in 2003 will be critical due to the poor production performance in 2002. The seeds have highly shriveled and are of poor quality for planting. Therefore, timely supply is critical to avoid inflated needs for the remainder of 2003." Additional appeals were made in March (DPPC, 2003a) and June (DPPC, 2003b) of 2003.

Most appeals reviewed since 1996 relate the farmers' vulnerabilities to the famine in 1983/84. In the Government of Ethiopia's appeal for 2003, the disaster was described as the residual effect of consecutive years of drought and poverty. The food insecurity is described as chronic in nature with the exception of particular crisis periods that may produce more acute and transitory food insecurity. The appeal concludes that poverty is the underlying cause of chronic food insecurity due to a lack of assets and endowments, low or variable rainfall, high population density, and low natural resource endowments. This is despite overall good harvests in 1995/96, 1998, and the *meher* of 2001, and increased cereal production in the surplus growing areas of the country from 1996 to 2001.

In Ethiopia, repetitive seed aid in the form of direct seed distribution has been institutionalized to such an extent as to see the formation of a relief seed system, which is driven with funds from international donors and focused on seed procurement and production. Apart from the funders, the system is composed of organizations or individuals who produce seed (or grain), institutions that procure seed, institutions that distribute the seed, and finally the beneficiary households that receive the seed as assistance. The system is regulated by the DPPC nationally, and by the Disaster Prevention and Preparedness Bureau (DPPB) regionally, while the National Seed Industry Agency (NSIA) monitors seed quality and procurement. DPPC and DPPB are government agencies. The DPPC has three mandates: prevention/mitigation, preparedness, and immediate response. Food aid is classified as emergency response, whereas seed aid is considered a mechanism for preparedness or rehabilitation. Other national agencies involved in the relief seed system are the Ethiopian Seed Enterprise (ESE), the Biodiversity Institute, Ministry of Agriculture, Ethiopian Agricultural Research Organization (EARO), and the universities.

The donors include international organizations, the European Union (EU), USAID/OFDA, DFID from the UK, and other official Northern agencies. Funds are provided directly or through FAO. Additional funding comes from private funds to NGOs. Donors may be involved at a number of different levels, funding assessments, serving as members of the assessment teams, or responding as key informants for the assessment. The food and non-food assessments are generally done with DPPC as the lead agency, while WFP and FAO, UN-EUE, the donors, the NGOs, the Ministry of Agriculture, the DPPB, regional/zonal/*woreda* staff, and farmers participate as appropriate. Irrespective of the assessment team, the assessments are generally based on the same sources of information (see below). The institutions that solicit funds and procure the seed include the Government of Ethiopia, FAO, EURONAID, CRDA, and international NGOs. The institutions that undertake the distributions include international and local NGOs, the Ministry of Agriculture, DPPB, and development agents in the affected peasant associations. Zonal and *woreda* committees participate in seed needs assessments, and work with affected farmers to identify the particular crops/varieties and quantities of seed needed. Often they may also participate in seed procurement through organizing local tender. In general, the *woreda* committee works with local

development agents or peasant association leaders or local peasant association committees to identify beneficiaries. The *woreda* committee is usually made up of representatives from the local government, the implementing NGO, Ministry of Agriculture, and the *woreda* DPPC.

Needs assessments

Prior to 1996, the DPPC did needs assessments based on the food balance sheet and used this as a basis for appeals. WFP assisted in the food assessments; FAO and the Ministry of Agriculture did agricultural assessments. This resulted in the donors receiving two sets of numbers or estimates of need, which were sometimes not very similar. In 1995/96 the DPPC made the assessments more transparent. Currently, multi-agency emergency needs assessments are led by the DPPC but carried out by over 15 institutions, including government agencies, foreign donors, UN agencies, and NGOs. EU-LSFU and FEWS-NET are also involved in assessments and early warning for food- and non-food needs.

Assessments are routinely done at least twice a year, depending on the situation. One assessment is done in October/December for *meher*, followed by another in June/July. Indicators used in the assessments are crop production estimates, crop production area, livestock status, market prices, human health status, general food security, and weather data. The number of affected households is determined together with local officials. The Ministry of Agriculture provides market data, and market trends are analyzed and assessed relative to other years and to quantitative assessments done by others. The collected data is cross-checked against information from farmers, traders, NGOs, donor project staff, and remote sensing data from early-warning systems. Prior to 2003, food assessments were used to justify seed needs. In 2003, seed assessment indicators were identified by the DPPC, thus facilitating a separate assessment of seed security. The indicators were the status of *belg* rains and the effect on seed stock, on the plant/replant cycle, grain price, and the quality of grain in the market (DPPC, 2003b).

Local assessments are used as inputs into the larger scale food or non-food assessment (WFP/DPPC and FAO/Ministry of Agriculture). Local conditions and needs are assessed by local government officials, such as the development agents or Ministry of Agriculture extension staff. These assessments collect data on the number of specifically affected communities, number of affected households, and the specific needs for food, seed, or other non-food needs. They are summarized at the *woreda* level by the *woreda* officials, reported to the zonal DPPB, and finally reported to the DPPC in Addis Ababa. This local assessment also guides the Government of Ethiopia and local NGOs in implementing direct seed distribution. The Ministry of Agriculture extension staff, the development agents and the local NGO staff work with the affected communities to identify the exact quantities and types of seed needed. The exact number of beneficiaries to be targeted in the communities is also determined with the local officials.

In addition, to these assessments, UN-EUE carries out descriptive annual regional assessments and special assessments throughout the year to provide a situation report that is initiated with the DPPC at the federal level but implemented with DPPB at the local level, along with NGOs and farmers. The assessments are cross-checked with the local government and others for validity. The indicators of stress include weather conditions, livestock conditions, grain/livestock prices, and human health status. The agricultural situation is assessed along with the farmer's seed status from farmer interviews. The assessment does not consider the cause of the lack of seed—whether it is from lack of availability or lack of access. Seed requirements are formulated from a local request for an agricultural/seed response and local confirmation with different farmers, NGOs and government representatives. They alert the UN country team to the seed shortage. If it is a very local crisis, the local NGO will respond, but if it is of greater magnitude, FAO will get involved and follow up with an additional assessment.

Seed procurement

The seed is procured at the international, national, regional, or local level. The procurement process is usually by tender, which specifies the exact quantity of seed required for each crop/variety, the requirement for packaging and labeling, quality standards, and delivery site. Certified seed of improved varieties is supplied from the formal sector (ESE, private sector, research stations, and university farms). In addition, there are producers and traders who are certified to produce and deliver seed of local varieties. Uncertified seed and grain, generally from the informal system, is also supplied, either from central and regional markets or through local traders, seed grower cooperatives, and local farmers.

Over the years, emergency seed from central sources, including improved varieties, has been met with many complaints from farmers about late delivery and the appropriateness of distributed seed. This has led to the development of a local procurement process, where FAO and various NGOs procure seed by tender to local traders, who generally purchase local seed from smaller traders or farmers and bulk the seed lots. They also purchase seed from local seed grower cooperatives. The Ministry of Agriculture assesses the physical quality of the seed (cleanliness, purity, degree of impurities, broken or diseased seed) but not germination percentage. Local procurement is usually done by local tender under the supervision of a local procurement committee made up of staff from the zonal/*woreda* DPPB and Ministry of Agriculture, *woreda* council members, and the local NGO. The tender is usually given to one trader.

The provision of seed from the formal sector is limited because of an underdeveloped national seed industry. This includes federal and regional agricultural research establishments, universities, the NSIA, the ESE, and a few private companies (Gemeda et al., 2001). ESE dominates the production, processing, and distribution of seed of released varieties, selling its seed to commercial farmers and other interested organizations, such as the Ministry of Agriculture and NGOs. Each year, ESE sends a letter of availability to NGOs. During 1995–1998, ESE distributed about 15% of its seed to state farms, 55% to extension management training plots, and 30% to others (Gemeda et al., 2001). It decides what varieties to produce over a two-year cycle based on the supply of breeder seed, availability of contract farms, and demand for the varieties. In 1998, 67.5% of its distribution was wheat, 31% was maize, 1% was barley, and 0.5% other crops. *Woreda* Ministry of Agriculture staff sell the seed that is given to them in retail packs. All the seed is packaged and sold in small amounts sufficient for one-fourth to one-half hectare. The seed rate is predetermined based on an average for the crop across the country. The price for seed is set based on production cost, overhead, and a small margin to recover costs.

These days, traders involved in seed relief, such as the ODA Share Company (which has participated in this type of seed trade for more than 10 years), purchase and deliver from the same area (personal interview with Belissa Gobosho, General Office Manager, ODA Share Company, Addis Ababa, Oct 16, 2002). If the seed is not locally available, they will ask to procure from other areas or they will decline tender. They participate in tenders in Addis since this is where they are licensed and mainly deal with seed of haricot beans, barley, *tef*, chickpeas, niger, and wheat. All these traders are required to have a trade license, which can be got from NAIA, which issues an efficiency certificate to deliver seeds and a license/technical certificate to deal with seeds. To get a certificate, the traders must meet specific standards, have experience with delivery, and pay a fee.

One additional approach has been used by SCF-UK. In this process, *woreda* local committees work together with *woreda* officials to set up a market place on a specific date. The committee compiles a list of crops and varieties and the required amounts, and then selects the desired seed from farmers and local traders that meets quality standards. If the required seed is not available, the committee has to look at alternative crops and varieties. These local seed markets have been arranged in six to eight *woredas*.

In an EU-funded project, there was a major problem with the EU procurement procedure that required a single central tender from one vendor for all the required seed.

The "relief seed system" has a large number of participants and is better developed and utilized than the formal seed sector, although the seed produced by the formal sector is used extensively by this system. The main feedback loop is between those who procure seed and those who deliver seed. There is little feedback between the recipients of the seed (who are the affected households) and these seed producers. The development of this system has been driven by the constant need to provide seed in emergencies, and many feel that it has had a negative impact on the development of the formal seed sector to meet the seed needs of farmers in a more sustained fashion.

Evaluation of seed assistance

We reviewed five final reports and evaluations of past interventions to study how the seed problem was diagnosed, which actions were taken to alleviate the problem, the evaluation criteria used to judge the impact of the intervention, the technical and social adequacy of the intervention, cost effectiveness, and finally, the impact over the longer term in relation to meeting project goals. The reports reviewed dealt with seed distributions by CRDA in 1994, CRS-Ethiopia in 1999, SCF-UK in 1999, CARE-Borana in 2001, and FAO in 2001.

CRDA

Since 1984/85 CRDA has been coordinating the procurement of seeds, tools, and transport for members. The 1994 program was its tenth. Reports from 1994 show that 81% of the recipients received the seed on credit, 9% got the seed on time for sowing, 92% thought it was appropriate, but only 11% used the seed for 10% of their seed requirement (CRDA, 1995). Problems identified in the implementation included the high demand for seed in the target areas, delays in seed delivery, a shortage of staff in the member NGO and the Ministry of Agriculture, remoteness of project areas, and finally, the poor yield of planted crops due to continued drought, too much rain, diseases, and other pest problem over the season.

CRS-Ethiopia

CRS-Ethiopia/HCS implemented seed distribution in 1999 in 12 peasant associations in Fedis Woreda in East Hararghe (CRS/HCS, 2000). The project was implemented through a local partner, the Hararghe Catholic Secretariat (HCS), and the DPPC at the zonal and *woreda* levels. Impact was assessed on the basis of four criteria: the number of beneficiaries, the amount of seed procured and distributed, area planted, and production per area planted. The evaluation of the project concluded that the seed was delivered on time, the project distributed appropriate local seeds of high quality (germination of 95%), there was good production by farmers in both distributions, good participation by all partners, and the allocated budget was adequate.

SCF-UK

SCF-UK implemented seed distribution in seven *woredas* of North Wollo and in three *woredas* of Wag Himra, along with the zonal departments of agriculture (SCF-UK, 2000). The implementation process, which included procurement, distribution, and coordination between actors, was evaluated with the stakeholders and found to be satisfactory even though there were problems with the procurement of the seeds from ESE in a timely fashion, and seed was distributed to only 55% of the beneficiaries targeted, who only received 35% of the seed required. Impact was assessed on the basis of the following criteria: number of beneficiaries, quantity of seed distributed, area planted, production per area planted, the contribution of production to household food security and indebtedness, farmer satisfaction with the timing of distribution and variety, credit repayment, and effectiveness of targeting. In general, the

project was well received although some of the farmers received the seed late and it was the wrong variety of wheat or the wrong crop. The use of improved varieties and credit were also found to be problematic for targeting beneficiaries in this intervention.

CARE-Borena

CARE-Borena reported on a seed distribution done for the *meher* 2001 in the pastoral areas of the Borena Zone of Oromiya Region (CARE-Borena, 2001). CARE and the Ministry of Agriculture procured local haricot beans and *katumani* maize from ESE. Woreda committees and peasant association leaders allocated seeds to beneficiaries. The criteria used to measure impact included the number of beneficiaries, quantity of seed distributed, percent of area in the *woreda* planted with distributed seed, timely distribution of seed, crop production and deviation from normal, the gap filled in food security with the production, and seed repayment. The haricot beans performed well but the maize was planted late and did very poorly, so there was not much of an impact on food security.

FAO

FAO implemented seed distribution as part of a larger project to facilitate the resumption of agricultural activities in preparation for the *meher* cropping season of 2001 among displaced households in Tigray and Afar. The tender process was used. The improved seed was delivered late or the next season, but all the local purchase was fully distributed in the *meher* 2001 cropping season. The criteria used to evaluate the project included the number of beneficiaries, quantities of seed distributed, land area cultivated, success of local purchase to meet variety preference (no data given), use of inputs (stated as "were put to good use" but no data), estimated production, and estimated months of food supply. The ratio of cost of production versus total value was 1:3. In this calculation, costs included the cost of the seed purchase and the cost of land preparation/planting, while value included both the food and the value of the straw. Both project implementation and impact were judged acceptable based on quality of inputs, timeliness, and suitability of implementation.

Summary of review

In general, in the five projects reviewed, no specific problem diagnosis was used to design the intervention, so no alternative interventions to address the emergency were considered. The process of implementation focused mainly on the procurement and delivery of the inputs and was not reviewed. The impact of the intervention was considered in each of these cases almost exclusively in relation to technical adequacy. Thus, the diagnoses and evaluations are very focused on the supply-side dimension of the operations; while the farmers, representing a possible demand for assistance, were not involved. One evaluation was made of the social adequacy in relation to the targeting (SC-UK) and one evaluation addressed the cost-benefit ratio of the intervention (FAO). No project evaluated the longer-term impacts of the intervention on the households, the communities, the target agricultural system, or the seed system. While all these evaluations concluded with a list of constraints and future needs or opportunities, it is not clear how all these were addressed in subsequent interventions.

Farmers' seed systems in Hararghe regions

The diagnosis of seed insecurity at the household level depends upon a baseline understanding of household seed security within the framework of local livelihood systems. Fieldwork was conducted in nine *woredas* of West and East Hararghe to describe the community and household seed system in relation to seed security, identify indicators of household seed security, evaluate household experience

with seed assistance, and determine the role of farmer/grain trader sales for local seed security. Interviews were done with individual farmers and farmers or grain traders who sell seed and grain.

Household characteristics

The farmer survey included 1801 respondents who were randomly sampled, using an opportunistic sampling scheme, at the village, *woreda*, and district level. The proportion of the respondents that were female (3%) or came from female-headed households (3%) was very small. The survey also sampled very few very poor households with small landholdings and very few animals or other livelihood assets. The sample mainly included male-headed households with four to eight members, of average wealth with moderate landholdings, a small number of animals, and some *chat* as a cash crop.

In recent years, there have been indications that farm production has fallen (figure 1). Farmers perceive that crop production has fallen dramatically since the fairly average year of 2000—bad in 2001 to even worse in 2002. In 2002, more than 60% of the lowland and midland households rated the harvest much lower than average.

Cropping practices

The households surveyed listed 15 crops grown overall in their plots. Of these, 10 were grown in all three zones. Finger millet and oats were only grown in the midland and highlands, groundnuts and paprika only in the lowlands, and garlic only in the midlands. Maize, sorghum, and *chat* were grown by the highest proportion of the households in all three zones. There were a total of 74 crop combinations planted by the surveyed households. The only crops that were mono-cropped were finger millets, groundnuts, and paprika. A moderate proportion of the respondents used fertilizer routinely (25% in the lowlands, 48% in the midlands, and 43% in the highlands). Of those who used fertilizer, it was used mainly on maize and potatoes. Improved seed of maize, sorghum, and wheat were used routinely by a number of households in all zones (23% in the lowlands, 28% in the midlands and 5% in the highlands). The seed required was higher in the lowlands but similar for maize, sorghum, *tef* and haricot beans.

The planting time for maize, sorghum, and haricot beans is March to June (March to May in the highlands). *Tef* is planted from April to July in the lowlands, from March to May in the midlands, and only in April in the highlands. Replanting is rarely done. For maize, 92%–97% of the respondents did not replant if there was crop loss. If replanting is done, it is mainly done with sorghum and potatoes in the lowlands and midlands, and sorghum and maize in the highlands.

Household seed sources

In normal years a household will utilize the most trusted sources that they can access. Any disruption in the normal farming practices can result in reduced availability of this preferred source and an increased demand for seed from alternative sources.

While 97% of farmers in Ethiopia still use landraces (FAO, 2002), that does not necessarily mean that they use 100% home-saved seed for those landraces, even under normal conditions. A single household can use two or more sources routinely, and different crops or varieties may be accessed from different sources. The survey households used seed from their own saved seed, seed obtained from social networks (such as neighbors or relatives), seed purchased from the local market, and seed obtained from seed assistance given by NGOs and the government. Figure 2 shows how households in the three different zones meet their seed needs. The figure compares data for 2003 and before 2003.

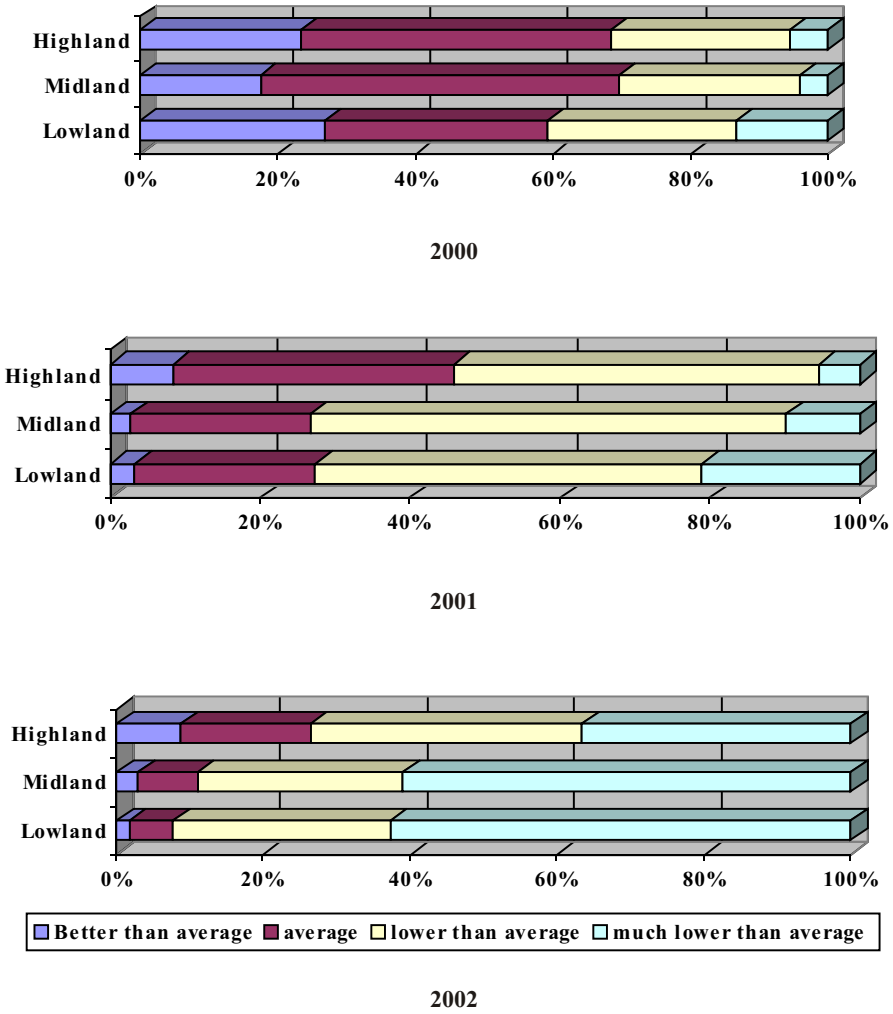

Figure 1. Household assessment of harvest status in 2000, 2001, and 2002

Before 2003, the majority of households in the lowlands used multiple channels for seed. In the midlands and highlands, the proportion of households who used own saved seed only was equal to the proportion of households using multiple channels. Prior to 2003, about 10%–12% of households used only the local market to access seed in all three zones. In 2003, after the drought of 2002, a higher proportion of households planned to use the local market in all three zones. There was also an increase in the proportion of households who planned to use only seed from seed assistance, especially in the lowlands and midlands. In all three zones, the proportion of households who planned to obtain seed from multiple channels declined. The use of only own saved seed declined in the lowlands and midlands but increased in the highlands. Thus, the drought of 2002 resulted in households accessing fewer seed channels, especially in the lowlands and midlands, and reliance on seed from outside the home–from the local market and seed assistance—increased.

Table 1 shows the contribution of different seed sources to household seed needs. Figures are separated by crops and zones, and compare data from 2003 with that from before 2003.

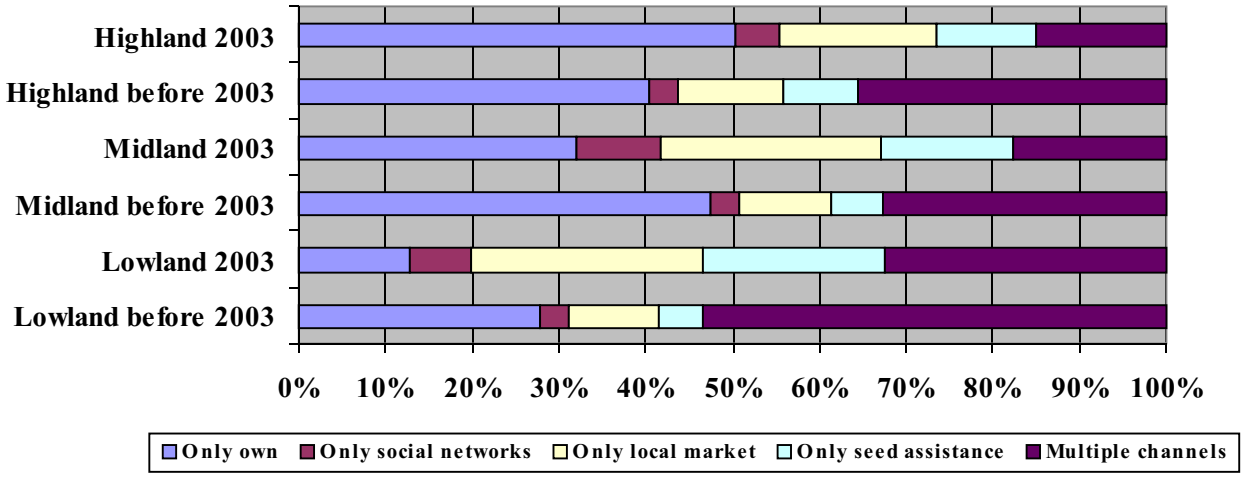

Figure 2. Proportion of households that obtain seed from only own saved seed, only seed from social networks, only seed from the local market, only seed from seed assistance, or seed from multiple channels, before 2003 and in 2003 for the three agro-ecological zones

The main seed channel used to meet household seed needs for maize was own saved seed both before 2003 and in 2003; however, the use of this channel declined in 2003, especially in the lowlands and midlands. This reduced use of own saved seed was compensated by an increased demand for seed from the local market and from seed assistance. The social network only contributed a small proportion of the total seed needs for maize.

Own saved seed contributed 61%–76% of the total seed needs for sorghum, but in 2003 this was reduced, especially in the lowlands and midlands. For sorghum, the social network contributed more than seed assistance, especially in the lowlands and midlands.

The importance of own saved seed before 2003 was less for wheat compared to maize or sorghum, especially in the lowlands where households only used this source for 27% of their seed needs. In 2003, the contribution of this seed source increased or stayed very similar. Both the local market and seed assistance accounted for one-fourth to one-third of total seed needs. In 2003, there was a reduced demand for seed from the local market, especially in the highlands. In the lowlands there was an increased use of seed assistance for 2003.

For *tef*, own saved seed was used for about one-third of the total seed needs before 2003 in all three zones. The local market and seed assistance combined accounted for more of the total seed needs than own saved seed. In the lowlands and highlands, there was a reduced use of own saved seed in 2003, while the contribution of the local market increased. In the midlands, households planned to use more of their own saved seed and seed from local networks in 2003.

For haricot beans, own saved seed and the local market were the main seed sources used before 2003. In 2003, there was a reduced use of own saved seed and a large increase in seed needs to be met from the local market. There was no change in the use of seed assistance.

Generally, the households surveyed met a high proportion of their seed needs with their own saved seed and the market. The impact of the drought of 2002 increased the proportion of households who used only one seed source. The local market met an increased proportion of total seed needs in all three zones. In

Table 1. Proportion of Total Household Seed Needs Met from the Four Seed Channels for Sorghum, Maize, Wheat, *Tef*, and Haricot Beans in the Lowlands, Midlands, and Highlands, before 2003 and in 2003

		Proportion of Households Meeting Seed Needs from Channel:			
Maize		**Own saved**	**Social Networks**	**Local market**	**Seed assistance**
Lowland	Before 2003	49.4%	10.4%	27.8%	12.4%
	2003	11.5%	11.2%	34.7%	42.6%
Midland	Before 2003	66.2%	8.0%	16.3%	9.4%
	2003	31.5%	11.4%	23.2%	33.9%
Highland	Before 2003	58.8%	4.6%	20.0%	16.6%
	2003	52.9%	7.2%	18.1%	21.9%
Sorghum					
Lowland	Before 2003	61.4%	10.9%	21.5%	6.3%
	2003	27.2%	12.4%	43.7%	16.8%
Midland	Before 2003	76.4%	9.0%	12.8%	1.9%
	2003	41.4%	14.6%	39.6%	4.4%
Highland	Before 2003	71.6%	10.6%	16.3%	1.5%
	2003	60.9%	8.5%	27.9%	2.6%
Wheat					
Lowland	Before 2003	26.8%	7.9%	32.5%	32.9%
	2003	21.4%	0.0	21.4%	57.1%
Midland	Before 2003	43.8%	4.5%	25.3%	26.5%
	2003	60.0%	0.0%	20.0%	20.0%
Highland	Before 2003	40.2%	7.1%	24.6%	28.2%
	2003	64.4%	4.1%	6.6%	25.0%
Tef					
Lowland	Before 2003	28.5%	2.3%	27.7%	41.5%
	2003	18.8%	2.5%	53.8%	25.0%
Midland	Before 2003	37.1%	11.4%	24.7%	26.7%
	2003	43.8%	25.0%	12.5%	18.8%
Highland	Before 2003	27.3%	9.1%	27.3%	36.4%
	2003	0.0	0.0	75.0%	25.0%
Haricot beans					
Lowland	Before 2003	36.7%	7.5%	39.9%	15.9%
	2003	12.2%	14.4%	62.2%	11.1%
Midland	Before 2003	50.1%	10.0%	35.9%	4.0%
	2003	37.1%	6.2%	51.9%	4.8%
Highland	Before 2003	52.7%	1.8%	43.2%	2.3%
	2003	20.0%	6.7%	73.3%	0.0

the lowlands, the contribution of seed assistance increased as well. The proportion of the total household seed needs to be met from own saved seed was reduced for all crops except wheat in all three zones, maize and sorghum in the highlands, and *tef* in the midlands. The household's response to this reduced supply of own saved seed was to increase seed use from the local market for all crops except maize and sorghum in the lowlands where there was an increased use of seed assistance. Thus, households in the survey responded to the reduced supply of own saved seed with greater use of alternative seed sources, such as the local market, and they became more dependent on single sources.

The households were questioned about their experience with seed from outside their domestic supply over the previous 10 years. In the midlands and highlands, very few households had never used seed from outside. Unlike the lowlands or midlands, a majority of households in the highlands use seed from outside every year for all the crops. However, the majority of seed still comes from own saved seed. The use of outside sources has increased in the past five years for most crops.

The ability to produce one's own seed is critical to household seed security, but to benefit from this retained seed, the household must also be able to conserve the seed and use practices that maintain varietal integrity or quality. Thus, households were asked about their seed selection and conservation practices now and in the past. Significant changes in any of these components could indicate increased risk to seed security. The households in the survey described a number of methods used to conserve seed but many (more than 80%) used a white tablet they obtained from the Ministry of Agriculture for maize, sorghum, *tef*, barley, wheat, and haricot beans. In all crops there were very few changes in seed selection procedures and storage systems from 10 years before. In all three zones, maize seed is mainly selected in the field at harvest or the cobs are selected before storage. Sorghum is also selected in the field at harvest and panicles are selected before storage, but in the highlands a higher proportion of the households select the seed at planting time. Separating seed from grain without any selection process is more common for wheat than for maize and sorghum. The majority of barley, *tef,* and haricot bean seed is selected at planting time.

Seed markets

The market is a major source of smallholder seed. Generally, in the lowlands, households listed 40 different markets where they found the quality and quantity of seed desired. In the midlands, households listed 35 markets, while in the highlands, households listed only 15 markets. Thus in the surveyed *woreda*s, households used a diversity of markets to access seed or planting material. Overall, about 70% of the households accessed sufficient quantities of seed to purchase. Among those who did not access sufficient quantities of desired seed, only 5% felt that this was due to a prohibitively high demand in the market. Another 13% felt that quality seed of the desired varieties was unavailable. About 90% of the households in the lowlands and midlands and 80% in the highlands found the price of seed higher than for food grain in the market.

Overall, in the three agroecological zones, 75%–85% of households used credit to purchase seed. The main sources of credit were loans from relatives/neighbors (26%), the government (49%), cooperatives (4%), or NGO revolving funds (1%). Households were also asked about other sources of income for seed purchase, which was mainly cash from the sale of shoats, calves, or food crops. For many households, access to the seed market depended upon credit from the government or relatives/neighbors, with very few households (less than 20%) using cash or assets sold for cash.

Seed traders

A survey was also done with 19 male grain traders in nine *woredas*. A trader was characterized as small, medium, or large, depending on access to storage facilities, own transport, marketing facilities (own store to sell seed or selling only at weekly markets), and volume of sales. A majority of the small traders had regular sales but were unlicensed. A nearly equal number of the medium traders had regular licensed trades and intermittent unlicensed trades. Surprisingly, the large traders were mainly unlicensed, with temporary to intermittent sales. There was no relationship between the characteristics of the traders and the number or types of markets attended. A trader attended up to four regional and local weekly markets.

The traders were asked about the crops sold in the previous year (2002) and crops purchased for selling in 2003. Individual traders sold up to five crops in 2002 and six in 2003. There was no relationship between the number of crops sold, the types of crops sold, and the various trader characteristics. There was little relationship between the number of crops sold in 2002 and 2003. For example, three traders who sold no crops in 2002 had bought two to six crops to sell in 2003. All this demonstrates the very informal, dynamic nature of this market.

Traders either buy the commodity directly from farmers or through local agents in various ways: 42% purchased the commodity at the main market, 16% purchased from agents, and 42% traveled by public transport and by donkey to farmers to make purchases. Nearly 47% of the traders did not need to transport the grain since it was bought near their house. Overall, 42% of the traders felt they could access as much as they wanted. Grain was sold as seed by 68% of the traders but only 42% of the traders had ever purchased grain to sell as seed. Seed was stored separately from grain by 59% of the traders. Seed was sold on credit to farmers by 22% of the traders.

Local purchases accounted for 57%–100% of grain purchases for 2003, depending on the crop. In 2002, a drought year, local purchases accounted for a lower proportion of the grain/seed supply of maize, wheat, and beans but a higher proportion for sorghum, *tef*, barley, and chickpeas. In 2003, all the local-purchase seed came from direct purchases from farmers for sorghum, beans, and chickpeas. Even for the other corps, a majority of local purchases were directly from farmers. In 2002 and 2003, the government, other traders, and NGOs met the demand for relief seed assistance through local purchases. In 2002, 48% of these traders sold seed to farmers, 24% sold to the government, 19% to other traders, and 10% to NGOs. Obviously, local purchase of relief seed assistance uses the same market that farmers use directly, which could contribute to a shortage. However, neither the traders nor the farmers perceived these purchases from the relief seed system as a constraint to access to seed in the local market. Apparently, seed supply is sufficient but access to seed from the market may be restricted due to low availability of cash or credit in the households. It is noticeable, however, that local traders were able to access the grain of most crops from farmers during years when production was low and seed assistance was needed.

Farmers' experience with seed received from government and NGOs in 2000 to 2003

Households were asked about their experience with seed received from NGOs or the government for assistance or development in the past three years. Overall, 8% of the households had received sorghum, 23% had received maize, and 1% had received wheat. In total, only 72 households in the survey received more than one crop from a distribution. In many cases, the government distributes seed for the NGO or together with NGO staff. No household declared that they had received a distribution from both in the same season. Most of the distributions were free, from both the NGOs and the government, although the

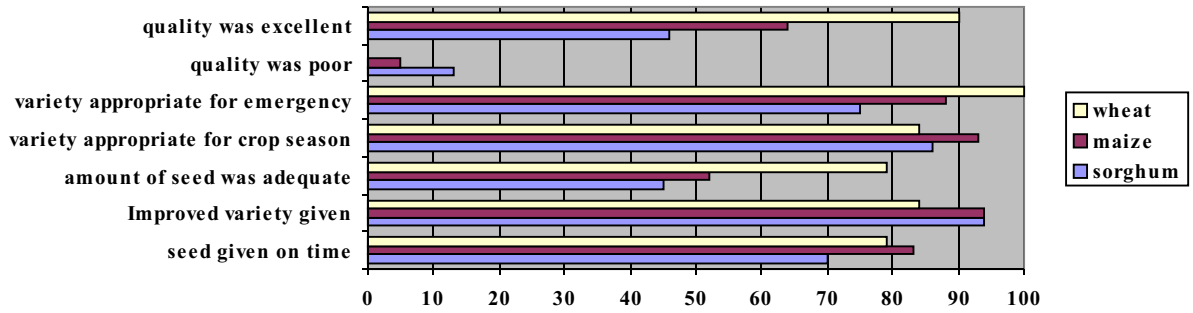

Figure 3. Evaluation of the effectiveness of the relief seed distribution for respondents who had benefitted

number of households that received the seed for credit or in-kind repayment has increased slightly, especially for seed from the government.

The survey requested the farmers to judge the technical aspects of relief seed distribution for those who had benefitted (figure 3). Nearly all the households received improved varieties of wheat, maize, and sorghum. Over all crops, 70%–83% of the households that received seed for an emergency received it on time. Only 45%–52% of the beneficiaries felt that the amount of sorghum and wheat seed they were given was adequate. For all three crops, the beneficiaries felt that the variety was appropriate for the crop season and the emergency. Very few beneficiaries thought the variety quality was poor, and for maize and wheat, over 60% thought it was excellent. This indicates that beneficiaries felt that the distributions were technically sound.

In the lowlands, of the households that received assistance, 42% received seed because they did not have seed to plant because of the drought, while 58% said they took the seed because they were told to take it by the peasant association leaders. In the midlands, only 16% of the respondents needed the seed because of the drought, while 85% said they were told to take the seed by the peasant association leaders. In the highlands 50% of the households accepted the seed for each of the two reasons. In the lowlands and midlands, 53% of the households felt they could have obtained the appropriate seed themselves if they had received cash instead of seed for assistance, but in the highlands, only 42% felt this way.

The households that had received seed assistance in the previous three years also used seed from their family or neighbors and the market. In all three zones, the majority of households used seed obtained from the market at the same time they obtained relief seed. Households were also asked about the source of seeds used during the season/year when others received seed assistance. There was no difference in the responses across agroecological zones. Overall, 65% of the households that did not receive seed aid indicated they had still planted, 55% of the households that planted when others used seed assistance used their own saved seed, 19% accessed seed from family or neighbors, and 26% obtained the seed from the market.

In the previous three years, 75%–79% of the households in the survey received seed assistance. The households were asked whether they were still growing the varieties they had received from the government or NGOs in the last three years. Two maize varieties (*katumani*, a variety released in 1974, and A511, a variety released in 1973), a sorghum variety (76TI#23, released in 1979), and one haricot bean variety (Mexican 142, released in 1973) were still being grown. The households had also adopted a

wheat variety, *inkoyi*, and a *tef* variety that were farmer varieties from other areas of Ethiopia. The proportion of households that still planted the varieties varied across the three zones for all varieties except Maize A511. Of those who had received a variety through seed assistance but no longer planted it, the main reasons given were related to poor performance (whether the variety was improved or local), high incidence of pests, and the low storability.

Altogether, 18% of the households that received these six crops/varieties as seed assistance still cultivated them. Another 26% of the households also cultivated these varieties, but these households had been introduced to the varieties by other farmers. Thus, it would seem that farmers were more willing to experiment and grow new varieties when they obtained them from other farmers rather than directly from the government or an NGO. While this is a good adoption rate, it is not known how many times they received these crops/varieties or how many crops/varieties they had tested but not adopted. Thus the effectiveness of the use of seed assistance to introduce new varieties is still uncertain from this survey.

Evaluation of past seed interventions by government and local officials

A survey was done with *woreda* administrative officials: the agricultural development officer (ADO) and the peasant association leader or the development agent in all nine *woredas* were interviewed. Seven of the nine *woreda* administrative officials had been involved in seed relief programs during the previous three years. In four *woredas*, the officials also had experience with fertilizers as part of the seed package. All the experiences were from the *belg* seasons in 2000–2002.

The *woreda* officials listed three main responsibilities for their office in seed assistance: (1) organizing *woreda* DPPC committees, (2) identifying drought-affected peasant associations, and (3) setting up screening committees at the *woreda* level to target beneficiaries. For the three *belg* distributions, the problem was described as a drought, with the overall project goal to protect the affected people and to provide them with seed. Seed needs assessments were performed in four *woredas* with staff from the *woreda* DPPC, Ministry of Agriculture, and NGOs. The targeting of beneficiaries was described as "those households highly affected by the drought with no seed and no purchasing power." When asked if the targeting was adequate to reach the most affected, four out of eight officials said no.

All *woreda* agricultural development officers had been involved in emergency seed interventions in the past, while five had also been involved in seed/fertilizer package distributions. Agricultural development officers were involved in seed needs assessments in eight of the *woredas* (Meyu is a new office) and this was done with the development agents. NGOs were involved in the distribution, and the coordination was good among all the agencies in four of the seven *woreda*s. According to the agricultural development officers, the criteria used to identify beneficiaries were drought impact, seed loss, availability of assets to buy seed, availability of land, ability to prepare the land, and knowledge of how to use the seed properly. In four out nine of the *woreda*s, the agricultural development officers felt that the most affected beneficiaries were targeted. Two felt that some farmers sold or ate the seed given to them. Seed was distributed for free in two *woreda*s and for credit in five *woreda*s but no agricultural development officer reported any payback of the credit, apparently due to either a lack of follow-up by the government or NGOs or crop failure for the beneficiaries.

Ninety-three percent of the peasant association leaders and development agents have been involved in seed programs in the past. The main role of these officials was to mobilize the peasant association to take the seed and/or fertilizer package. In 24 of the peasant associations, a committee was established for targeting beneficiaries. All peasant association officials described the problem as loss of seed due to late

onset of *belg* rains and stated the project goal as "giving seed to affected households." Seed assessments were done in 37 peasant associations and in 32 of these, the peasant association official was involved in the assessment; however, only seven of the 68 peasant association officials knew how the assessments were done. Most (95%) identified the criteria for targeting beneficiaries as, for example, "Those who entirely lost his seed due to caterpillars," while a few gave criteria like the following: "Those who could afford to pay back the Ministry of Agriculture." There was no reference to loss of crop from the drought. Overall, 63% of the peasant association officials knew that special efforts had been made in the past to target female-headed households.

Local purchases had been made with the assistance of the peasant association leader or development agent in eight peasant associations. In three of these, the farmers were also involved in the selection of the seed needed. The seed was distributed for free in 28% of the peasant associations and for credit in 22%, but only two said the farmers repaid the credit for cash, while no peasant association official reported that farmers had repaid the in-kind credit. Some of the peasant association officials (38%) were involved in the supervision and monitoring of the performance of the crops. When asked to give suggestions to improve seed interventions in the future, 96% suggested that it would be better to distribute varieties directly determined by the farmers instead of "strange" varieties.

The survey among local government officials indicates that the focus of the emergency interventions in the previous three years was on direct seed distributions for emergency and development seed assistance. The main role for all these officials was identifying the affected areas and targeting the beneficiaries. Officials at the *woreda* level were mainly involved in coordinating the response, assessing needs, and targeting beneficiaries. The peasant association leaders, the development agent, and the ADO were involved in assessing local needs, listing beneficiaries, and monitoring crop performance. The description of the disaster and the description of the criteria used for targeting beneficiaries differed at the various government levels. At the very local level, there was greater awareness of the poor impact of the distribution and the poor payback on any credit arrangement. The peasant association officials and development agents felt the farmers could have taken a greater role in determining the specific crop/variety to be distributed.

Discussion

It is clear from the 30-year history of food and non-food assistance given to Ethiopia that the approaches used by donors, relief agencies, and government agencies have not mitigated the need for assistance. This is evident in the appeals for more than $15 million in seed assistance in the year 2003. The case study reveals that different opinions persist as to what is the root cause of the Ethiopian emergencies. Most Addis-based officials claim that the recent emergencies are the result of a combination of chronic poverty and extreme climatic events. Many of the officers at the level of the *woreda* and peasant association concluded that the cause was an acute climatic event. Given the history of seed assistance in Ethiopia, direct seed distribution is the standard approach to agricultural relief and rehabilitation. This seems to be used as a follow-up to food distribution and, in general in Ethiopia, food needs are used to justify seed needs. Indicators used for assessing both food and seed needs are estimates of crop production, cropping season indicators, and grain prices in the market. While independent assessments have been suggested for food and non-food needs in Ethiopia, we were only able to identify one example where the two had been addressed separately: the DPPC assessment of 2003, where new indicators of seed need had been suggested for future use. The records show no examples of emergency responses

other than direct seed distribution, except in 2003, when two new approaches were used: CRS-Ethiopia used seed vouchers and fairs and CARE Ethiopia used seed vouchers.

A number of changes have been made in the implementation of direct seed distributions. Donors, NGOs, and the government of Ethiopia have responded to farmers' concerns with more frequent delivery of appropriate local crops/varieties in a timely manner. They have made changes in the procurement procedures, such as the timing of request for funds, more efficient tendering processes with certified traders, and the use of local purchase to obtain local varieties with less stringent quality assurance. The formal sector has expanded and has made changes to better address the need for specific varieties in small packs. Local purchase itself has been improved to allow greater input from the local communities in the decisions on crops and varieties. All of this has resulted in the development of a relief seed system that relies on local production to provide seed to respond to agricultural emergencies. Also, noting the adoption of new approaches piloted by CRS and CARE, the evidence from Ethiopia shows that institutions are able to learn from past lessons.

Why does the need for direct seed distributions persist in Ethiopia?

There is a general lack of problem diagnosis to identify local constraints and design an appropriate intervention. Generally, the need for a shift from food distributions triggers the need for an agricultural response. While macro-level assessments may trigger this shift from food aid to agricultural recovery, no micro-level assessments have been done to design the most appropriate local response. In all the cases reviewed, it is assumed that there is a need for seed, so direct seed distribution is implemented. No one assesses seed security, i.e., whether seed is available locally, whether seed can be accessed, whether seed is of acceptable quality, or even whether seed is the priority need of the affected households. The experiences from Hararghe found that at the same time as farmers received relief seed, most of them also used other seed channels, such as the market. This suggests a problem of access rather than availability. Apparently, the complexities of diagnosing a lack of access to seed, and the challenge of addressing access, contribute to the avoidance of seed stress being identified and addressed as an access problem. This has contributed to the poor performance of these programs.

Farmers have responded to disasters with increased reliance on seed outside the home, mainly from the local market and seed assistance. The local commodity market is very informal, with supplies of grain and seed procured mainly from local farmers. It is used as a source of seed for farmers on a routine basis but the demand increases when local crop production is lower. This local market is also used for the procurement of local seed for emergency seed distributions. It has probably been strengthened with the relief seed purchases but the impact of this does not seem to have enhanced the seed security of individual households.

Generally, the needs assessments are initiated at the local level by the Ministry of Agriculture or the *woreda* DPPB, which report the results to the zonal and then the Addis DPPC. They also notify the local NGOs or UN-EUE. This can be reported to Addis or a local proposal can be developed for a response. The focus of the assessment is on the number of beneficiaries to be targeted and the quantity and type of crop/variety needed. Based on this, a project proposal is developed to solicit funds to implement the intervention. The project must be approved at different levels, delaying its implementation. As the timing for the response is paramount, there is generally no time for considering alternative approaches and interventions.

Evaluation and reflection

In general, no timely comprehensive evaluation of the short- and long-term impact of direct seed distribution is done, nor is there any attempt to redesign further interventions. There is a tendency to continue to use the standard response with logistical changes made to increase its efficiency. Longer term evaluation of the impact of direct seed distribution on system resilience or productivity has not been done.

Most of the informants in Addis had knowledge of the local seed system, but the local seed system and its seed security were not considered in the design of alternative interventions, especially in relation to the issues of availability of seed versus access to seed. All of the informants interviewed concluded that the seed security constraint in these emergency responses was access to seed due to a high market price, a lack of household assets to gain access, and the stress on social networks. No one believed that the seed insecurity was due only to lack of household seed availability, yet direct seed distribution was implemented, a response tailored to address failures in seed supply.

The need to continually respond to emergency agricultural recovery has resulted in fewer resources being available for agricultural rehabilitation or development. There were a number of examples given in the key informant interviews with donors and NGOs where agricultural development programs have been reduced or delayed because of the need to respond to an emergency. There was no shortage of ideas on alternative rehabilitation or development programs but very few had been fully implemented because of the need by donors to shift funds from development programs to an emergency response due to the continual crisis. Many of the NGOs articulated the perception that donors were not interested in longer term projects or in the application of alternative approaches. However, donor interest in alternatives to funding direct seed distribution was demonstrated by OFDA in 2003 with the alternative approaches implemented by CRS and CARE.

One other problem is that the continual need for emergency responses results in a low level of investment by NGOs and others into good agricultural technical expertise in Addis and in the local offices. Most of the responses involving direct seed distribution are logistical and, thus, agricultural technical knowledge is not always appreciated. Alternative agricultural recovery interventions and development will require good technical skills and research options. Even though research stations (EARO) and agricultural universities are involved in many of these emergency interventions as seed producers and suppliers, their research support is not available to use for testing. The survey revealed that 26% of respondents had adopted a few varieties that had been developed and released in the early 1970s or earlier, which shows that farmers are interested in new approaches in their cropping systems. However, it is doubtful whether the continual emergency response with its short-term goals can meet this need.

Conclusions and recommendations

Households in Ethiopia have a need for assistance to recover from complex, chronic emergencies and to increase their agricultural productivity. The continual application of the standard response has not met this need. Alternative approaches to agricultural recovery, rehabilitation, and development need to be designed for Ethiopia. Some specific options suggested by the case study were as follows:

- A comprehensive diagnosis of the agricultural system, not just the seed system, needs to be made. There is a need to study seed security within the broader context of livelihood and not to study seed needs in isolation. One option may be to consider the value of baseline studies, like the farmer survey conducted for this case study, to develop a tool to assist in seed security assessments.

- There is a need to design interventions that are appropriate to address the problem at the micro-level. The intervention used needs to address both the strengths and weaknesses of the existing seed and agricultural systems, which requires a good understanding of the local agricultural system and good technical knowledge of agriculture. The application of alternatives to direct seed distribution, such as seed vouchers and fairs or just seed vouchers, needs to be carefully evaluated, and used if appropriate.
- More emphasis should be put on market-based interventions that address the issues of access by farmers to seed, such as seed vouchers and fairs. These should be focused on stimulating the development of local seed markets for farmers who already use the local grain market and find it satisfactory, as evident in our farmer and trader survey. A clearer understanding of this local seed market needs to be established and used in the design of seed interventions. The whole issue of access to this market through credit also needs to be investigated.
- There needs to be greater investment in research to develop and test new varieties/crops and new agronomic practices that are appropriate to resource-poor farmers. This has to be clearly linked to local market development and it needs to involve farmers in the testing and evaluation. All this requires a shift in investment from emergency interventions to development and is very long term, compared to direct seed distribution in a single season. Farmers have constraints to production and marketing that need to be addressed by research. The articulation of these needs to the research community is always very difficult and will require a more active role for NGOs and farmer organizations in research planning and testing. Farmers clearly need a greater role in designing emergency intervention, but future gains in agricultural productivity depend upon both the development of research products and their use by farmers to meet a demand in the market place. This will need to be considered for future development interventions.
- NGOs, the Government of Ethiopia, and donors need to carefully consider monitoring and evaluation as a very critical part of project implementation. There is a need for clear criteria and procedures for evaluation of the process and the impact of the intervention. This needs to be done in a timely fashion and must be considered at the time of the project design. It must be user focused for the benefit of the implementing agency, its partners, and others. It needs to consider the perspective of the donor, the implementing agency, local staff and partners, and the beneficiary farmer. It needs to look at both short-term indicators and long-term impacts on the agricultural or market system.

Acronyms

ADO	Agriculture Development Office
CRDA	Christian Relief Development Agency
DPPC/B/c	Disaster Prevention and Preparedness Commission/Bureau/committee
EARO	Ethiopian Agriculture Research Organization
EC/LFSU	European Commission/Local Food Security Unit
ESE	Ethiopian Seed Enterprise
FAO	Food and Agriculture Organization
FEWS-NET	Food Early Warning System-Network
HCS	Hararghe Catholic Secretariat
NGO	Non-Governmental Organization
NAIA	National Agricultural Input Agency
NSIA	National Seed Industry Agency
UNDP	United Nation Development Program
UN-EUE	Emergency Unit of Ethiopia
WFP	World Food Program

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A Review of Seed Security Strategies in Malawi

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Abstract

The liberalization of Malawi's economy and the removal of agricultural and food subsidies have had an adverse impact on agricultural production costs, productivity, household economy, and food security. This situation has been exacerbated by droughts and floods, which have alternated in most parts of the country, sometimes causing acute stress in isolated areas. In response to such crises and long-term poverty, the Government of Malawi, donors, and NGOs have distributed food aid, followed by agricultural inputs to rebuild agricultural productivity.

A study was carried out in central Malawi to assess strategies designed to mitigate the impact of disasters or of poverty on seed security among smallholder farmers. Even during one of the worst disasters, local seed systems were shown to be resilient, and farm-saved seed remained the major source. In the absence of real assessments, relief seed implementers seemed to jump by default from Direct Seed Distribution (DSD) during the acute phase to Community-Based Multiplication Schemes (CBMS) thereafter—as the interventions are known and relatively simple. Farmers' views suggest that relief seed interventions have enhanced the number of crops or varieties at the household level, and farmers have preferred NGO to government seed interventions mainly because the latter distributed only small seed packages and did not involve farmers in the choice of crops or varieties. However it is not clear if the relief aid or if the agricultural inputs packages more generally (focused on maize) have managed to lessen the need for repeated emergency assistance. Chronic aid itself maybe be undermining local system—but this remains to be clarified further.

Introduction

Malawi is a small, landlocked Sub-Saharan African country covering about 118,000 km^2 with a population of about 11 million people. The country's economic base still largely depends on the agricultural sector, which contributes about 35% to the gross domestic product (GDP) and employs about 80% of the population. The agricultural sector is divided into smallholder and estate subsectors. Traditionally, the estate sector has mainly focused on the production of export crops, such as tobacco, tea, sugar, and coffee, while the smallholder sector has been the main producer of food crops (maize,

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rice, cassava, sweet potatoes, grain legumes) and lower-value cash crops, such as cotton. This study focuses on the smallholder farmers.

After enjoying food self-sufficiency for a long time between the 1970s and early 1990s, Malawi suffered a severe drought in 1992, leading to a disastrous food shortage. In response to this, the government, along with donor agencies and NGOs, provided food relief, followed by seed relief. Similar relief was provided in response to the food crisis in 2001/02, and again in 2002/03.

Access to appropriate seed is an important precondition for food production. It is often assumed that seed insecurity is directly linked to food insecurity. In Malawi, this kind of perception was first proved invalid after the 1992 drought disaster. For all interventions in response to the disasters mentioned above, the hypotheses were that farmers had run out of food, and that therefore they had consumed their seed stocks. However, to the contrary, even in areas that had been worst hit by drought, farmers were able to plant their maize crop with the first rains, well before the seed relief was delivered in some areas, where delivery was delayed (Musopole, personal communication, 2003). Similar results in Sudan were reported by Jones et al., (2003). Farmers' seed systems continued to meet the crop and variety needs of farmers, even following the 1998 famine in that country.

Seed security is dependent not only on seed being physically available, but also on the ability of individual households to access the seed. In addition, the seed must be of appropriate quality (physiological/physical and genetic). Often, farmers' access to seed of improved varieties is considered to be crucial to food security. At the policy level, it is argued that farmers' access to improved varieties (that is, varieties developed through formal plant breeding) will lead to increased food production and improved food security. However, very little attention has been given to whether these correspond to a farmer's own preferences.

This case study was initiated to assess the various strategies that have been implemented during the past two to three years in an attempt to mitigate the negative impacts of natural disasters and deprivation on seed security among smallholder farmers in Malawi.

Background of the project

This case study feeds into a larger project studying seed systems under stress. It will contribute to the overall aim of gathering knowledge about how farmers secure seed in times of stress, and providing institutions with information on assisting farming communities in ways that promote, rather than undermine, seed security.

This report describes the seed systems that farmers in Malawi use and how they have functioned under the stresses that have occurred during recent years. It also evaluates the impact of the seed interventions that have been undertaken in response to these stresses and how such interventions have affected farmers' seed systems in Malawi, assessing whether these operations were necessary and appropriate. Based on institutions' own perceptions regarding farmers' needs and the appropriateness of past interventions, the text analyzes the institutions' ability to apply lessons from past activities to their planning and programming process.

The case study contributed to the project in a number ways. Through meetings and informal exchanges, stakeholders have been informed of and included in the project with the hope that this will influence future practices and approaches concerning seed security, to ensure that future interventions support and/or increase farmers' resilience.

Methodology

Literature review and stakeholders' meetings

The project started with a comprehensive literature search on recent "seed and tools" initiatives that have been implemented through various organizations. This review was guided by a review outline developed by the study team. Checklists were also developed for consultations with key organizations and donors and for a selected number of communities where some of the NGOs are operating. The focus was mainly on the most popular seed interventions, through the Starter Pack Initiative (SPI) and the Targeted Input Program (TIP), the Agricultural Productivity Investment Program (APIP), and NGO initiatives. Several NGOs that operate emergency programs, including Care Malawi, Catholic Relief Services (CRS) through the Catholic Development Commission of Malawi (CADECOM), Save the Children, Plan Malawi, Concern Universal, and World Vision Malawi were consulted. Subsequently, a stakeholders' meeting was organized to which these key organizations were invited. After the stakeholders' meeting, some communities where the NGOs operated were selected for a field study with a focus on the impact of seed initiatives.

Field study: Survey and focus-group discussions

Although several NGOs were involved in the pre-scoping phase of this case study, the field study was undertaken in six sites in five districts where five different NGOs were operating seed intervention initiatives. These were Concern Universal (Dedza), Action Aid (Salima), Care Malawi (Dowa and Lilongwe-Chilaza), CADECOM (Lilongwe-Mitundu), and World Vision Malawi (Mchinji). All study sites were in central Malawi, in areas within or close to Lilongwe for ease of logistics. All six sites had also been subject to government seed intervention programs, SPIs, and TIPs.

Field work was comprised of focus-group discussions that were conducted using checklists, and individual interviews that were conducted using structured questionnaires with approximately 40 questions, which were relatively the same questions as those in the focus-group checklist. The aim of using a questionnaire was to quantify the qualitative information collected from the focus groups and then to compare the two sets of information.

Only communities that were involved in NGO-driven seed-related operations were included in this study. Most NGOs in Malawi operate within the framework of a traditional authority. Hence, this was the entry point into each of the communities. Within a traditional authority, a cluster of villages was selected with the help of one group village headman. Each site had at least five focus-group discussions with over 30 people in attendance in each group. A total of 30 focus groups were conducted.

The individual interviews were conducted in the same areas. Individuals were selected using a multi-stage purposive and random sampling technique. From a cluster of villages, four to five villages were sampled (generally the same as those used for the focus groups) and households were then randomly selected. A total of 35 villages were selected for such interviews, with a target of nine individual households in each village. However, only 311 individual household interviews were achieved. These were distributed as follows: Dedza (51), Dowa (49), Lilongwe-Chilaza (50), Lilongwe-Mitundu (58), Mchinji (53), and Salima (50).

Results

Population and farming overview

Social and demographic characteristics

Interview results revealed more than 40% illiteracy in the households studied. This corresponds with the national illiteracy level (NSO, 2000). The highest illiteracy rate was reported in Salima, where 52% of the household heads had not been to school. Such levels of illiteracy have negative implications for the uptake of new technologies and the overall understanding of development issues.

Overall, the main occupation of the majority of the household members across study sites was agriculture. The highest proportion (63%) of those engaged in agriculture was reported in Salima and the lowest (34%) in Mchinji. These results confirm that agriculture is the main occupation of the majority of people in the rural areas of Malawi.

Size of farm landholdings

More farmers in Mchinji (94%) reported to have large landholdings, more than 1 ha, followed by Lilongwe Chilaza (66.0%), Salima with 56%, and Dedza (33%). For households with an average size of six people (which is a conservative figure for Malawi), such small landholdings cannot produce enough to meet the food requirements for all members of the household from one harvest to the next.

Cropping systems

The majority of the rural households are smallholder farmers who rely on a single harvest in a year for their livelihoods. These farmers grow various crops such as maize, cassava, rice, sweet potatoes, millet, sorghum, white potatoes, groundnuts, beans, and soybeans (table 1). Intercropping is widespread. Results from this study indicated that such crops as soybeans, white potatoes, and cassava were limited to relatively few farmers across the study sites, compared to maize, groundnuts, tobacco, beans, and sweet potatoes, which are traditional crops in most of the study sites.

Traditionally the majority of people in Malawi, as in many countries in southern Africa, rely on maize for food security. In all the survey sites, almost all respondents (92%), produced maize mostly for food, compared to only 8% who sold part of it to earn some cash income. It has been estimated at the national level that maize occupies about 70% of the cultivated land within the smallholder subsector in any growing season (Phiri et al., 2003). As a result, food security in Malawi is defined in relation to maize, which was confirmed by this study. Although most households had limited landholdings, on average 0.49 ha of that was planted to maize. The land allocated to other crops, and their sowing density, is difficult to quantify because they are generally intercropped with maize. Generally, their densities are much lower than they would be when mono-cropped.

Cassava, white potatoes, and soybeans have only recently been introduced to the area as a result of crop diversification efforts. Cassava, for example, has been promoted for food security in most parts of the country following persistent droughts. Nevertheless, interviews with farmers revealed that the inclusion of cassava has been slow, partly due to lack of access to cassava planting materials.

The farmers in the study sites reported various constraints. Some of the cross-cutting ones, captured through the focus-group discussions, were (1) declining soil fertility, (2) lack of fertilizer, (3) lack of markets for agricultural produce, (4) pests and diseases, and (5) seed-related problems. The last is explored further in the following section.

Table 1. Summary of Demographic and Farm Overview

Characteristic	Survey (N=311)	Characteristic	Survey (N=311)
Occupation		***Landholdings***	
Agriculture	48%	Less than 0.4ha	6%
Formal employment	1%	0.4ha to 0.7ha	19%
Petty trade	<1%	0.7ha to 0.9ha	15%
Hired labor (*ganyu*)	<1%	More than 0.9ha	59%
		Cropping systems	
Cassava	5% (16)	Groundnuts	68% (210)
White potatoes	10% (32)	Tobacco	33% (104)
Soybeans	21% (66)	Beans	30% (93)
Maize	90% (281)	Sweet potatoes	29% (91)

Seed stress in Malawian cropping systems

Farmers' perceptions of seed-related problems

Within the survey and focus-group discussions, farmers described their seed-related problems for different crops in varied ways. In general these included the following:

- lack of cash to buy seed
- lack of markets that sell seed
- inability to store seed because of hunger
- inadequate seed or no seed at all
- poor germination of relief seed
- seed eroded by floods
- delays in sourcing seed
- low harvest leading to seed insecurity
- poorly timed distribution of relief seed
- use of poor seed
- cost of seed

The most frequently mentioned seed-related problems were lack of cash to buy seed and poor germination. Farmers in the focus groups mentioned poor germination of farm-saved seed, mainly of maize, beans, and groundnuts. This contrasts with findings from studies carried out in the Great Lakes Region, where farmers had no major concerns with germination of farm-saved bean seed (Sperling et al., 1995). The question is whether poor germination of farm-saved seed is caused by poor genetic quality or poor physiological quality. However, there is reason to believe that poor storage facilities, combined

with possible weevil damage over the long period that seed must be stored because crops are only cultivated in one season, contributes to the inferior quality.

The problem of poor seed quality was not only related to farm-saved seed. In Lilongwe Chilaza and many other study sites, farmers received hybrid maize seed for the winter season (when farmers grow crops under residual moisture or irrigation). This was part of the government's Targeted Input Program (TIP), aimed at farmers in certain localities who had lost their rainy season crop in floods. Farmers complained that the hybrid maize seed they received failed to set cobs, and they did not harvest anything. They claimed that the hybrid was not adapted to the winter growing conditions.

Description of stress: Acute and chronic

Seed stress can be categorized as two types: acute or chronic. According to Sperling (2003), acute seed insecurity is brought on by distinct, short-duration events that often affect a broad range of the population. People can be short of seed because of a failure to plant a single season, loss of a harvest, or loss of seed stocks in storage. On the other hand, chronic seed insecurity is generally associated with poverty or resource deprivation. People who are marginalized may have problems saving seed or accessing seed through purchase or barter. Such seed insecurity is independent of an acute stress or disaster, although it may be exacerbated by it. These two types of stress can both be recognized in Malawi:

- Droughts and floods that have alternated in various regions of the country have temporarily caused low supplies of seed.
- Poverty, coupled with high seed prices resulting from removal of subsidies on agricultural inputs, has negatively affected access to seed on a continual basis.

Disasters like droughts and floods usually occur in isolated pockets, causing acute food and seed stress in a localized area. However, in recent years, floods and drought have been frequent and, at times, have covered wide geographical areas, resulting in prolonged food and seed stress and the loss of people's resources. In such circumstances, the problem changes from acute to chronic food and seed stress. The chronic nature of this stress is illustrated by the fact that most households are not self-sufficient in maize from one harvest to the next. Usually, during the last three months before the harvest (February-April), the majority (approximately 75%) of the households are without their own maize supplies (Levy, 2003). Some of them are forced to buy from the market at relatively high prices, or exchange labor for food, but many cope with inadequate food supplies. Even those who buy or work for food most likely do not get supplies adequate to meet FAO daily intake standards. In the past few years, such disasters and stresses to the livelihoods of smallholder farmers in Malawi have resulted in more than 60% of all rural households being food insecure every year (Levy, 2003). Due to high levels of poverty, the majority of them are unable to compensate through the market, leaving many food and seed insecure.

Seed systems and seed security

Almekinders and Louwaars (1999) categorize seed systems as formal and farmer. In the formal seed system, specialized breeders, seed producers, certifiers, and marketing agents supply seed through an organized chain. On the other hand, farmer seed systems are defined as systems in which seed selection, production, and exchange are integrated into crop production and the socioeconomic processes of farming communities.

In the past few years, various authors have mentioned the value of seed in the farming system. Out of all the inputs used in agriculture, Morris (1998) identified seed to be one that is most limiting to crop productivity. Tripp (2000) said that under normal circumstances, most farmers are able to save or use seed from a previous harvest. He identified four situations where there is an incentive or need to access seed from other sources. These are emergencies, poverty, need for quality seed, and need for new varieties. Each of these situations leads to different types of seed demands, which can be satisfied by different responses.

The concept of seed security depends on three principle elements: availability, access, and quality (Sperling, 2003). *Availability* is related to seed supply: a sufficient quantity of seed of desirable crops must be found within reasonable proximity to people and in time for critical sowing periods. To benefit from available seed, people must have *access* to it, which means they must have adequate resources to secure the seed through purchase or barter, or indeed, domestic storage. Last, seed must be of appropriate *quality,* that is, it must be of desirable varieties and of acceptable standards (health, physiological characteristics, and varietal integrity).

The following text summarizes information on seed systems among Malawian farmers and how they secure their seed. The information has been collected through direct discussions with participating NGOs, extracts from the literature, and farmers' opinions expressed in the focus groups and individual interviews.

Channels of seed acquisition: Overview

This study showed that most of the smallholder farmers in Malawi depend largely on the farmer seed system for such crops as maize, groundnuts, beans, soybeans, sweet potatoes, and white potatoes. The farmer seed system includes such means of seed acquisition as farm-saved from previous production, purchases from local markets, exchange of labor for seed, and donations from friends or relatives. Phiri et al. (2003) reported similar results in a study on farmers' use of improved maize seed in the SADC region. They found that up to 70% of the smallholders in Malawi still used the farmer seed system for maize, where the main seed source was farm-saved, which was recycled each season. The remaining 30% of the smallholder farmers acquired maize seed through the formal system, which is about 20% hybrid and 10% open-pollinated varieties.

The formal system is limited because farmers' income or other resources are not adequate for purchasing seed from organized retail outlets or agro-dealers. The inability of farmers to access seed from the formal system has been exacerbated by the higher prices resulting from removal of state subsidies on agricultural inputs. Adding to this, most seed dealers in the formal system are located in urban or semi-urban areas, making the distances to the nearest distribution point prohibitively far. Thus, farmers tend to recycle their own local maize varieties or grain harvested from a hybrid maize crop. Although group discussions with farmers revealed that they doubted the quality of recycled maize seed, the farmer seed system continues to dominate the acquisition of maize seed among smallholder farmers in the study sites. The situation for other crops is different in the sense that the formal seed system is less developed for such crops. Very limited quantities of certified seed for groundnuts, beans, soybeans, etc., is made available through seed multiplication groups or farmers' associations. The few farmers who access such seed usually do so through loan schemes or NGO activities. Otherwise, the majority of farmers rely on the farmer seed system for these crops.

Channels of seed acquisition: Good versus bad years

The major source of seed for maize and other crops is farm-saved from previous crops. Other means include cash purchases, loans, exchanges of seed for work, relief seed, and gifts from relatives. During the last few years, relief seed has become one of the important means of acquiring seed, particularly after the food crisis in 2001/02.

Figures 1-4 highlight the trends in seed acquisition in the study area. The focus in these graphs is primarily on the differences in trends between a normal year (2000/01, representing the general situation with chronic seed stress) and a year of disaster (2001/02, representing acute seed stress). These graphs capture two crops: maize (figures 1 and 2) and beans (figures 3 and 4). The patterns shown for beans are reasonably representative of similar crops like soybeans and groundnuts. Since many farmers acquired seed in a variety of ways, the percentages add to more than 100%.

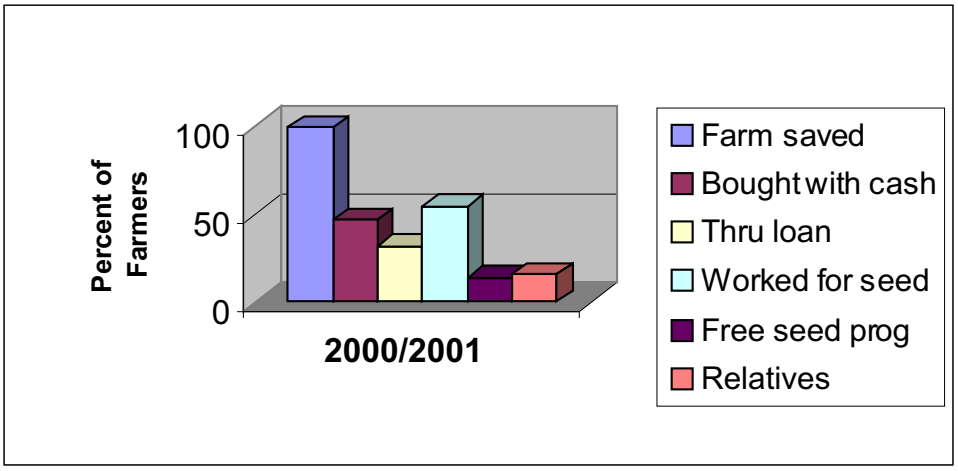

Figure 1. Means of maize seed acquisition during a normal year (2000/2001) (n=311)

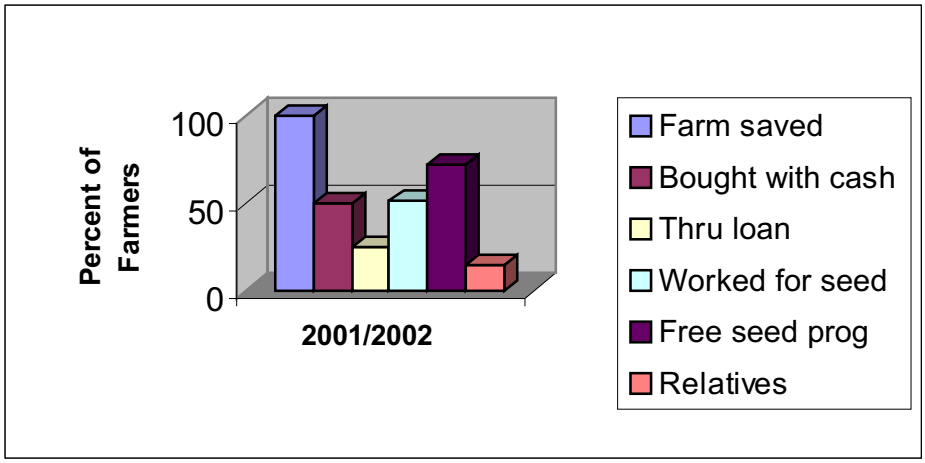

Figure 2. Means of maize seed acquisition during a stress year (2001/2002) (n=311)

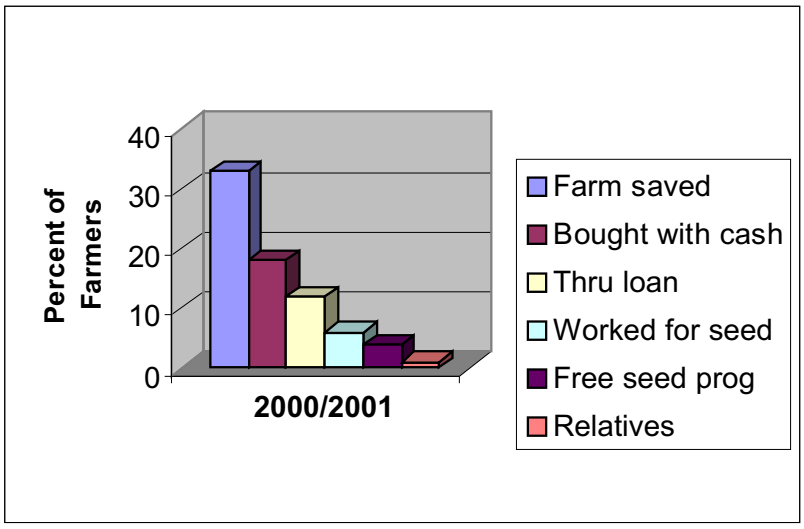

Figure 3. Means of bean seed acquisition during a normal year (2000/2001) (n=311)

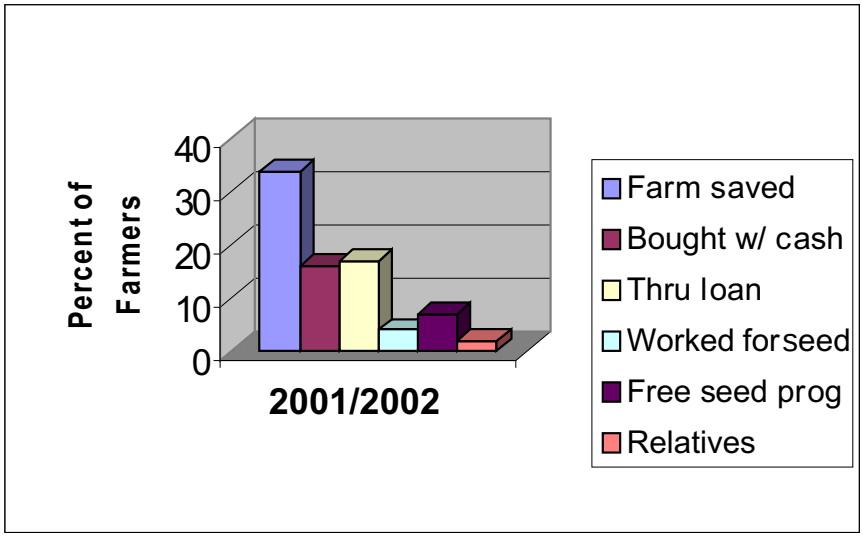

Figure 4. Means of bean seed acquisition during a stress year (2001/2002) (n=311)

For both maize and beans, farm-saved seed from own production remains the major means of acquiring seed for normal seasons (figures 1 and 3) as well as seasons of seed stress (figures 2 and 4). Although the interviews with farmers did not clearly separate purchased seed by source (formal or local markets), it is only maize seed that could be obtained from both types of markets. Beans and other grain crops are almost nonexistent in the formal market and can only be obtained as grain in the local market, planted as seed for the next crop. Seed acquired in exchange for labor has also become an important means for the needy to obtain seed on a routine basis. These are people who are prepared to work and prefer to get paid in kind (with seed) rather than with cash. There is also some indication that there was an increase in the proportion of farmers who acquired maize and bean seed through relief programs during the seed stress season. This means that although farmers saved some seed (and also used local channels to acquire seed off-farm), during disaster years such as 2001/02, seed relief interventions might have supplemented or

duplicated their own stocks. It should be noted, however, that the area planted to beans is a lot smaller than that planted to maize and that not all study sites were in bean-growing areas, which explains the differences in proportions of farmers accessing maize and bean seed.

Seed security in Malawi

In terms of seed security in Malawi, the survey information is far from clear-cut. It was evident in the study that for all the crops that were reported during the period 1999 to 2003, the main source of seed was farm-saved. Even during 2001/02, a food crisis year, farm-saved seed was reported to be the main type of seed that farmers grew. Thus, even under the worst conditions, many farmers were able to save some seed from their major crops. However, farmers routinely have to go outside their own home stocks, their own farm-saved seed, to get enough to plant. In some cases, such as with beans, they are used to accessing seed off-farm through purchases in local markets and by working for seed. Obviously, seeds have always been locally available, but whether they are accessible to all farmers and whether they are of appropriate quality remains in question.

Seed-related interventions

It is often assumed that seed insecurity is directly linked to food insecurity. Because of the importance of maize to food security in Malawi, seed interventions have tended to focus on maize. However, in an attempt to diversify cropping systems, recent interventions (mainly SPI and TIP) have included other crops, such cassava and sweet potatoes for drought tolerance and legumes or pulses for enhancing soil fertility, protein supply, and cash income. By trying to diversify cropping systems, these interventions are different from the routine direct seed distributions that aim only to restore the pre-disaster cropping system.

The following section discusses policies and interventions that have been enacted or undertaken to improve farmers' seed security. They include general agricultural policies to strengthen access to seed, seed distribution for development purposes, and seed as emergency assistance. The premise of these programs is that access to appropriate seed, which for most program managers means seed of improved varieties, is the key to restoring or enhancing agricultural productivity.

General agricultural policies

Although the single most common means of seed acquisition is farm-saved for most food and dual-purpose (food/cash) crops, farmers do supplement or replenish their seed stocks through other sources. Two contrasting eras of central agricultural policies have, in different ways, influenced farmers' seed systems and the means that farmers have used to restock or replenish their seed stocks. Up to the early 1990s, there were subsidies on agricultural inputs and products administered by the Agricultural Development and Marketing Corporation (ADMARC). Among the agricultural inputs, ADMARC used to stock subsidized certified seed of officially recommended varieties for maize (hybrids and open-pollinated varieties), groundnuts, beans, and several other crops that the government promoted at that particular time. Seed of specific crops was made available in ADMARC markets, which were located in the rural areas where such crops or varieties were adapted.

As a parastatal organization, ADMARC enjoyed a monopoly in marketing smallholder agricultural inputs and products. Through its Smallholder Agricultural Credit Administration (SACA), the organization offered credit and inputs at subsidized prices. This provided an avenue for most farmers who needed to restock or add on new seed to their own stocks, thus helping them to overcome problems

with access to seed or seed quality (for the new varieties). But this type of support to the smallholder farmers was considered to be financially unsustainable. As a condition of structural adjustment programs, ADMARC was restructured to improve efficiency in the marketing of smallholder inputs and produce (Ng'ong'ola et al., 2003). In the mid-1990s, subsidies on agricultural inputs were removed and from then onwards, the market for agricultural inputs and products was liberalized.

With the removal of input subsidies, lack of access to credit (following the collapse of SACA), and reduced income (following liberalization), farmers lost their access to certified seed of improved maize hybrids, old and new. Seed of open-pollinated maize varieties and other crops was no longer available, because after liberalization, the private sector was only interested in hybrid maize seed, on which they could make profits. However, many farmers could hardly afford the seed of improved maize hybrids at market value. Smale and Phiri (1998) reported discontinuities in the use of improved maize hybrid seed by the majority of smallholder farmers in Malawi. Obviously, ADMARC had stimulated the demand for improved seeds. The question remains whether the demand for certified seed of improved hybrids indicates that farmers appreciate such seed, or whether it followed from certain biases (especially subsidies) towards improved seed in the ADMARC system.

Nowadays, farmers may find it difficult to replenish or restock seeds of new or improved varieties if such seeds have been lost, which may cause hardships in disaster situations. Different government and NGO seed initiatives have assisted communities in overcoming seed stresses, but there are variations in approaches, and their impact on local seed systems may differ.

Seed as a spur to development: APIP and SPI/TIP

The market liberalization, combined with other factors, has led to reduced productivity and food security at both the household and national level. In this context, both government and donors have accepted the urgent need to scale up safety-net programs as well as to find appropriate strategies to promote smallholder productivity.

In recent years, the government has enacted two major initiatives to respond to seed insecurity among smallholder farmers. The Starter Pack Initiative (SPI), which has been modified to the Targeted Input Programme (TIP), and the Agricultural Productivity Investment Programme (APIP). Both of these are based on government perceptions of food insecurity among smallholder farmers. As many resource-poor farmers run out of maize before the onset of the rains, there is a widely held notion that they are not able to save seed for the next crop. Through ensuring access to quality seed, the interventions have been aimed at enhancing crop productivity and thereby helping to overcome food insecurity and alleviate poverty at both the household and national level.

Justification

APIP is a countrywide loan scheme designed to help smallholder farmers obtain agricultural inputs; it is not a free input-distribution initiative. The project, implemented with financial and technical assistance from the European Union, gives "resource-poor" smallholder farmers interest-free loans on agricultural inputs. Intended to strengthen access to improved technologies, such as improved seed (Phiri, 2000), the loans are given free of interest to overcome the barriers that risk aversion put on investment decisions among resource-poor farmers. Although the main target group for APIP is the resource-poor farmer with less than 0.5 hectares of land, the target group has expanded to include farmers with up to one hectare of land. The credit package provides not only maize seed, but it also includes soybeans, groundnuts, cotton, and other legumes to promote diversification of the crop base and improve soil fertility.

SPI/TIP on the other hand, was established after an assessment in 1998 (Blackie et al., 1998) that revealed that farmers had poor access to improved technologies such as seed of improved varieties, leading to declining productivity. The main assumption was that the majority of smallholder farmers were unable to access seed of "improved varieties" because they were cash constrained, but it was also widely believed that farmers were not aware of the benefits of using seed of improved varieties. It was believed that through the use of seed of improved varieties and proper application of fertilizer, agricultural productivity would improve and so would food security. In the section that follows, we discuss this in more detail, considering the design, implementation, and lessons learned from SPI/TIP.

Design and implementation

SPI started in the 1998/99 cropping season with a universal free seed distribution to all smallholder farm families throughout the country, where 2.86 million packs containing 2 kg of improved maize seed, 1 kg of legume seed, and 15 kg of fertilizer (10 kg of basal and 5 kg of top-dressing), sufficient for 0.1 ha were distributed. This blanket SPI was repeated in the 1999/2000 cropping season. The intention was that after production had been "jump-started," farmers would ultimately be weaned off distributions.

However, from 2000/01, the program was modified and became a Targeted Input Program, through which only a targeted number of households received free inputs (enough for 0.1 ha). Initially, the target was 50% (about 1.5 million households) of the total number of smallholder households in the country, and during this season, the fertilizer was reduced to 10 kg instead of 15 kg. The number of beneficiaries was gradually reduced in subsequent TIPs, and only about a third of smallholder households were targeted during the 2002/03 cropping season (Levy, 2003).

Lessons learnt from SPI/TIP

Evaluation reports for the first two cropping seasons SPI was implemented revealed that maize production increased (Levy, 2003). It was estimated that this increased production would be sufficient to feed a family for about 1.5 months. However, since inputs were distributed free, there was a danger that local markets would be undermined.

Lessons from TIP were somewhat different. According to Levy and Barahona (2001), the contribution of TIP to household and national maize production in general, was poorer than that of the universal SPI. Targeting beneficiaries for TIP was generally based on criteria such as poverty, number of orphans in a household, and the age of the household head. This targeting was not very successful. It turned out that the strategy of relying on the community to identify the poor, was not appropriate. There were two major problems:

- The reliance on village-level political authorities to be capable of and willing to select beneficiaries in a fair and transparent manner was not realistic.

- In addition, the assumption that communities would accept the notion that when resources were scarce, the small amount available should be targeted to the poorest, turned out to be in error.

The evaluations revealed that there was resistance within communities to singling out the poorest families because differentiation among the poor was culturally unacceptable. Furthermore, the village task forces favored themselves, relatives, and friends. These problems in securing proper targeting of provisioned seed could have significantly reduced the impact of the program.

Lessons from APIP

The main lesson from APIP is that maize, grown under smallholder management conditions, is not a high-return crop capable of repaying the loan (Dr. Elizabeth Sibale, European Union/APIP, personal communication 2004). Although APIP is a subsidized credit scheme, the majority of farmers have been unable to repay the loan solely on the basis of maize. Hence, grain legumes were subsequently included in the loan package to play a dual role of fetching a higher income to repay the loan as well as fixing nitrogen in the soil for the subsequent crop. There is general consensus among key players (government, donors, and NGOs) that due to low maize yields under the management conditions of smallholders (and the low prices of maize relative to prices of inputs), it is not worth creating an extra burden by introducing maize hybrids. Instead, open-pollinated varieties have been preferred to hybrids; they can be recycled and farmers do not need to purchase new seed each year.

Emergency seed initiatives

On 27 February 2002, the president of Malawi declared a "State of Disaster" in relation to food security in the country. The donor community, spearheaded by the World Food Programme (WFP) and the UK Department for International Development (DFID), responded . Through the Department of Disaster Preparedness, Relief and Rehabilitation (DDPRR) and the Ministry of Agriculture and Irrigation (MoAI), donors, the UN, and the NGO consortium, the government launched the Joint Emergency Food Aid Programme (JEFAP) as a coordinated humanitarian response to the food crisis. This included provision of both food and seed. Seed was distributed in most of the communities in Malawi to ensure that farmers had some seed to plant.

Several NGOs played a role in these seed provisions. This study has gone into detail with the operations of selected ones, including Action Aid, Save the Children (UK), Plan Malawi, World Vision Malawi, Care Malawi, Concern Universal, Catholic Relief Services through CADECOM, and the Evangelical Lutheran Development Program (ELDP). Several of these NGOs had previous experience with seed-based activities. They had distributed seed and planting materials of different crops to foster crop diversification and thereby strengthen food security and increase cash income. These distributions included seed of open-pollinated varieties of maize, self-pollinated legumes (groundnuts, beans, soybeans), and the vegetatively propagated crops like white potatoes, cassava, and sweet potatoes. Some of the NGOs were also involved in promoting community-based seed multiplication groups to ensure the availability of good-quality seed at reasonable prices within the communities.

Justification

Almost all NGOs in this study used the government's call for disaster assistance to justify their responses. Nevertheless, they also did rapid assessment studies of the food, social, and economic situation in the areas in which they operated and, thus, quantified the magnitude of the disaster. Concern Universal observed loss of family members due to famine and the use of erosive coping strategies, such as disposal of capital assets at extremely reduced prices, and used these observations as indicators of stress. Likewise, Care Malawi used such indicators as levels of hunger-related diseases and consumption of famine foods like wild tubers and banana roots. Similarly, CRS used observations of farmers' premature harvests to feed their families as an indicator of looming disaster, and therefore called for interventions (CRS, 2003). According to Mr. Edson Musopole of ActionAid (personal communication, 2004), ActionAid justified their interventions on vulnerability assessment reports from the FAO, WFP, and Government of Malawi.

All NGOs assessed seed insecurity, and the need for intervention, on the basis of food insecurity. CRS (2003) clearly states this in their proposal document: *"It is assumed that as a result of unfavorable*

weather conditions, many households do not only run out of food, but seed or planting materials for the next crop season as well."

Diagnosis

None of the NGOs undertook a specific diagnostic study on the magnitude of the seed problem. Sylvester Kalonge, sector coordinator for C-SAFE (personal communication, 2003) explained that this was due to the time pressure in responding to disaster situations. Project proposals for food relief, intended to save lives, and those for seed relief, for agricultural recovery, have to be developed almost simultaneously because the hunger period coincides with the on-set of the next cropping season. Because of this, many NGOs use a food crisis to justify a seed crisis. However, at the implementation phase, many NGOs do further analyses of the seed situation through participatory assessments with farmers in the areas in which they operate. These analyses have revealed that food insecurity is often accompanied by seed insecurity at the household level, again leading to food insecurity in the long run (CRS, 2003).

For example, Concern Universal had been working in various areas in Dedza and Ntcheu Districts. After the 2002 food crisis, Concern Universal responded to the government's call for assistance. Since they already had operations in the area, they conducted a quick assessment of the social and economic situation. They used such food security indicators as people losing a family member to starvation, desperate sales of livestock and other capital items like bicycles at incredibly low prices (usually at less than 30% of the normal value) to determine the seriousness of the food crisis. Based on these findings, they targeted the communities that needed food relief support, and with assistance from WFP, distributed food in the disaster-affected areas. Following the food distribution, Concern Universal proposed a small grant targeting one traditional authority, Tambala, in Ntcheu District. The area was chosen because of the poverty level and because no other NGO had activities there. The project aimed to provide poor households with relief seed and tools. Through participatory rural appraisals at the beginning of project implementation, farmers in the communities chose two crops (maize and beans), seed banks, and small irrigation equipment. The maize seed was for open-pollinated varieties because it is their policy to distribute seed of open-pollinated varieties. This project was one-off, only for one year, a typical relief response to crisis. Clearly, the project used the food crisis and extreme poverty in the area to justify their relief seed and tools intervention.

Design and implementation

Recent relief seed initiatives in Malawi have mainly taken three forms. One is direct seed distribution (DSD) for quick agricultural recovery following acute seed stress. Most NGOs have delivered seed directly to beneficiaries. CRS-CADECOM tried seed vouchers and fairs (SV&F) because, unlike DSD, seed fairs promote a decentralized choice of crop seed based on smallholder farmers' preferences in terms of type and amount. It also promotes diversification since the smallholder farmer has a wide range of choices.

In the case of CRS-CADECOM, the seed vouchers and fairs approach was used to give vulnerable households access to seed. Several activities preceded the actual seed fairs. One important activity was to conduct a quick survey to establish seed availability in the communities before conducting the fair. This was important to make sure that farmers would have seeds to sell. (It is worth noting that just the possibility of holding a seed fair is an indication that seed is locally available.)

A third type of seed initiative is encouraging community seed multiplication (CSM) schemes, which aim at establishing seed security in the long run. In CSM schemes, farmers who receive seed are generally

required to repay the seed, plus interest, at harvest. The recovered seed is stored and may subsequently provide insurance in case of future harvest failures. CSM schemes are often institutionalized into community seed-producer groups, where a group of farmers are trained in producing quality seed.

All of the NGO initiatives emphasized community participation in decision making. Farmers, through group discussions at the community level, were involved in reviewing the causes of food insecurity and were encouraged to identify possible solutions. Then they suggested possible crops and varieties of their choice. The communities also participated in choosing the primary beneficiaries. As a result, NGOs adapted their approaches to farmers' preferences and thus tried to ensure that they met the actual needs of the vulnerable households. Study findings through focus-group discussions in the communities and discussions with NGOs indicated that these initiatives not only served to restore seed security within the community, but also became ways of generating income for members of the communities. Although not explicitly stated, the choice that the NGOs made between DSD and CSM indicates that they are somehow aware of the distinctions between chronic and acute seed stress and that the chronic stress can only be resolved through building local capacity.

Concern Universal and CARE Malawi combined DSD and CSM. They argued that even though the immediate need was to respond to the rehabilitation of the seed situation after the crisis, their focus was beyond rehabilitation, towards self-reliance in seed supply. The example of Concern Universal, described above, is a case in point, where they combined the two roles by providing farmers with (maize and bean) seed to replenish lost stocks soon after the disaster, but also built seed banks, where farmers could store their seed, coupled with provision of irrigation equipment to make sure that farmers would be able to generate more seed in the future should drought strike again.

The types of crops that NGOs used in their rehabilitation activities (DSD/SV&F) were no different from those they used in CSM. For example CADECOM-CRS held SV&F that encouraged the exchange of various crops (open-pollinated maize, cassava, pearl millet, sorghum, beans, groundnuts, white potatoes, cowpeas, rice, soybeans, and pigeon peas), depending on which crops were grown in the area (CRS, 2003). While Concern Universal distributed only two crops (maize and beans), CARE Malawi had cassava, sweet potatoes, beans, and groundnuts.

From the project proposals, one gets the sense that for the SV&F, the focus of CADECOM-CRS was primarily on the rehabilitation of agricultural systems in drought-affected areas. By facilitating the appearance of a broad spectrum of crops and varieties at the fairs, they gave farmers access to varieties they would otherwise have lost. For CARE Malawi and Concern Universal, on the other hand, the aim was not only rehabilitation, but also to improve the self-reliance and food security of disaster-affected households by introducing new crops and varieties. Both organizations promoted the use of improved crop varieties. The proposal highlighted the need to offer farmers some high-protein and cash-income crops in addition to drought-tolerant crops, so that farmers would be better able to cushion subsequent drought effects.

Impacts of initiatives: Development, versus emergency, versus chronic stress

Farmers' perceptions

In the focus groups and individual interviews, farmers were asked about their perceptions of different seed initiatives. These discussions focused mainly on DSD and CSM (NGO seed programs) and SPI/TIP (government seed programs), since SV&F and APIP had a limited reach.

Communities largely preferred the NGO initiatives over those from the government. The targeting of NGO initiatives was considered more transparent, seed was provided in a timely manner, farmers were able to choose the crops they received, and the quality of the seed was superior. In addition, the NGOs provided extension services with their CSM program. Overall, the NGO seed programs were said to be more sustainable because the CSM approach provided an exit strategy, in strengthening the local capacity to multiply and share seeds.

Seed intervention initiatives in general have had a positive impact on cropping systems by promoting diversity in the number of crops as well as varieties grown. Farmers in all six areas in this study were unanimous in reporting that the seed interventions expanded the diversity of crops and varieties in their communities. This was consistent across the six sites and from both the focus groups and individual interviews, with 82% of the households interviewed reporting an increase in diversity. Most of the farmers were happy that they now had more crops and varieties than before.

However, the new varieties have been introduced at the expense of some old ones. Among the individual interviews, 71% of the respondents reported that some old local varieties were disappearing. Most notable were local maize and groundnut varieties. In all six study sites, the late-maturing local maize varieties were being replaced with new early-maturing varieties for food security purposes. Likewise, farmers were replacing local groundnut varieties with new ones, like CG7, because new varieties performed better than local ones under specific production constraints.

Regarding seed security, 47% of the individual farmers interviewed reported that the seed initiatives had contributed to seed security; hence, farmers were less worried about seed problems. However, the seed initiatives had varied impacts on farmers' ways of sourcing seed. The majority (69%) of respondents among the interviewees reported that they had changed their ways of sourcing seed because of the seed initiatives that had been implemented in their areas. For example, among individual interviewees, 44% of the respondents reported that they had reduced buying seed of the crops included in the program: open-pollinated maize, groundnuts (CG7), cassava (*Manyokola* and *Mbundumali*), sweet potatoes (*Kanchiputu*, *Kenya*, *Yoyera*), and new bean varieties (*Napilira*, *Khaki*, *Nanyati*, and *Nkhalatsonga*). It was reported that white potatoes had also been introduced recently through seed initiatives; however, farmers were not aware of the varieties. Likewise, the focus groups revealed that in all communities under study, farmers who had benefitted from the programs had either stopped or reduced buying or working for the type of seed that they had received (note that this kind of information is not reflected in figures 1 through 4 because they present a single cropping season and not a trend).

The discussions with farmers indicated that the seed initiatives had eased access to seed. If we take a social perspective, particularly in Malawi, where farm-saved seed is the predominant system and, more important, where poverty levels are very high, the reduced need to buy seed either through local or formal markets is a plus because it implies that farmers need to use fewer resources for seed. However, it is difficult to identify the long-term impact of the interventions.

Advocates of the formal seed system perceived these NGO or government seed interventions as a threat to the formal seed industry. DSD programs were said to have a negative effect on retail and household demands for seed. Tripp and Rohrbach (2001) reported that seed distribution programs had also discouraged the development of wholesale and retail trade channels because private seed companies preferred to sell large consignments of seed to a single buyer, like an NGO. Thus, any interest in the private sector in developing local channels for seed distribution would be reduced by the possibility that either government or an NGO would suddenly initiate a free seed distribution program.

In reality, however, the perceived threat is probably exaggerated. Not all farmers get seed from the formal seed markets anyway, and for those who do, it is mostly hybrid maize seed. Thus, both the formal and farmer seed systems have had and will continue to have a role in Malawi's smallholder agriculture.

Resilience of farmers' seed systems: Farmers' view

Through the focus groups, farmers were given an opportunity to express their opinion on how they would manage their seed problems in the absence of NGO or SPI/TIP seed interventions. Most of them, in five out of the six sites, suggested that they could still cope with the situation by using their farm-saved seed, supplemented by seed acquired through cash purchases from local markets or neighbors or exchanging seed for work. These responses revealed that farmers' seed systems would still maintain some resilience. However, it should be noted that farmers who rely on seed for work often plant late, as they have to wait until the seed owners have satisfied their own requirements.

The ability of institutions to respond to assumed or assessed impacts

Most institutions covered by this study have evaluated some of their previous interventions to look at the strengths and weaknesses of their programs. Based on the findings of such evaluations, they have responded by making adjustments.

Plan Malawi made a follow-up study on the possible impact of their previous seed interventions (Joseph Ndengu, personal communication, 2003). However, apart from identifying that certain new crops and varieties were adopted after being introduced by the interventions, specific social and economic impacts were difficult to establish. For example, because primary beneficiaries of the DSD were required to pass on a proportion of their harvest as seed to other farmers, there is reason to believe that there were a number of secondary beneficiaries. However, there was no proper record of this.

Another lesson for Plan Malawi has been to ensure that the seed of open-pollinated and self-pollinated crops is of good quality. In the past, they bought open-pollinated maize and self-pollinated legume seed from any registered seed grower or supplier (Joseph Ndengu, personal communication, 2003). The quality became difficult to verify when small traders, farmer groups, and associations supplied the seed, and it appeared that some suppliers sold grain as seed. To get around this problem, Plan Malawi started to make contracts with reputable organizations, such as ICRISAT, to provide quality basic seed of groundnuts and pigeon peas, which they used in their CSM programs. This has worked well and the quality of basic seed has been assured. Based on this, similar contracts to produce good-quality basic seed are now being extended to other organizations that can supply basic seeds of other crops, such as beans from CIAT and cassava and sweet potatoes from IITA-SARRNET.

Concern Universal has also evaluated its previous initiatives (Isaac Munro, personal communication, 2003). These have focused on seed sources and the performance of seed banks, among other things, and have had an influence on current seed programs. For example, there were negative experiences with centralized storage facilities, which made it difficult to ensure the quality of seed that farmers put into the

storage. To encourage the production and storage of quality seed, they recommend decentralizing seed banks to the communities, so that each community is responsible for its own seed.

Concern Universal also did a study on seed sources, which revealed that while farmers acquired seed from various sources, seed banks were ranked as one of the preferred sources (Senard Mwale, personal communication, 2003). Therefore, subsequent programs have built in more emphasis on seed banks to make them efficient, reliable, and sustainable.

Care Malawi relied heavily on the national agricultural research system for their supply of basic seed, which they used in their DSD/CSM programs. This worked well before the year 2002, when they faced serious seed shortages because, during the disaster year, the national research stations had committed most of the seed to government seed initiatives. As a result, the NGO had to access seed from unreliable sources, where quality (varietal purity) could not be guaranteed. After this experience, they decided to contract out the seed supply to reliable institutions or medium- to large-scale farmers.

ActionAid recorded experiences similar to those of Concern Universal with seed banks. However, their approach to improving the supply of quality seed at the community level, involved establishing community seed producer groups where selected farmers and farmer groups within communities were trained to produce quality seed of open-pollinated crops that should be reliable within the area. However, these suppliers were not equipped to market their seed, and in their subsequent programs ActionAid had to focus on training the seed suppliers in marketing skills.

CADECOM-CRS said their experience with DSD and SPI/TIP showed that the number of crops offered to farmers was too limited to cover the crops that farmers normally grow. To respond to this, they developed the SV&F approach, which provided access to a wider range of crops.

FAO had gone into seed multiplication by default rather than by design. This basically started after the 2002 food crisis and the call for crop diversification. Cassava multiplication was one area they got involved in. Their experience was that marketing was seen a problem; however, over time, structures were put in place to market the certified disease-free cuttings. In addition, farmers had to be trained in disease and pest identification so that they could identify diseases and pests in good time, to maintain quality production.

Discussion

In Malawi, extreme weather events like droughts and floods have caused acute stress to farmers' access to seed. Over the longer perspective, such vagaries of weather have added stress on livelihoods, depriving farmers of their resources. Thus, more households are experiencing chronic stress, which is manifested as poor access to seed, even in normal years.

Seed security

While a significant proportion of farmers employ formal markets for parts of their maize seed, the large majority of those interviewed in our study rely on the farmer seed system (farm-saved, local markets, relatives, and seed for work) for most of their crops. This was the situation even after the stress of the 2001/02 season. It is apparent that seed has always been available in the areas studied, even in times of stress. This is also illustrated by the observation that CADECOM-CRS were able to conduct seed vouchers and fairs that attracted a wide spectrum of seeds of different crops and varieties. This indicates that programs that import seed for relief aid, on the assumption that seed is not available, have been

mistaken. However, households under stress may not have the capacity to access seed in adequate quantities or of appropriate quality because the terms on which to access them can be prohibitively high.

Farmers' complaints of the poor germination of their farm-saved seed require attention. These claims may be related to poor genetic quality of the local varieties, thus suggesting that new genetic material (new varieties) should be introduced. However, the complaints may also be related to poor physiological quality of the seed, caused by inappropriate storage facilities. With only one cropping season per year, there is a long storage period before the next planting. Establishing proper seed storage facilities may contribute to solving this problem. Complaints about the maize hybrid delivered for winter TIP, which was said not to have been adapted, indicate that even improved seed may sometimes be unsatisfactory.

Seed-related interventions

Through the ADMARC system, farmers had been subsidized with cheap inputs, marketing support, and credit. The collapse of ADMARC and other subsidized institutions that provided credit for agricultural inputs, created a new operating environment for smallholder farmers seeking external sources of seed. Seeds from the formal sector became prohibitively expensive for smallholder farmers, with the result that most of them could only access local seed.

The authorities responded by establishing ad hoc forms of subsidies that provided interest-free loans (APIP) or free agricultural inputs (SPI/TIP). By disseminating certified seed, the SPI/TIP aimed at boosting agricultural productivity, and thereby *promoting* food security. However, in the face of recurrent emergencies, it is evident that households are vulnerable, which has led to yet another type of intervention, namely, seed relief, with the aim of *protecting* food security in the short run.

Responses from farmers who had benefitted from DSD or CSM interventions were generally positive. The general notion was that the programs had helped to reduce seed insecurity and, therefore, improved food security. Farmers had positive perceptions of the seed they received through DSD, and they commended the programs because they were open to local involvement. Further, the farmers commended the CSM initiatives because they were directed at strengthening local capacity to secure quality seed. However, these favorable responses are subject to serious questions. First, there is a human element to such responses where the beneficiaries respond favorably with the hope of continued support from the program. The second is related to the sustainability of the CSM activities. What becomes of the CSM scheme when everyone in the community has acquired the seed of their choice?

Generally, NGOs in Malawi have become involved in seed interventions as a response to the government's call for assistance following the 2002 disaster. While the call was primarily for food, there was also an urge to provide seed for agricultural recovery. NGOs did not undertake in-depth diagnoses of the impacts of the disasters on seed systems, but made quick assessments to justify funding from donors. Because of time pressure, these were based on indicators of food insecurity; . the situation in regard to seed insecurity was not assessed *per se.*

Based on the findings reported here, it can be said that the justification and design of NGO seed interventions in Malawi have been based on somewhat ad hoc approaches. The information that is collected to guide the interventions has been based on assumptions and informal inferences rather than structured assessments. NGOs don't employ a wide repertoire of alternative interventions; rather, they seem to follow certain approaches as a blueprint and employ them by default. In general, DSD was undertaken whenever a seed shortage was diagnosed, while CSM and the establishment of seed storage facilities were employed to facilitate seed security in the long run. The exception was CADECOM-CRS, who tried seed vouchers and fairs.

Ideally, different seed problems should call for different seed interventions. Among the specter of acute or chronic stress conditions and problems of access to or quality of seed, there are various options for responses (Sperling 2002). While DSD would be appropriate whenever there is a failure in the seed supply—where seed is unavailable—it may not be the most appropriate response when there are access problems. Even though most NGOs have a sense that DSD and CSM may fulfill different objectives and play a role in different circumstances, they generally have a narrow sense of the differences between stresses. This limited knowledge may contribute to the low repertoire of approaches that organizations employ. However, NGOs seem keen to learn from experience, as indicated by the adjustments that have been made to the standard approaches over time.

In the cases of TIP and SPI, seed distributions were used as a development tool to jump-start agricultural production, and not to resolve an emergency situation. In these programs, the implicit goal seems to be one of substituting the farmer seed system and traditional varieties with the formal system and improved varieties. There is reason to question the sustainability of such approaches. SPI was meant to be one- off, to jump-start agricultural growth by showing farmers that good seed and fertilizer could make a difference in food security at the household level. However, the program has been recycled several times (also in the form of TIP), without any convincing long-term impact. Agricultural productivity did increase in the short term, but no sustained increase in production can be detected. Farmers complained about the approach, and the blanket distributions made it difficult for the approaches to target specific seed problems.

It is worth noting that the various seed interventions described in this study have different impacts on the resilience of the farmer seed system. The government seed interventions (SPI/TIP) have all included hybrid maize, which cannot be recycled. However, farmers seem to acknowledge the yield advantage of hybrids compared to local cultivars or open-pollinated varieties. The NGO seed initiatives (DSD and CSM), on the other hand, have focused on improved seeds of open-pollinated maize, self-pollinated legumes (groundnuts, beans, and soybeans), and vegetatively propagated crops (white potatoes, sweet potatoes, and cassava), which potentially add crop diversity at the household level.

By creating artificial access to inputs, there is a danger that seed interventions may actually undermine the local systems and traditions for securing seed—systems that households may be dependent upon in the absence of external assistance. On the other hand, subsidies and interventions may already have significantly altered the local seed and livelihood systems in Malawi, creating a situation of dependency on such assistance. Having said this, the study showed that even during disaster years, farm-saved is the largest component of all means of seed acquisition. And clearly, farmers have coping mechanisms, even under what policymakers might perceive as the worst scenario.

Conclusions and recommendations

The following factors are critical for the success of seed relief interventions, such as DSD:

- timeliness
- amount
- appropriateness
- targeting

A diagnosis of the impacts of disasters on seed systems is important to ensure that interventions are justified and to guide their design and implementation so that they meet the actual needs of farmers. Diagnoses must be sensitive to differences across crops and across, as well as between, households and communities.

Local involvement is important for both diagnosing the problem and implementing any intervention.

While disasters may cause severe stress to local communities, local systems for securing seed often show remarkable resilience. Rather than intervening in the field of seed, it may often be more worthwhile spending efforts to relieve other stresses.

When the need for seed interventions is established, NGOs seem to jump to DSD and CSM by default because they are logistically simple. Depending on the type of seed problem, other options, such as SV&F, might be more appropriate to meeting farmers' needs.

Seed insecurity and, especially, chronic seed insecurity should not be viewed merely as seed problems but, rather, within a livelihood context. Appropriate seeds are often available even in emergencies, but farmers cannot access them because their resources are insufficient. Rather than looking at seed as an isolated issue and thereby coming up with seed-based interventions, non-seed approaches may be more appropriate to alleviate such general stresses. It may be relevant to view the use of both DSD and CSM in this light. Rather than seed, as in the case of DSD, farmers should be provided with general resources with which they can access local seed or meet other priorities. Rather than establishing new networks, as in the case of CSM, maybe efficient networks for seed production and exchange already exist, the problem being that livelihood stress leaves no potential for accessing them.

In Malawi, two sets of highly subsidized systems (ADMARC and SPI, both targeted on the supply side) may have distorted both commercial systems and farmers' own management of the seed supply. This may have undermined local systems and resulted in a high dependency on external subsidies, which, again, may be one reason it is difficult to find an exit strategy from recurrent seed interventions.

Acronyms

ADMARC	Agricultural Development and Marketing Corporation
APIP	Agricultural Productivity Investment Programme
CADECOM	Catholic Development Commission of Malawi
CIAT	Centro International de Agricultura Tropical
CRS	Catholic Relief Services
CSM	community seed multiplication
DDPRR	Department of Disaster Preparedness, Relief and Rehabilitation
DFID	Department for International Development, UK
DSD	direct seed delivery
ELDP	Evangelical Lutheran Development Programme
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
ICRISAT	International Center for Research in the Semi-Arid Tropics
IITA	International Institute for Tropical Agriculture
NGO	nongovernmental organization
SADC	Southern African Development Community
SACA	Smallholder Agriculture Credit Administration
SARRNET	Southern African Roots and Tubers Research Network
SV&F	seed vouchers and fairs
SPI	Starter Pack Initiative
TIP	Targeted Input Program
UK	United Kingdom
WFP	World Food Program

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Relief Seed Assistance in Zimbabwe

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Abstract

Zimbabwe has been a recipient of food or seed aid since the 1990/91 drought, considered one of the worst in 100 years. At present, as in the past, interventions aimed at agricultural rehabilitation and recovery have focused on direct seed distribution ("seeds and tools"). While these interventions are being modified to better address the needs of farmers recovering from disaster, they are still based upon the premise that the emergency has resulted in a loss of seed and other assets, and there is a need to supply them. This study of relief seed interventions in Zimbabwe addresses a number of issues: (1) the effectiveness of the past agricultural recovery response to disasters, (2) knowledge of farmers' seed systems, (3) changes in seed systems as influenced by relief seed distributions, and (4) the cause of the continual need for seed assistance.

The survey reported here found that the seed requirements for households were less than those generally recommended by the technical guidelines used in macro-level seed assessments, especially for legume crops. Households obtain most of their seed from own saved seed and the local market for all crops but maize. For maize, seed obtained from the formal sector is most important. Seed security for households in the survey was dependent on availability of own saved seed and access to seed channels outside the home. Maize appears to be the exception for the use of various seed channels, especially in relation to the formal sector seed. Thus, seed needs assessments that focus on maize have a bias towards seed demands from the formal sector.

The Zimbabwe seed industry is one of the largest in Africa and is a major supplier of relief seed in the region. Much of this seed is produced by smallholder farmers and also distributed to smallholder farmers for emergency relief programs, often by the same NGOs in the same areas. While this increase in seed supply and the enhanced links to the formal sector has increased the supply of seed to the relief market and increased the value of the relief seed market to Zimbabwe seed companies, it has not increased the supply of local seed or enhanced access to local seed for rural smallholder farmers. There is a critical need for alternative responses that will strengthen the local seed system and its links to the formal sector, with increased emphasis on seed enterprise development at the local level.

Introduction

Zimbabwe has a history of recurrent droughts. In the last 20 years, significant droughts occurred in 1982/83 (700,000 people affected), 1991/92 (4.6 million people affected), 1994/95 (5 million people affected), and 2001/02 (6.1 million people affected). This frequent loss of food production, and the subsequent need for recovery, has reduced household assets, increased vulnerability and stressed coping mechanisms. Recurrent droughts have also contributed to a rapid decline in the economic status of the

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country. A study done by the World Bank (Alwang, Mills, and Taruvinga, 2002) on the changes in poverty in Zimbabwe in the 1990s and its causes found that the percentage of people living in extreme poverty increased from 26% in 1990 to 35% in 1995. This increased poverty was closely tied to economic restructuring and the poor performance of the economy. There is evidence that ownership of physical assets has been slow to recover from the impact of the drought of 1991/92. In addition, the country faced a political crisis in the late 1990s which severely affected the competitiveness of the economy (International Crisis Group, 2002). The political crisis also severely affected the policy environment that is necessary for the alleviation of poverty and the facilitation of rapid recovery from drought. All of these have contributed to the current chronic complex emergency in Zimbabwe.

Since the end of 2001, FEWS NET, FAO/WFP, IFRC, UN-RRU, and other organizations have conducted numerous assessments of the current emergency food situation in the Southern Africa region. These assessments have confirmed an increasing food crisis in the region due to a combination of factors, including (1) drought and unusual rainfall patterns, (2) poor harvests from previous years, (3) reliance on a single staple crop (maize), (4) a continuous decline in economic conditions, and (5) detrimental government policies. Government policies and regulations, such as food price controls, a monopoly on maize marketing by the Grain Marketing Board, and the high duty on small grains, inhibit access to food in general. The government's fast-track land reform policy has severely curtailed commercial cereal production, contributing to a decline in grain reserves. The emergency food situation is exacerbated by the fact that considerable portions of the population in the country are particularly vulnerable because of high levels of chronic malnutrition and HIV/AIDS. (Zimbabwe has one of the highest HIV/AIDS rates in the region, at 25.1% of the population).

Zimbabwe has been a recipient of food and seed aid since the 1990/91 drought—considered one of the worst in 100 years. Donors, NGOs, and the government have used many approaches to assist farmers in recovering from the immediate emergency and to rehabilitate the agricultural sector. While these individual efforts may have alleviated the short-term needs, none of them have resulted in longer term improvements that would have mitigated the impact of the current drought and economic crisis, which once again threatens the lives and livelihoods of Zimbabwe. At present, as in the past, agricultural rehabilitation and recovery interventions have focused on the distribution of "seeds and tools." This response has become the standard programmed response after initiation of food aid (also see discussion in IFPRI, 2002).

Description of case study

Direct seed distributions (seeds & tools) are being modified to better address the needs of farmers recovering from disaster. However, they are still based upon the premise that the emergency has resulted in a loss of key assets and, since these are not available, there is a need to simply supply them.

This study of the relief seed approach in Zimbabwe will address a number of research questions:

- How do donors, relief agencies, government agencies, and farmers respond to the need for agricultural recovery from disasters?
- What are the attitudes towards and knowledge of farmers' seed systems?
- How has the formal seed system changed, influenced by the development of a relief seed approach?
- If a direct seed distribution is an intervention to assist agricultural systems in recovering from a drought or other disaster, then why is there always another request for seed assistance?

The evidence collected included a review of key documents, especially those by Mheen-Sluijer (1996) and Gwarazimba (2002a,b), and key informant interviews with the SADC Regional Seed Security Network, SADC/GTZ, FAO Emergency Unit for Zimbabwe, LEAD, ZACH, Agricultural Seed and Services/Nhimbe Seed Ltd., Mayfly Trading, ZFU-Binga, Hwange District AREX office in Binga, KMTC in Binga, UN-RRU, EURONAID, CIMMYT, ICRISAT, FEWS NET, SCF-UK, CRS, World Vision, and Plan International. Questionnaires were administered to farmers, market traders, and government officials in the Binga and Nyaminyami Districts with SCF-UK and in six districts with CRS-Zimbabwe and CTDT.

Seed aid in Zimbabwe

Seed assistance has been a response to disasters since independence in 1982. The Government of Zimbabwe and other donors have routinely assisted farmers in recovering from the civil war, droughts, floods, and other disasters that have had an impact on crop production. These distributions have included seed, tools, implements, livestock, and fertilizers. Direct assistance has become an annual response in many areas of Zimbabwe. The approach has been refined over the years with more and more emphasis on improved assessment and targeting. The current relief seed approach for Zimbabwe is shown in box 1. A description of the regional relief approach can be found in a review available from the SADC Seed Security Network (Gwarazimba, 2002a).

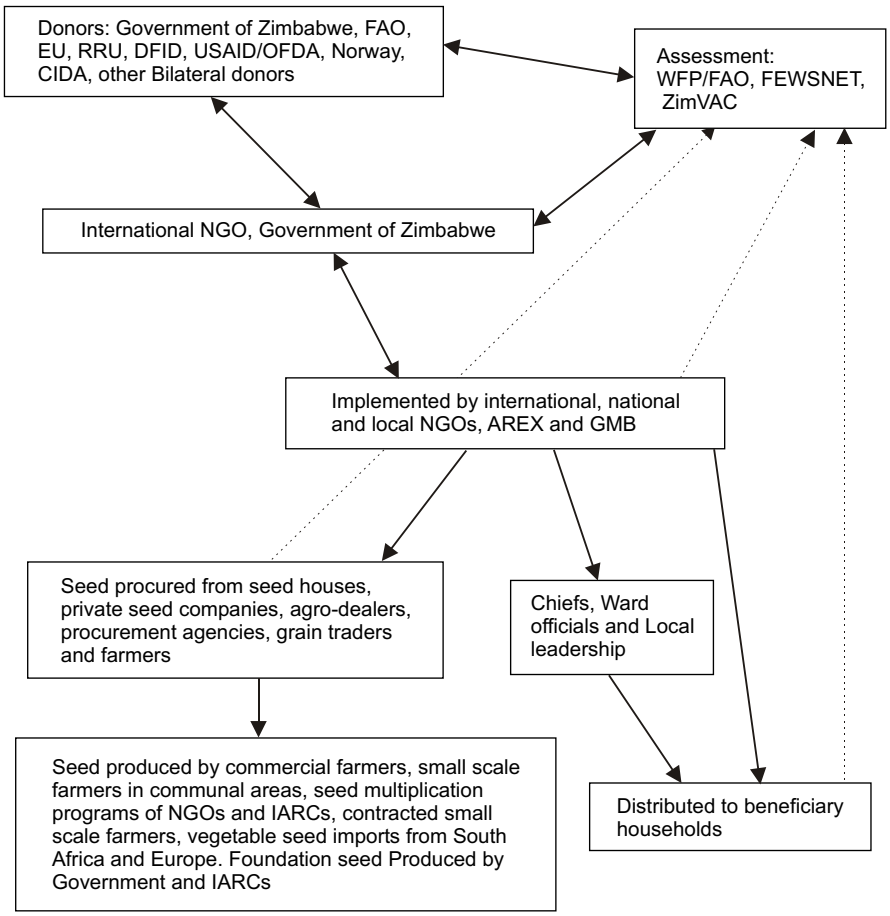
Seed aid donors include international organizations, such as UNDP-RRU and FAO and bilateral donors, including USAID/OFDA, DFID, CIDA, EU, Norway, Sweden, Netherlands, and others. Additional support comes from NGOs and Zimbabwe government funds through the Grain Marketing Board (GMB). Assessments are currently done by four groups in Zimbabwe, who use many of the same sources of information. Seed distribution projects are developed by FAO, NGOs, and the Government of Zimbabwe and implemented by international, national, and local NGOs, AREX, and the GMB. Seed is procured from the formal sector (national and regional seed houses, seed companies, and agro-dealers) and from grain traders. This year, for the first time, seed was sourced directly from farmers. Seed procured for relief seed distributions has been produced by commercial farmers, both large scale and small, by seed multiplication projects, and by contract farmers.

Seed needs assessments

A number of analyses have been carried out on the emergency situation in Zimbabwe, its root causes, and the complex nature of the crisis (Christian Aid, 2002; IFPRI, 2002; IFRC, 2002; OXFAM, 2002; WFP, 2002). A quantitative analysis of the food crisis has been done by FEWS NET (2002), which included an assessment of the crop and livestock situation at a district level. Separate analyses were presented on the status of production and access to food by four groups: communal areas, resettlement areas, farm workers, and urban areas. This analysis looked in depth at the status of reserves and at food availability for the 2002/03 consumption year. It took into account a wide variety of foodstuffs and looked at access from income-generating options, such as cash crops and livestock. It did not look at input needs, such as seed or fertilizers, for the 2002/03 production year.

The FAO/WFP (2002) crop assessment mission used key informant interviews, field visits, remote-sensing data on rainfall and vegetative indices, and interim assessment reports produced by other organizations. They also used secondary data to confirm all their field results and come up with estimates of the population affected and seed needs. These are mainly based on estimates of crop and

Box 1. Seed Relief Approach in Zimbabwe



livestock production, vulnerability, food availability, and market prices, compared to previous years and 1991/92, as the worst drought year. No specific assessment of seed needs has been done, but the seed requirement is predicted based on crop status and food availability. This same methodology was used in 2002/03 and 2003/04 (FAO/WFP, 2003).

The Zimbabwe National Vulnerability Assessment Committee (ZimVAC, 2002a,b, 2003) also does seed needs assessments, based on the status of maize seed available and sales from the formal sector. They also use estimates of area to be planted to minor crops such as millet, cotton, groundnuts, and maize. They estimate the percentage of farmers who plan to plant the crop and assume a constant value for total area planted by each farmer to get a percentage of the area to be planted to each crop, which is then used to estimate seed requirements for each crop. The total seed needs are then based on the percentage of households with no seed to plant from retained seed. They then looks at input supply versus seed needs in the formal sector.

The 2003/04 ZimVAC household survey asked a number of questions on availability and access to agricultural inputs (box 2). There are three questions on seed availability and access for main cereal crops and cash crops. While the questions were asked, the analysis presented in their report does not refer to the responses to these questions.

Box 2. ZimVAC questions on seed

125. Did you have enough seeds for your main cereal crop in the last 12 months? No, yes, N/A

126. If not, what was the reason?
- could not afford to purchase
- was not available in the market
- both of the above
- other

127. What was the main source for the seed that you used? (one answer only)
- from last harvest/retained seed/carry over
- purchased
- provided by NGO
- provided by government
- gifts/remittances
- other

128. Did you have enough seed for your main cash crop? No, yes, N/A

129. If not what as the reason?
- could not afford to purchase
- was not available in the market
- both of the above
- other

In addition, FOSENET, a national NGO comprising a food security network of 25 organizations that cover all the districts of Zimbabwe, consolidates the monthly monitoring reports from individual NGOs and reports these results three to four times a year. They report on the status of seed distributions, crop status, and seed needs for the next season based upon observations in the field.

Mpofu (2002) described a macro-level approach to assessing seed needs in southern African countries affected by the floods in 1999/2000. The procedure estimates the total affected area and population in need of assistance. The crop need and crop calendar are also considered in the estimates of need. In this assessment, a questionnaire was sent to country focal points, seed companies, and seed projects. A mission was also sent to each of the affected countries to talk to government officials, NGOs, donors, and seed companies. Finally, there was a review of relevant background information. The crop seed needs were calculated as the total area to be planted times the government recommended seeding rate for each crop. The total cost of the seed needed was the seed needs times the number of households affected times the transport cost. The seed availability was determined from the supply available from the private or public sector in each country. Thus, the assessment was able to recommend where seed was available for distribution. This is a macro-level analysis that looked at theoretical need versus actual supply. It did not look at actual demand.

One assessment, done by CRS/CTDT for their planned seed voucher and fair distribution in 2002/03, did focus on seed needs in both the farmer and formal seed sectors (Takavarasha, Vudzijena, and Madondo, 2002). They used focus-group discussions and key informant interviews with AREX, CTDT, RDC, DA, and farmers. To determine the need for seed, they asked about cropping patterns, most important crops grown, preferred varieties, and quantities required by crop/variety. To determine the local seed supply,

farmers were asked about seed quantities available locally. There was a reluctance among households to report on home-saved seed or the availability of seed from other local farmers. Thus, in all districts assessed, farmers claimed that the local seed supply had been severely affected by the drought. This highlighted one of the major constraints to determining seed supply at the household or local level.

The focus of macro-level assessments of the country's seed needs is on calculated seed needs versus actual local demand for seed. Thus, the assessment that seed is needed is based on a perceived shortfall in supply rather than on demand, since local farmers' demand for seed is not entirely from formal-sector suppliers. All the assessment methods reviewed assumed that all households in an area (national, district, or ward) are equally affected by the drought or flood. In general, it is assumed that all households have a similar demand for seed of different crops/varieties, have the same seed requirements per hectare with no difference in cropping system or land type, and need the same quantity of seed assistance, since all have lost seed. The demand is also assumed to be constant, with little recognition of a farmer's use of alternative crops during recovery. Fluctuations in area to be planted are assumed to be influenced only by the seed shortage. For crops other than maize, it is assumed that part of the demand will be met with home-saved seed and that poor crop production has an adverse impact on the supply of home-saved seed. Since it is assumed that the seed loss has resulted in non-availability of seed in the local area, no assessment of the impact of the disaster on access or quality is made. Access to seed is based only on an assessment of the price of formal seed, which is assumed to be the only seed supply available to meet the seed needs of the affected farmers.

Farmers' seed system

Agricultural rehabilitation interventions with direct seed distributions are based on an assumption that all food-insecure households are also seed insecure, i.e., that seed is not available, they lack the capacity to acquire seed, and all crops are equally affected (Longley et al., 2002). Current approaches to agricultural rehabilitation tend to ignore or discourage alternative responses, which may be more appropriate. This is done on the grounds that alternatives are more suited to a "development" context. The result is the repeated fabrication of an artificial supply of inputs over a finite period of time, which changes traditional household strategies for seed management and existing seed markets (both formal and informal). In turn, this may prolong the need for "emergency" assistance and further divert donor support for longer term interventions.

Relief agencies in Zimbabwe do not carry out assessments of local seed systems. Rather, the decision to respond with a direct seed distribution is based on numbers of affected or vulnerable households and potential area to be planted. In Zimbabwe, as elsewhere in Africa (Remington et al., 2002), lack of availability is the most common misdiagnosis and is based on the assumption that lack of availability of food is equated with lack of availability of seed. A lack of access is neither diagnosed as the primary constraint nor considered in the design of interventions. Utilization (referring to the quality of both seed/planting material and varieties) is also rarely diagnosed as the primary constraint.

Remington et al. (2002) concluded that, "In summary, the precedence for the determination of food unavailability, the complexity of diagnosing a lack of seed access, and the challenge of addressing access all contribute to the avoidance of the access determination." This does seem to be the case for Zimbabwe. The only exception was the SADC Seed Security Network report (2002) that described the seed situation in Zimbabwe for 2002 as "adequate to surplus" for cereals and pulses, except for minor problems with groundnuts, millet, and beans. Since retained seed is important for these crops, it is probable that the seed supply was adequate. SADC assumes that when there are no harvestable

surpluses, households will lack the cash to purchase seed, resulting in an access problem. This is very different from the assumption of other assessments that the lack of harvestable surplus indicates a lack of seed at the household level, resulting in a diagnosis of lack of availability.

Household seed security

Survey

The diagnosis of seed insecurity at the household level depends on an understanding of household seed systems and security. Therefore, a survey was conducted (1) to describe the community and household seed system in the context of seed security, (2) to evaluate household experiences with seed assistance, and (3) to determine the role of farmers and grain traders in the local seed system. Interviews were done with individual farmers and with farmers and grain traders who sell seed and grain. These interviews were conducted in Chiredzi, Lupane, Tsholotsho, UMP, Makoni, and Murewa districts (all of which had been targeted in 2003/04 for a seed vouchers and fairs intervention by CRS-Zimbabwe and CTDT) and two districts (Binga and Nyaminyami) where a direct seed distribution had been implemented by SCF-UK in 2002/03. A total of 380 farmers and 92 grain or seed traders were interviewed.

The farmer surveys consisted of a set of questions to quantify individual farmer and community seed security. Questions were asked about the components of the system in relation to asset base, seed requirements for planting, value of crops to household, seed source channels used, seed conservation, and experience with seed from outside the household (from the market and relief or development seed programs). Longley et al. (2002) describe the development of a seed system profile that utilizes a similar approach to seed system security. These surveys and questionnaires were developed further with questions on household vulnerability and wealth from surveys carried out by SCF-UK for monitoring household food security (SCF-UK, 2003). A report is available for the seed security assessment in Binga and Nyaminyami (Bramel, 2003a). Information on possible indicators of household vulnerability from the impact of HIV/AIDs was added with input from a study done for four countries (SADC FANR Vulnerability Assessment Report, 2003). In addition, studies of seed system security commissioned by SADC/GTZ were used to frame the questions (Mheen-Sluijer, 1996).

Mheen-Sluijer (1996) reported on a study of household seed security in the semiarid districts of Tsholotsho and Chiredzi. Seed security was defined as the ability of households within specified geographical boundaries to meet seed needs from their own enterprise production or through purchases from domestic markets. A household was seed secure if it had an adequate supply from its own production or had cash to purchase supplementary seed. Since seed security was related primarily to household production levels, Mheen-Sluijer concludes that household seed security is related to crop-protection practices, farmers seed selection practices, seed storage practices, and the value of seed to the household versus its food value. She also concludes that the most important factors for seed security are timely planting, appropriate farming practices, pest and disease control, and appropriate varieties that contribute to maximum crop production and adequate seed availability at the household level.

Crop production

Most of the crop production in Zimbabwe falls into three agroecological zones, which are referred to as natural regions (NR). Two of the surveyed districts, Makoni and Murewa, are classified as mainly Natural Region III (NR3), which is characterized by a long growing season, favorable rainfall and temperatures, and low probability of crop failure. This is the most productive natural area of Zimbabwe

for agriculture. The other six districts are mainly classified NR4 and NR5: the semiarid to arid areas of Zimbabwe, where the growing season is shorter, the temperatures are high, and rainfall is low, with a high probability of crop failure. In many of these areas, farmers practice animal production more often than crops. The households surveyed were asked to rate the crop production for the last three cropping seasons (figure 1). In 2001, crop production was average in high-potential areas but below average in the semiarid areas. In 2002, both ecologies were affected to nearly the same degree and were much below average. Then in 2003, crop production in the high-potential area was rated as average, but the semiarid areas were again much below average. If household seed security is related to crop production, seed security in the 2003/04 season should be recovering in the high-potential areas but should still be problematic in the semiarid areas because of the three consecutive years of below- or greatly below-average crop production.

Household seed security

Farmers in the survey were asked about land holdings, areas planted to various crops, and the quantity of seed required to plant a specific area, based on the normal (1999) season. The mean plot size and quantity of seed required (in kilos) for the household was summarized for each agroecological area separately (table 1). There were different crops grown by the farmers in the two ecologies, different areas planted, and different seed requirements, except for groundnuts and bambara nuts.

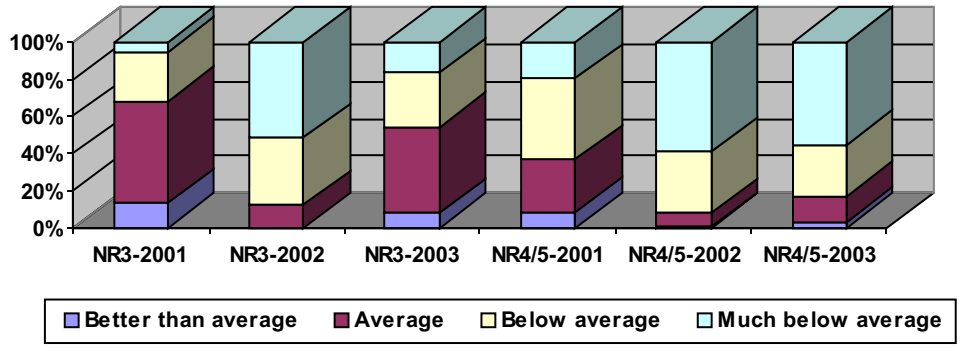


Figure 1. Farmer ratings of crop production in NR3 (high potential) and NR4/5 (semiarid) for the 2000/01, 2001/02, and 2002/03 seasons

Table 1. Mean Plot Size and Seed Required for Maize, Sorghum, Pearl Millet, Finger Millet, Cowpeas, Groundnuts, Beans, and Bambara Nuts in High-Potential (NR3) and Semiarid (NR4/5) Areas

Agro-ecology	Plot size (ha)	Seed Requirement (kg)	Plot size (ha)	Seed Requirement (kg)	Plot size (ha)	Seed Requirement (kg)	Plot size (ha)	Seed Requirement (kg)
	Maize		Sorghum		Pearl millet		Finger millet	
NR3	1.49	26.5	1.35	5.8	1.08	7.5	1.09	4.1
NR4/5	2.65	33.0	1.77	11.3	1.88	10.3		
	Cowpeas		Groundnuts		Beans		Bambara nuts	
NR3	1.19	2.0	0.96	16.0	1.37	13.5	0.9	8.0
NR4/5	0.76	4.0	0.97	12.9	0.73	9.5	1.1	7.8

In both regions, maize was planted on the largest plots, and required the greatest quantity of seed. Groundnuts also required a larger quantity of seed. Except for maize, the cereal crops have a high seed-multiplication rate, while legume crops have a very low seed-multiplication rate (ODI Seeds and Biodiversity Programme, 1996). Crops that have a higher seed requirement and/or a lower seed-multiplication rate may be more seed insecure because of the need to save a higher proportion of the previous harvest and the difficulty in storing larger quantities of seed. Crops that require less seed and have high seed-multiplication rates, such as sorghum, pearl millet, and finger millet, are more seed secure and recover more quickly from crop losses.

Seed requirements are dependent on the agroecological zone, specific crop, cropping system, and area planted. The recommended seed requirements for maize (33kg/ha), sorghum (8kg/ha–12kg/ha), and pearl millet (8kg/ha) for the farmers in NR3 were nearly equivalent to those used by the farmers in the survey. The seed rates used by farmers in the semiarid areas were lower than the recommended rates, except for finger millet (4kg/ha–6kg/ha). The seed requirements given by households for cowpeas, groundnuts, beans, and bambara nuts are very low compared to the recommended seed requirements (90kg/ha–120kg/ha). This is probably due to the common use of intercropping for these crops. It appears that the estimates of seed needs used for the macro-level assessments commonly used in Zimbabwe overestimate the seed required by households for crop production in the drier production areas and for the legume crops.

Sources of seed

Mheen-Sluijer (1996) reports that in addition to own saved seed, seed of traditional varieties could be gifted, purchased, and exchanged or bartered from one's neighbor or others locally. Households can purchase commercial seed from private retailers or receive it from the government (the Grain Marketing Board) or NGOs. Households can use one seed source or a combination of seed sources. The importance of each source is determined by household experience; in normal years households use the most trusted sources. The impact of any disruption in normal farming practices can result in reduced availability or reduced access to a preferred source and an increased demand for seed from alternative sources. These seed sources are referred to as seed "channels." The normal demand for seed from specific channels is determined by each household for each crop grown. In addition, the demand for seed from the various channels for the 2003/4 season was also determined by each household.

Maize was the most frequently grown crop in the survey. In the high-potential areas, 99% of the farmers surveyed grew maize, while in the semiarid areas, 97% did. The second most important crop in the high-potential areas was groundnuts (grown by 74%) and the second most important crop in the semiarid areas was sorghum (71%).

Few households use own saved seed exclusively (figure 2). Most—in both the high-potential and the semiarid areas—use multiple channels to access maize seed, acquiring it from commercial sources for part of their seed needs. In normal years, a quarter of all farmers in the high-potential areas source all their maize seed at the local market, and a quarter of farmers in the semiarid areas acquire commercial seed from GMB and retailers. Maize seed sourcing in 2003 remained virtually unchanged in the high-potential areas; however, in the semiarid areas, more farmers used multiple sources and acquired commercial seed from NGOs. This was matched by a sharp reduction in seed sourced exclusively from GMB and retailers and from the local market.

For all other crops, farmers in the high-potential and in the semiarid areas used different sources for seed in normal years and following drought (table 2). Own saved seed is an important seed source for small farmers in both ecological regions. For example, in the high-potential areas, farmers rely almost

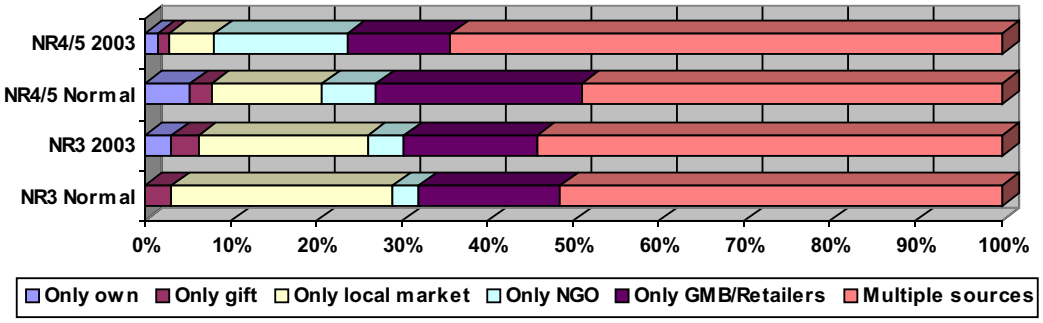


Figure 2. Proportion of households utilizing one seed source or multiple seed sources for maize under normal seasons and in 2003/04, for NR3 (high-potential) and NR4/5 (semiarid) areas

exclusively on own saved seed for finger millet and source the majority of their seed for groundnuts (63%), beans (58%), bambara nuts (68%), and pumpkins (84%) from their own stock. In the semiarid areas, almost half of all farmers rely exclusively on own saved seed for groundnuts (49%), sorghum (42%), and pearl millet (49%).

The drought disaster resulted in reduced availability and reliance on own seed. This reduction was compensated by greater reliance on multiple sources, including NGOs and the local market. For example, in the high-potential areas, seed sourced from NGOs and the government increased from 0% to 9% for finger millet and from 0% to 13% for bambara nuts. In the semiarid areas, it increased from 8% to 13% for sorghum and from 5% to 12% for pearl millet. Groundnut seed sourced from the local market increased from 10% to 14% in the high-potential areas and from 10% to 17% in the semiarid areas.

In cowpeas, the use of own saved seed increased with the drought, and the use of seed from NGOs and the government decreased. This is because cowpeas were given as seed assistance in 2002/03 by SCF-UK, which may have contributed to an increased household seed supply and reduced demand for outside seed.

One other strategy used by households to respond to the loss of own saved seed or reduced access to seed outside the home is to switch to a different crop. Generally, there were very few households who planned to change their crop mix from normal after the two years of drought. Thus, the shift to alternative seed channels was a strategy used more frequently to respond to the drought than changing crops.

Seed conservation

The ability to produce one's own seed is critical to household seed security. However, to benefit from this retained seed, the producer must also be able to use seed-saving practices that maintain varietal integrity and seed quality. Households were asked about their seed selection and conservation practices at present and in the past. Significant changes could indicate increased seed insecurity. Surveyed households described a number of traditional methods used to conserve seed. In the high-potential areas, 88% of households used chemical seed treatments, a practice that had not changed in the previous five years. Although only 22% of farmers in the semiarid areas used chemical seed treatment, 16% used traditional treatments like tobacco, goat dung, ash, and shrub leaves.

Mheen-Sluijer (1996) found that many of the respondents in her surveys felt that their varieties had degenerated over the years. This loss in varietal quality was attributed to poor seed selection. In response

Table 2. Use of Seed Sources by Households in NR3 (High-Potential) and NR4/5 (Semiarid) for Finger Millet, Sorghum, Pearl Millet, Groundnuts, Beans, Cowpeas, Bambara Nuts, and Pumpkins, Normally and in 2003

	NR3		NR4/5	
Seed Channels	**Normal**	**2003/04**	**Normal**	**2003/04**
	Finger millet		**Sorghum**	
Only own	96.9%	88.2%	41.7%	31.1%
Only gift	0.0%	0.0%	9.4%	6.8%
Only local market	3.1%	2.9%	5.0%	6.8%
Only NGO/government	0.0%	8.8%	7.9%	12.8%
Multiple sources	0.0%	0.0%	36.0%	42.6%
	Groundnuts		**Pearl millet**	
Only own	63.4%	62.0%	48.6%	19.8%
Only gift	2.8%	2.8%	9.5%	2.5%
Only local market	9.9%	14.1%	0.0%	3.7%
Only NGO/government	7.0%	7.0%	5.4%	12.3%
Multiple sources	16.9%	14.1%	36.5%	61.7%
	Beans		**Groundnuts**	
Only own	57.7%	46.2%	49.0%	38.9%
Only gift	0.0%	0.0%	4.1%	5.6%
Only local market	19.2%	11.5%	10.2%	16.7%
Only NGO/government	15.4%	15.4%	8.2%	9.3%
Multiple sources	7.7%	26.9%	28.6%	29.6%
	Bambara		**Cowpeas**	
Only own	67.7%	60.0%	37.9%	44.4%
Only gift	0.0%	0.0%	3.4%	3.7%
Only local market	22.6%	16.7%	10.3%	11.1%
Only NGO/government	0.0%	13.3%	31.0%	18.5%
Multiple sources	9.7%	10.0%	17.2%	22.2%
	Pumpkins			
Only own	84.2%	64.7%		
Only gift	10.5%	11.8%		
Only local market	0.0%	17.6%		
Only NGO/government	0.0%	0.0%		
Multiple sources	5.3%	5.9%		

to the question, "How has varietal quality changed?" 38% of the households responded that it had. Many indicated that they were currently using earlier maturing maize hybrids than in the past. Few respondents referred to changes in their own saved seed varieties or crops. The conclusion is that although varieties have changed, there has been no significant deterioration.

Conclusions

In summary, the seed requirements for the surveyed households was less than the quantities indicated in the technical guidelines used for macro-level seed assessments. This was especially true for legume crops that are routinely intercropped. While a high proportion of households use only own saved seed, except for maize, the use of multiple seed channels is very common, especially when crop production has been poor. Current seed selection and conservation practices did not seem to indicate any negative impact on seed or varietal quality. Thus, seed security for households in the survey was dependent on the availability of own saved seed and access to seed channels outside the home. Because households do not use own saved maize seed, seed needs assessments that focus on maize distort the assessment with a bias towards the formal sector.

Relief seed assistance

Mheen-Sujier (1996) observed that farmers preferred free seed distribution over using their own saved seed. Farmers actually waited for the seed distribution, with the result that they planted late. This reduced yields, resulting in less seed saved for the next season. She suggested that the dependence on free seed distributions created a temptation for farmers to consume their own seed. The conclusion is that seed packs have decreased household seed security and farmer reliance on own seed self. Though this study was conducted in 1996, it is likely that the situation has not changed, especially for maize, which is routinely given by the government and NGOs.

Local government officials and farmers were interviewed about their knowledge and appreciation of relief seed assistance. Although the local officials knew of past emergency and development seed distributions, these distributions were done with limited local assessment—or involvement and coordination with local officials. The exception was AREX for assessment and monitoring and the involvement of village heads in targeting beneficiaries. Little or no follow-up or monitoring was done. Seed distributions were mainly done on a credit basis, but there was little payback by the farmers. The result was (1) late delivery of seed, (2) delivery of inappropriate varieties or crops, (3) late planting, (4) poor targeting, (5) disappointing harvests for those who received the seed, and (6) increased dependence on seed handouts.

Local seed markets

Sheen-Sujier (1996) found that most seed insecure households were poor, with little means to purchase supplementary seed. These farmers bought traditional varieties locally, and any quantity could be bought if cash or barter items were available. The usual sources of seed were the better farmers. In some cases, farmers identified seed sources during harvest with visits to the field. Good farmers would even advertise the availability of seed through their neighbors. Sometimes the seed was available locally and sometimes they had to source from adjacent wards or districts. The acceptability of purchases from this informal market depended upon the location.

In our farmer survey, farmers described a local seed market where local varieties of maize and other crops, such as sorghum, pearl millet, and groundnuts, were sourced from local shops, shops in the nearest town, or from other farmers in the same or neighboring villages in the same ward. A number of farmers or villages were named as sources of seeds. Sourcing seed locally was described as follows:

- Seed is bought either in the same village or in the ward; however, there is no known prominent trader.
- Everyone can sell if they have excess grain.
- Selling is also at a very low level.
- Seed can be found locally or in other villages. The sellers are not exactly traders but farmers who sell their excess grain as seed. Any farmers can sell, depending on their harvest in a particular season.
- Seed can be obtained from local farmers in the same village. No specific farmer is known. Anyone with excess grain can sell
- People come from far away to sell grain that local people can buy and later use for seed. The names of the sellers are not known.

It should be noted that a number of farmers did comment that they preferred to obtain seed from relatives rather than use this market option, although the local market is used more frequently.

The households surveyed for the case study indicated that normally the local market is relied on for all crops. When farmers were asked about the quantities of seed available for purchase in the past, 59% in the high-potential areas and 30% in the semiarid areas felt that there were sufficient quantities available for purchase. However, in the current season, that proportion had fallen to only 17% in the high-potential areas and 4% in the semiarid areas. More than 60% of the respondents in both regions said they did not know if the present quantities would be adequate. Sheen-Sluijer (1996) reported that farmers did not find informal purchase from the local market a very reliable source of seed, although the farmers in their study did conclude that if you had enough cash, seed could always be found in sufficient quantities. It is not an easy channel to use and farmers in their study did not find easy access to the seed until the season had started and the sellers were confident of their own seed needs.

The households were asked about assets used to access seed normally and for the previous season. Normally, households in both regions use poultry, small ruminants, family labor, crop sales, cash or remittances, crafts, and vegetables to exchange for seed. The number of assets used and their use by the households to access seed had not changed in the 2003/04 season. However, the actual value of the assets in relation to the quantity of seed that could be acquired was not determined in the survey. So while the same asset was used, the "cost" of seed per asset may have been affected and thus access could have been limited because of the drought.

Local seed vendors

In total, 92 farmers and traders who sold grain or seed were interviewed, of whom 67% were farmer vendors. These vendors sold 14 crops for grain, mainly their own production, except for maize, beans, cowpeas, sunflowers, and vegetables where they also sold grain purchased from other farmers and traders. Virtually all the seed sellers were farmers selling their own production. Of these seed sellers, 16 farmers and six traders offered credit. It is clear that there is an important informal seed market in

Zimbabwe and that there are opportunities to strengthen the role of these farmer traders to improve the quality of their seed and the profitability of their seed business.

Table 3. Crops Sold As Grain or Seed by Vendors in 2002/03 and 2003/04

	Grain				Seed		
Crops	No of sellers	Own production	Purchase from local farmers	Purchase from other traders	No. of sellers	Own production	Purchase from local farmers
Maize	38	28	4	6	8	8	-
Groundnut	28	28	-	-	25	25	-
Beans	22	18	3	-	26	24	2
Sorghum	17	17	-	-	12	10	2
Cowpeas	14	13	-	1	10	10	-
Bambara	10	10	-	-	3	3	-
Sweet potato	4	4	-	-	-	-	-
Pearl millet	3	3	-	-	3	2	1
Finger millet	3	3	-	-	2	-	2
Soybeans	3	3	-	-	4	4	-
Wheat	2	2	-	-	2	3	-
Rice	1	1	-	-	1	1	-
Sunflowers	1	-	-	1	3	-	-
Vegetables	4	2	-	2	2	1	1

The premium for seed varied for different crops, but sellers listed a 40% to 60% premium for maize seed, 50% to 300% for groundnut seed, and up to 200% more for bean seed. Two sellers did not sell for cash but gave seed as a gift or exchanged for labor. One seller asserted that local crops were frequently sold only among farmers in villages and wards. Overall, 71% of the sellers surveyed sold grain as seed, but only 17% had specifically bought grain to sell as seed. The farmer sellers used special methods to store seed. These were mainly chemical and traditional methods. Farmers stored the seed in bags in the granary and in their home, hung from the roof in the kitchen and put in clay pots. Thus, the survey found that local seed sellers exist and are able to produce or buy grain that was sold as seed. They are very local in both their purchase and sales. One agro-dealer did sell local sorghum grain sometimes when he bought it specifically for that purpose. Sales of seed were made to local farmers (69%), government (6%), seed houses (4%), grain traders (10%), and NGOs (13%). When asked if they could access as much seed as they wanted from the local farmers, only about half the sellers said yes. When asked if they could sell as much seed as they wanted, more than 70% said yes.

In the evaluation of the seed vouchers and fairs program implemented by CRS-Zimbabwe and CTDT in six of the districts surveyed for the case study, a series of questions were asked of the seed sellers after each seed fair (Bramel, 2003b). The survey included 1347 seed sellers from the seed vouchers and fairs who sold 31 different crops. The majority of the sellers were farmers (88%) and full-time seed sellers. Overall, 72% of the seed sellers were women. Full-time seed sellers were very experienced sellers: nearly 70% had sold seed for more than four years, while nearly 30% of the farmers had sold seed for more than eight years. All the maize seed was sold by seed companies, stockists, and agro-dealers, but the majority of seed sellers for the other crops were farmers. The majority of farmers sold their own seed for all crops while part-time seed sellers only sold their own seed. Part-time seed sellers were farmers

who were proficient seed producers, selling seed in their communities if they had a surplus. Full-time seed sellers obtained the majority of seed they sold from sources other than their own production, usually from other local farmers. Thus they were full-time because they consolidated excess grain or seed in the community and sold it regularly. They did sell their own production for some crops, for example, groundnuts. Other market traders and the formal sector were also sources of seed for farmers and full-time seed sellers.

This assessment of the seed sellers at the seed fairs indicates that a very local seed market operates on a routine basis for crops other than maize. The source of seed sold is local but there does seem to be a routine demand and specialized suppliers. From the evaluation, it was clear that the CRS seed vouchers and fairs program utilized an already existing market structure to meet the need of the beneficiaries for the seed of a wide range of crops and varieties.

Summary

The local seed market in Zimbabwe is very informal. Most of the seed sold is a farmer's or trader's own production. A large number of crops are sold routinely for both cash and credit. The market seems to have adequate quality with special seed storage facilities used by most of the sellers. The majority of the potential customers view the supply as unknown, while the seed sellers view the demand as adequate but the supply inadequate.

This information concurs with the observations of Mheen-Sluijer (1996), who described this market as dependent on farmer-to-farmer interactions, which resulted in farmers having to seek out a supplier for seed of both local and new varieties. She describes the local nature of this market as being "within the area" where "farmers see the crops in the field and then determine which variety they wish to plant the next season. Sometimes farmers buy heads when they are ripe, they know it is a good variety and it is good quality. Farmers who sell seed are good farmers who grow a variety of crops and usually have a good harvest and one can often buy a range of varieties. If a farmer has a lot of seed to sell, he will advertise that there is plenty of seed for sale. As long as one has money, anyone can be approached to sell seed."

Formal seed sector

The seed industry in Zimbabwe is one of the largest in Africa. The public sector monitors and controls variety releases, multiplication, and distribution of seed within the country and for export. The public sector also conducts research and development on a wide range of field and horticultural crops. For some crops, this research is done in collaboration with international agricultural research centers. The public sector is also involved in seed distribution through relief programs. The private sector is responsible for seed production and marketing. In addition, a number of private companies are involved in research and development, mainly for maize. After 1970, all publicly registered varieties were released and marketed through one company, Seed Co. The agreement with Seed Co specified production and pricing levels, as well as the retention of carryover stocks for seed security of maize, sorghum, wheat, barley, soybeans, and groundnuts. This agreement was cancelled in 1997 to make all publicly developed varieties available to any company if they also agreed to pay royalties on sales and retain carryover stocks for seed security. No company has come forward to sign any new agreement, with the result that very few new public varieties have been available to farmers (Gwarazimba, 2002b).

The private seed sector consists of a number of companies which are focused on crops, vegetables and flower seeds. Seed Co, Monsanto, Pannar, and Pioneer do research and development in Zimbabwe while National Tested Seeds, Agricultural Seeds and Services, and Quton Seed Company only do multiplication and distribution of seeds. A number of small companies import and market vegetable seeds. Based on seed production estimates in 2002, Seed Co has about 50 percent of the formal sector market share for cowpeas, 52% for pearl millet, 56% for beans, 59% for open-pollinated maize, 66% for hybrid sorghum, 79% for hybrid maize, 91% for sorghum, 94% for soybeans, and 100% for wheat. Agricultural Seeds and Services has 60% of the market for groundnuts. There are 4 companies involved in hybrid maize and beans, 3 in open-pollinated maize, pearl millet, and cowpeas, 2 in soybeans, groundnuts, and sorghum, and only 1 company in wheat and cotton (Gwarazimba, 2002b).

Informal seed sector

The informal seed sector has attributes of both the formal and the local seed sectors and occupies a middle ground between the two. Companies such as National Tested Seeds and Agricultural Seeds and Services purchase seed directly from smallholder or communal farmers. This seed can be of local varieties or from production with foundation seed obtained from these companies. These companies and others, such as Seed Co and Pannar, collaborate with NGOs to provide foundation seed and to purchase seed produced by smallholder farmers' groups. In 2002, there were seven NGOs involved in the seed sector with the collaboration of ICRISAT and CIMMYT. The crops produced were sorghum, pearl millet, open-pollinated maize, and cowpeas. This increasing link between the formal and informal sectors with the assistance of the NGOs has contributed to an increased supply of seeds for these crops. Many of these seed projects have focused on increased production by smallholder farmers, training farmers on seed production/conservation, and developing marketing links between producer groups and the private seed companies (Gwarazimba, 2002b).

Maredia and Howard (1998) reviewed the literature on changes in the seed sector in Africa. They concluded that the focus by governments and donors on formal seed sector development had been unsuccessful in building demand from the smallholder sector. Such a shift will require increased demand for improved varieties of a wider range of crops among smallholder farmers, decreased cost of seed production and marketing, improvement in transport and information infrastructure, and reduced learning and transaction costs for new seed enterprises. While their focus is on the seed suppliers, they do consider the need to better understand and develop the market demand and to consider the seed quality issues of a decentralized seed system.

Maredia and Howard (1998) concluded that seed projects carried out with the assistance of NGOs and the public extension service in Zimbabwe could result in reduced costs in seed production and distribution, with trained seed producers in the informal sector and increased market links between the informal and formal sectors. They noted that there was a danger that these activities would be dependent on subsidies from the NGO or donor community. Thus the withdrawal of these subsidies or the NGOs could result in the failure of the seed production and market links. This has been the case for a number of seed-multiplication projects in Zimbabwe and it continues to be an issue for the future of the informal seed sector. This will clearly be the case if the focus of this production is on crops or varieties that are distributed for seed relief but not marketed in rural areas to smallholder farmers.

While seed projects that emphasize increased seed production can result in increased availability of seed of minor crops in remote areas, without a focus on market development among smallholder farmer-producers, here might not be a similar increase in access to these crops in these areas due to poor

local markets. Unfortunately, this currently seems to be the case in Zimbabwe. The focus on the informal seed supply system without a concurrent focus on the informal seed market system may reduce the cost of seed production but will not increase the demand for improved varieties or strengthen distribution systems to these same farmers.

Impact of the relief seed market

The Zimbabwe seed industry is a major supplier of relief seed in the region (Gwarazimba, 2002a). Most sales of seed have been to Mozambique, Malawi, Angola, Zambia, and South Africa. Much of this seed is both supplied by smallholder farmers and distributed to them through emergency relief programs, often by the same NGOs in the same areas. A large proportion of smallholder farmers (85%) in the more remote, drier areas of Zimbabwe are willing to pay for high-quality seed of minor crops. However, despite increased supply, many of these varieties are still not available locally at a reasonable price. Quite simply, the repeated and persistent distribution of relief seed has stifled the development of a viable seed market.

Smallholders in Zimbabwe have limited access to this formal/informal sector seed since most of the research, development, and marketing is done by agribusiness companies specializing in hybrid maize. Most of the distribution is done through a central location by traders who lack knowledge of the varieties. In addition, the formal seed companies do not offer credit to the traders or farmers. Thus, only small quantities of seed are available in remote areas, or the availability in shops is limited to planting time. There is also a limited distribution network, which results in farmers in remote areas traveling long distances to more central points to source seed. Much of the seed that is sold from rural retail and wholesale centers is of poor quality due to poor handling and storage conditions, and there is inadequate production of specific crops and varieties to meet an undeveloped market. Thus, the cost of seed is very high, well over 20% of the costs of production. Farmers have very limited access to finances at reasonable credit terms at planting time. At the same time, there is limited labor in the rural areas, very low land holdings, and limited access to markets with low prices for commodities. Thus, grain is only valued at 5% to 10% of the seed price.

The local seed system for maize is very different from the other cereals. There has been a shift away from own saved seed and greater use of formal-sector seed sources. Maize is also a crop that has been routinely made available through relief programs; thus, households have come to depend upon this source. The impact of the frequent distributions of seed was evident from a discussion held with ZFU in Binga (Personal interview, June 2003). First, purchases by the government and NGOs in Harare make the very limited stocks unavailable in remote markets like Binga or Kariba. Also, the diversity of hybrids available locally is limited since many of the seed companies make the less desirable hybrids available for sale there. One other consequence is that the agro-dealers and shops in the area are unable to get credit from the companies because the seed market is so uncertain with so much free seed being distributed. Thus, local sources of formal maize seed have access to very limited supplies, which affects possible sales and then influences future access to seed for sales. The other problem is the limited access to transport, since these local markets outside of Harare are also not lucrative. In 2003/04, ZFU had managed to get Pannar to make seed available for cash sales to farmers in Binga, but a very limited supply of a less desirable hybrid. Such a situation further limits farmers' willingness to access formal-sector maize from local shops and influences the development of formal-sector outlets in the districts. In the past, both farmers and traders confirmed that maize seed was available at local shops, but at the time of the survey, no local trader indicated they sold maize seed.

In Zimbabwe, the majority of smallholder farmers use their own saved seed for crops that are critical to food security. Thus, a seed system must be encouraged that will sustain farmers' saved seed, a local seed market, and a viable seed industry. All play important roles in agricultural rehabilitation and development. The past focus on seed supply needs to be complemented in the long term with enhanced development of market links and a distribution infrastructure at the local level. Both of these are currently sharply curtailed by the distribution of large quantities of free seed, which biases the development of commercial seed markets for alternative crops and sharply reduces incentives to develop retail trading networks in rural areas. Thus, addressing the short-term emergency need to enhance farmers' access to seed with some form of direct seed distribution reduces agricultural rehabilitation over the long term.

Conclusions

Generally, donors, relief agencies, and government agencies have responded with direct seed distributions to a fairly constant need for agricultural recovery from droughts and floods. These distributions have used seed obtained from the formal sector and traders in Zimbabwe, and the need for seed has mainly been based on assessments from this sector of seed availability . Farmers have come to rely on this artificial seed channel for hybrid maize and have responded to this routine seed distribution with delays in planting, as they wait for the distribution of relief seed. . For other crops, they continue to utilize local markets.

The donors, NGOs, and government have some knowledge and appreciation of farmer seed systems but do not focus emergency responses on enhancing farmers' access to normal seed channels, such as the local market, when they fail to save enough of their own seed or have a need to go outside their home for seed of new varieties. Instead, they assume seed is unavailable and make it available locally via direct seed distributions. The local seed system is constrained by a poor information infrastructure about alternative sources of seed, which include both the informal and formal sectors. Both the farmer and the formal seed sector are hampered by the poor transportation system and the remote nature of most of the crop production in Zimbabwe.

Farmers have limited access to formal-sector seed and the cost is high. They have greater access to local seed through a very informal market, but it is limited by supply, quality, variety choices, and access. This informal market is more accessible in rural Zimbabwe than is the formal seed sector. Farmers are interested in new varieties and crops but have limited access except through direct distribution of relief seed.

The relief seed approach in Zimbabwe has included smallholder farmers as seed suppliers. In some cases, that has been with the assistance of NGOs and international agricultural research centers in producing seed for the formal sector through seed multiplication projects. This increase in seed supply and the enhanced links to the formal sector has increased the supply of seed to the relief market, as well as increasing the value of the relief seed market to seed companies in Zimbabwe. It has not necessarily increased the supply of local seed or enhanced access to local seed for smallholder farmers in rural areas. In addition, the impact of the direct distribution of relief seed on the formal sector has been to reduce the supply of seed to the rural retail level and to increase the supply at central points like Harare.

Finally, if direct seed distribution is an intervention meant to assist agricultural systems in recovering from a drought or other disaster, then why is there always another request for seed assistance? The answer to this question is that the direct distribution approach does not strengthen seed system

productivity and resilience, nor does it effectively integrate the different systems farmers use. Past distributions have been ineffective in terms of timeliness, crop and variety appropriateness, and community/farmer participation and empowerment. Rather, they have disrupted the development of local seed enterprises. There is a critical need for alternative responses that will strengthen the local seed system and its links to the formal sector, with increased emphasis on developing seed enterprises at the local level. One alternative approach is the use of seed vouchers, which utilize the existing local seed market to meet the need of farmers affected by a disaster. This alternative was introduced into Zimbabwe in 2003 and was widely implemented in 2004.

Acronyms

AREX	agriculture research and extension
CRS	Catholic Relief Services
CTDT	Community Technology Development Trust
FANR	Food, Agriculture, and Natural Resources
FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Food Early Warning System Network
FOSENET	National NGO Food Security Network
GMB	Grain Marketing Board
NGO	nongovernmental organization
NR	natural region
SADC	Southern African Development Community
SCF-UK	Save the Children Fund (UK)
UMP	Uzumba Maramba Pfungwe
UNDP-RRU	United Nations Development Program-Relief and Rehabilitation Unit
WFP	World Food Program
ZACH	Zimbabwe Association of Community Hospitals
ZFU	Zimbabwe Farmers Union
ZimVAC	Zimbabwe National Vulnerability Assessment Committee

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