Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Who are we and what do we do?

The International Center for Tropical Agriculture (CIAT), Catholic Relief Services (CRS) and CARE Norway, in collaboration with national partners in Africa, are implementing a project to increase the effectiveness of seed-based interventions in acute and chronically stressed African farming systems.

Consensus is emerging from applied research and rigorous *ex post facto* evaluations that conventional seed relief poses concerns. These include:

- Missing, inadequate or incorrect diagnosis of seed insecurity, with the problem often (mistakenly) assumed to be one of seed unavailability.
- Predominance of supply-side approaches, with a strong reliance on the commercial seed sector for relief seed.
- Lack of understanding of farmer seed systems and the important roles they have to play in agricultural relief and recovery.
- Lack of appreciation of the central importance of local markets in informal and more integrated seed systems.
- Repetitive relief interventions leading to chronic seed aid.

CIAT serves as the project coordinator with funding from USAID/Office of Foreign Disaster Assistance (OFDA). CIAT's interest in seed systems under stress dates to the Rwanda Seeds of Hope project of 1995-6, where the impact of disaster on seed systems and agrobiodiversity were both key issues. CRS, also with funding from OFDA, is actively engaged in agriculture recovery wherever there is a need in Africa, and emphasizes approaches that stimulate enhanced production and income generation. CARE Norway, with funding from the Norwegian Ministry of Foreign Affairs, has developed expertise across broad areas of agriculture recovery.

The goal of the Seed Systems Under Stress project is:

To assist disaster-affected and chronically stressed communities in recovery by strengthening seed systems used by farmers and restoring productivity and enhancing system resilience.

The project seeks to influence and enhance the knowledge, attitudes and practices of donors and practitioners as they support and undertake seed assistance. It does so by increasing understanding, firstly of the impacts of disaster and sustained stress on seed systems; and secondly of the effectiveness of varied seed-aid responses on efforts to strengthen seed systems in the short and longer term.

New knowledge, as well as synthesis of better practice is being generated by this project, and Briefs 3 to 7 share insights on different topics related to

Case studies show seed-based agricultural recovery to be more complex than is commonly assumed.

These Briefs provide practical advice on how to improve seed aid, including specific technical guidance as well as tools and checklists spanning steps from assessment to evaluation – through to new proposal design.

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seed relief. However, we recognize that providing information is not on its own sufficient because information alone does not necessarily convert to greater use of knowledge or altered practice. Therefore, the project is also providing new input on how to:

- Analyze and assess seed systems and seed security.
- Design seed-assistance interventions.
- Monitor and evaluate seed-assistance interventions.

Briefs 8 to 10 include tools and guidance for practitioners and donors.

The Project also aims to influence practices by other means. There are ongoing efforts to educate, learn with, and communicate with the range of agriculture recovery actors – from policy to field implementation. Hence we welcome comments on these briefs as people read and use them, as well as more general information exchange and dialogue (see contacts below).

For more information about the project, see http://www.ciat.cgiar.org/africa/seeds.htm

The Practice Briefs

No. 2 presents an **overview of the Country Case Studies** undertaken to guide the design of the tools presented in Briefs 8 to 10 as well as to examine the effects of different types of interventions. The case studies were undertaken in Burundi, Ethiopia, Kenya, Malawi, Mozambique, Uganda and Zimbabwe.

No. 3 introduces the general **concept of seed security** and differentiates parameters of availability, access, and seed and variety quality, as well as distinguishing chronic from acute stress.

Briefs 4 and 5 consider focused topics that cut across seed assistance and seed security. No. 4 addresses issues of **relief and agobiodiversity**: the importance of diversity in stabilizing systems and the possible effects of various relief approaches in maintaining, enhancing, or undermining such diversity. No. 5 focuses on the opportunities and risks of using seed aid to move beyond the *status quo ante* by **introducing seed of new varieties** (or indeed, new crops altogether).

Briefs 6 and 7 present short overviews of practice. No. 6 looks at the range of seed systems routinely used by small farmers in Africa and highlights the escalating **importance of local markets**. Effective interventions depend on a solid understanding of such standard seed procurement practices. No. 7 sketches the **current major seed-system based response options**, and reflects on their appropriateness in relation to the stresses on hand.

The last set of briefs focus on tools and guidance. No. 8 examines how effective interventions depend on sound and timely assessment, which requires both a **tool to assess seed system security** and the knowledge and skill to use it. No. 9 starts to bring the cycle to a close by giving guidance on **evaluating seed-aid projects**, suggesting the types of evaluation needed and their content. The final brief then looks to the future and suggests a **checklist for the development of proposals for seed assistance**. It is this last which builds on the range of lessons learned.

Acknowledgments:
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Overview of Seed Systems Under Stress Project: *Case Studies*

Seed relief studies, managed by CIAT, CRS, and CARE Norway, have been published in a volume entitled *Addressing Seed Security in Disaster Response: Linking Relief with Development* (see below for availability). The eight case studies were undertaken to evaluate various forms of emergency seed aid and to document how seed stress is diagnosed and how interventions are designed in concrete contexts. The objectives were to understand whether and how vulnerable farmers are being helped by the kinds of assistance they receive – and how to move forward to improve practice.

The work unfolded over a two-year period in seven countries in Africa. In each case study the seed-aid practitioners were directly engaged in the evaluations and reflections, so that lessons learned could immediately influence the next steps of practice. It is to the credit of 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, 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 a 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 were implemented.

The eight seed relief case studies ask if and how vulnerable farm families are being helped by the emergency assistance received

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

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Each case was chosen to be somewhat unique, in order to build up our body of knowledge concerning seed system relief. However, they all provide details on how the seed problem was initially assessed, the type of interventions that unfolded, and an *ex-post facto* evaluation of their effectiveness. 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.

Major features – case by case

- The eastern Kenya case compares the effectiveness of Direct Seed Distribution (DSD) and Seed Vouchers and Fairs (SV&F), funded during the same period of the 1990s. Aspects such as number of beneficiaries reached, diversity on offer, financial costs, and spin-off effects (for example possible community empowerment) are considered.

- The northern Burundi case looks closely at how small traders (generally a specialist group) have been among the primary beneficiaries of seed vouchers and seed fairs. It gives insight into the type of trader involved (gender, scale, barriers to entry), the investment of trading proceeds into the local system, and opportunities for introducing innovations (including new varieties) *via* established traders.

- The western Uganda case explores the ability of seed vouchers and fairs to supply farmers with seeds of preferred crops and varieties, and the effects of offering a wide range, even in a relief intervention. It also examines the degree to which the SV&F approach makes use of and bolsters the agrobiodiversity available in the wider farming systems, by comparing which crops and varieties are offered at the fair – and which are not.

- The western Kenya case looks at the effectiveness of different seed channels (informal seed producer groups, local seed/grain markets) for moving new bean varieties during a period of dramatic production decline. Speed and extent of diffusion, as well as the quality of seed put on offer, figure as key assessment variables.

- From northern Mozambique, the study presents the challenges of responding to crop breakdown of the vegetatively-propagated staple, cassava, which was devastated by virus. Challenges of moving plant cuttings quickly and of diversifying in areas of single crop monopoly are analyzed.

- The Malawi, Zimbabwe and Ethiopian cases analyze the longer-term patterns and effects of repeated seed aid. Lack of seed security assessments to address targeted problems, the emergence of a separate 'Relief Seed System' and the use of standard default responses (Direct Seed Distribution evolving to Community-based Seed Production) are among the trends examined.

Overview lessons: select findings

The project also synthesized findings from across the different cases. We present several of the most important results below, but refer the reader to the full volume for more elaborate insight (Sperling et al. 2004, see below for availability).

Relief organizations are generally using an 'acute' response – seed aid – to treat what are more often 'chronic' poverty-based problems.

Emergency seed system assistance was delivered in six out of the eight cases examined in response to what was characterized as an acute stress (that is, an event of short-duration). However, more in-depth analysis, in each of the six cases, showed the problems to be more chronic and systemic in nature, for example declining productivity, water-related stress, ongoing civil unrest, and 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 actually took place.

These revealed that the 'acute manifestation' was also due to more systemic pressures, including the build-up of plant disease, lack of crop rotations and declining farm sizes.

TABLE 2
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 much of the time
Malawi	12 seasons or more
Zimbabwe	13 years (food aid, seed aid, or both)

The result of an 'acute' response in a more chronically stressed context is that the problem is not alleviated and that seed system assistance is then needed repeatedly.

Chronic seed distribution is resulting in the emergence of a Relief Seed System.

Seed aid distribution is taking place in an alarmingly large number of countries: one season, two seasons, three seasons, and beyond. Giving seed aid is itself becoming a chronic activity. Table 2 summarizes the number of years seed aid has been given in several countries. There seem to be few checks for stopping such assistance (simply when funds dry up?) and deliberate exit strategies have not been planned.

The rise of a chronic seed aid system has been identified as a profitable business opportunity for entrepreneurs, who specialize in quick delivery of a small range of crops. It has also led to the rise of a separate Relief Seed System (see cases from Ethiopia and Zimbabwe).

No diagnosis and a mis-assumption of seed availability problems has been triggering seed-related disaster responses.

The lack of any diagnosis related to the seed system is a widespread problem (see Brief No. 7). In the absence of seed-related needs assessment, the default option has been to assume that there is a lack of available seed. Two sources of information indicate that this automatic assessment of lack of availability is often incorrect in the extreme.

- A growing number of studies have traced where farmers in disaster situations sourced the seed they planted – in areas where seed aid distribution had taken place. Table 3 indicates that in contexts where precise data were examined (and with larger sample sizes), relatively little of the seed sown came from emergency aid. Seed had been available in local channels, and particularly from local markets.

- Seed availability has also been assessed via those who may supply seed in crisis periods: the local seed and grain traders. In Burundi, where seed aid has been given since 1995, 41 traders recounted their experience with seed sourcing over the past 10 years of drought and war. Thirty-seven indicated that there had never been a problem with availability. The other four nuanced their answers, with only one trader suggesting an absolute lack at one point in time (see case study from Burundi).

TABLE 3
Importance of Relief Seed in Farmers' Overall Supply during Disaster Periods

Context	Crop	% of seed sourced via relief*
Zimbabwe: drought and political instability 2003	Pearl millet	12
Rwanda: war 1995	Beans	28**
Kenya: drought 1997	Maize	11
Somalia: drought 2000	Sorghum	10-17
Somalia: drought 2003	Maize	3

* See Sperling et al., 2004 for full data sources
** The figure of 28% came from the first seed distribution, two months after intensive fighting ceased. Relief seed was then distribution again for the next major planting in January 1996, and only 6% of the bean seed came via relief channels.

Only two types of case have been identified when availability of seed in a disaster context may be a fundamental constraint. First, where local seed on offer is no longer adapted to local growing contexts (for example in eastern Kenya, due to bean root rots, and in northern Mozambique, due to cassava brown streak). And secondly when there have been substantial shortfalls in production and local markets have never sufficiently developed to deliver seed or planting supplies. (Local markets prove particularly important as sources of seed in crisis, see Brief No. 6).

> Seed availability is not necessarily the problem during emergencies. Practitioners need to understand the real constraints and opportunities – before they respond.

In terms of implementation, there seems to be a broad default pattern, from direct seed distribution (DSD) to community-based multiplication schemes (CBMS).

At present, a relatively narrow range of responses are employed to bolster seed systems in stress. Diagnoses being minimal, the evolution of a seed-related assistance pattern is well established (see case studies from Malawi, Zimbabwe and Ethiopia). During emergencies, institutions jump to direct seed distribution (DSD). During recovery, they move to community-based multiplication schemes (CBMS) schemes. So seed system assistance tends to be characterized by people doing what they already know, rather than what might be best under the particular circumstances.

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

Issues of seed quality shape the types of seed assistance that can unfold. Quality issues most often focus on whether the seed is certified or not (as many donors require formal verification as a prerequisite for emergency seed procurement). Stereotypes typically equate certified and formal sector seed as being of high germination and good seed health, while farmer seed (home-produced and procured from the market) is typically judged to be of poor quality. Case studies show that such labels can be deceptive. The quality of formal-sector seed may not be as advertised (as in the case from western Kenya), while emergency-grade seed overall is of highly variable health and genetic quality (the case from eastern Kenya). Farmer seed and market seed has also proven to be of good quality, as assessed in laboratory analyses (western Kenya).

The focus on seed health has diverted attention from what is probably the more important quality issue for seed: at the very least, the seed on offer must be adapted to the environmental conditions at hand. Genetic 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 recipients' management conditions.

For full documentation see:

Sperling, L., Remington, T., Haugen, J.M., and Nagoda, S., eds. 2004, Addressing seed security in disaster response: linking relief with development. Cali, Colombia: International Center for Tropical Agriculture. Available for download from http://www.ciat.cgiar.org/africa/pdf/emergency_seed_aid_case_studies.pdf

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Understanding Seed Security

Inherent in the decision that seed aid is needed is an assumption that farmers themselves are not able to secure seed for their normal planting periods. Farmers' ability to secure seed is described by the concept of seed security.

The concept of seed security (and its inverse, insecurity) is often nuanced by two broad sets of parameters: duration (are the problems short or longer-term?) and the different features needed to ensure security (if there are concerns, what types of diverse problems might farmers encounter?). We discuss both in this introduction to the concept of seed security.

Distinguishing between Acute and Chronic Seed Security

To understand seed security it is important first to distinguish between acute (short-term, transitory) and chronic (longer-term, long-lasting) seed security issues.

Acute Seed Insecurity

Acute seed insecurity is brought on by distinct, short-duration events that often affect a broad range of the population. It may be spurred by the failure to plant in a single season, the loss of a harvest, or by high levels of infestation of stored seed stocks. While during normal times households may variously be identified as seed secure, semi-secure, or always seed-short, all may be affected during an acute event such as a flood or short civil disturbance. Those farmers who recover quickly, with or without one-off seed-related assistance, are often those who have suffered only acute stress. Note that acute food stress (and the need for food aid) is not necessarily followed by seed stress (and the need for some form of seed aid). Seed systems can be very resilient, and, for some crops (e.g. sorghum), small amounts will satisfy farmers' practical sowing needs.

Chronic Seed Insecurity

Chronic seed insecurity is independent of acute stress or disaster, although it may be exacerbated by it. Chronic seed insecurity may be found among populations who have been marginalized in different ways: economically (for example, poor, little land, little labor); ecologically (for example, repeated drought, degraded land); or politically (in insecure areas, or on land with uncertain tenure arrangements). Populations that suffer chronic seed insecurity may be characterized by:

- Continual shortage of adequate seed to plant.
- Difficulties in acquiring seed off farm due to lack of funds.
- The routine use of low quality seed and unwanted varieties.

The result is households with a built-in vulnerability to seed system calamities.

Seed insecurity comes in many guises. Chronic insecurity differs from acute insecurity and the elements of seed availability, access and quality need to be examined independently. Understanding seed systems and seed security properly will lead to more effective seed-related assistance

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Reflections on the relationship between acute and chronic insecurity

Acute and chronic seed insecurity will very often exist together during an emergency. Indeed, in cases where emergencies are recurrent events, for example in drought-prone areas, acute situations are nearly always superimposed on chronic problems that are rooted in poverty. Figure 1 aims to show conceptually the relationship between acute and chronic seed insecurity. At any given normal time a portion of the agricultural population, usually the majority, are seed-secure, with the poorest being those who fall below the theoretical security line. In a disaster, all may be affected to some degree, as harvests may decline overall and some seed stocks may be lost.

However, those just above the margins of security may fall into chronic seed stress if alleviating actions are not sufficient. Similarly, those already in chronic stress may not recover above the line into seed security if they are simply assisted with one-off injections of seed aid.

Analysis of seed insecurity in the field reveals two trends in the relationship between acute and chronic contexts.

- First, there is increasing evidence of a general transition from acute to chronic seed insecurity, rather than the presumed goal of recovery. This occurs because various forms of quick relief, such as the free distribution of improved varieties, can undermine the functioning of local seed systems, alter more robust crop profiles, and create marked dependencies. Thus, it is alarming – but not surprising – that in the year 2000 farmers in the Tana Region of Kenya routinely listed 'seed relief' as one of the basic channels by which they count on accessing seed season after season.

- Secondly, closer analysis is showing that many of the aid cases originally considered acute exhibit aspects of more chronic stress. Six out of the eight seed intervention cases we examined in this project (see Brief No. 2) show acute aid being implemented in situations that are primarily chronically-stressed, with such seed aid being delivered not as a one-off intervention, but repeatedly. Acute emergency measures are being implemented in lieu of possibly more effective and more long-term support. This is not a new insight – but it is one that has yet to change practical responses to major seed emergencies.

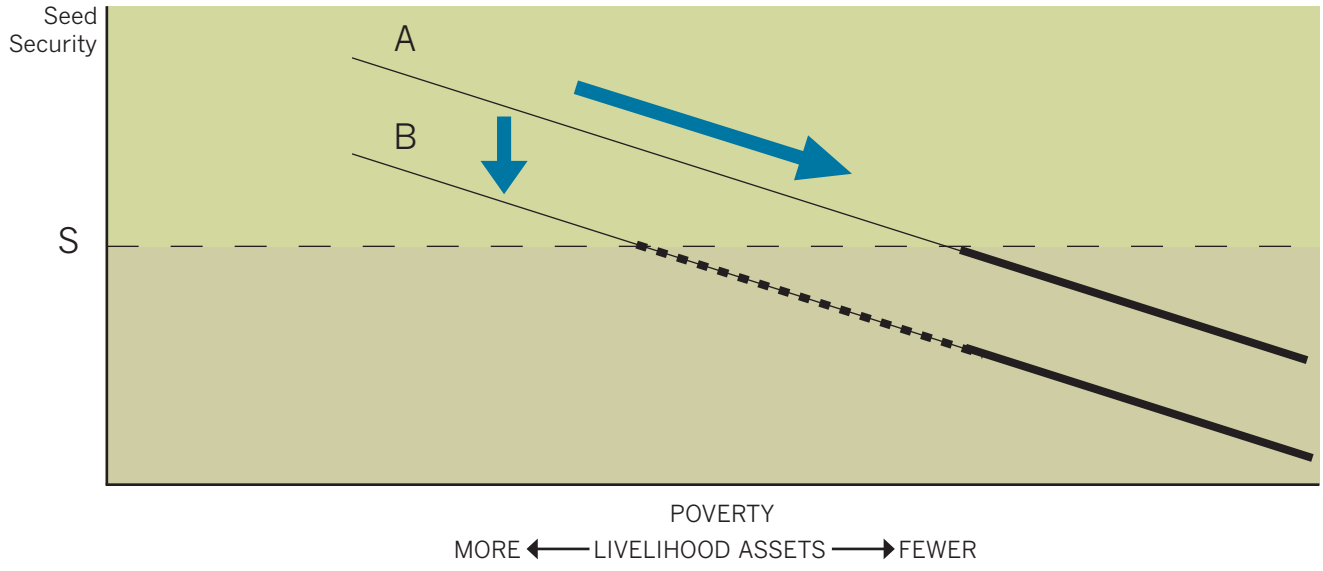

FIGURE 1: The relationship between seed security and poverty, in times of acute and chronic stress.
Line A represents a stylized relationship between poverty (x axis; expressed in terms of assets) and seed security (y axis). The point S represents an arbitrary seed security threshold: above the broken line is seed security, below it seed insecurity. In locales for most interventions, in normal times, a proportion of the population, represented by the thicker portion of line A, is chronically seed insecure. In an emergency, two things may happen: (1) livelihood assets may decrease, so the entire population will move down the line, such that more of the population will be seed insecure by virtue of their increased poverty; (2) there may be a shift downwards of the entire line to B, perhaps due to short-term problems of seed availability or access. Either way, a larger proportion of the poor, the vulnerable population, will become seed insecure, as represented by the additional, dashed part of line B.

Distinguishing among the Dimensions of Seed Security: The Seed Security Framework

The concept of seed security embodies several diverse aspects: differentiating among these is crucial to promote those features that foster seed security as well as to anticipate the varied ways in which such security might be threatened.

The Seed Security Framework in Table 1 outlines the fundamental elements of seed security: seed has to be available, farmers need to be able to access to it, and the seed quality must be sufficient to promote healthy seed system functioning.

TABLE 1
Seed Security Framework: Basic Elements

Parameter	Seed Security
Availability	Sufficient quantity of seed of adapted crops are within reasonable proximity (spatial availability), and in time for critical sowing periods (temporal availability).
Access	People have adequate income or other resources to purchase or barter for appropriate seeds.
Quality	Seed is of acceptable quality and of desired varieties (seed health, physiological quality, and variety integrity).

Availability is defined narrowly as whether sufficient quantity of seed of target crops is present within reasonable proximity (spatial availability) and in time for critical sowing periods (temporal availability). It is essentially a geographically-based parameter, and so is independent of the socio-economic status of farmers.

Seed **access** is a parameter specific to farmers or communities. It largely depends upon the assets of the farmer or household in question: whether they have the cash (financial capital) or social networks (social capital) to purchase or barter seed.

Seed **quality** includes two broad aspects: seed quality per se, and variety quality. Seed quality consists of physical, physiological and sanitary attributes (such as the germination rate, and the absence or presence of disease, stones, sand, broken seed or weeds). Variety quality consists of genetic attributes, such as plant type, duration of growth cycle, seed color and shape, palatability and so on (see Brief No. 6).

In using the framework, it is important to emphasize that the distinction between availability and access is dependent on scale. At some level, if one is willing to pay enough to transport seed from far enough away, seed is always available. Likewise, the concepts of availability and quality are interrelated. If seed is available which will grow and mature to harvest, but which is of otherwise low quality or of unwanted crops or varieties, this constraint would usually be considered under the quality parameter, but one could question whether appropriate seed is available at all.

More Refined Analyses of Seed Security Leading to More Targeted Appropriate Responses

Formal definitions of seed security are fairly recent, as is the notion that seed security assessments need to be distinct from those that focus on food security. In standard field practice, food security assessments inevitably assume that food insecurity means seed insecurity. The cause of this seed insecurity is also invariably diagnosed as a problem of availability;

TABLE 2
Seed System Problems and Broadly Appropriate Responses

Parameter of the problem	Acute (short-term)	Chronic (longer-term)
Unavailability of seed	Direct distribution of seed (possibly for sale)	Support development of seed production, including commercial enterprise, where viable
Poor and vulnerable farmers do not have access to seed	Cash disbursement Seed Fairs with vouchers or cash Local procurement and distribution	Poverty-reduction programs: e.g. support development of • Income-generating activities • Agro-enterprises

that is, there are not enough seeds in a region. A better understanding of the seed security concept, along with informed used of a seed system security assessment tool (see Brief No. 7), should help lead to more targeted diagnoses of problems at hand as well as to more targeted responses.

Using the two aspects of seed security outlined above, Table 2 gives examples of more targeted responses to seed insecurity, to address explicit constraints in seed availability, access and quality in the short-term (acute) and long term (chronic). (See also Brief No. 7 for a more extensive analysis.) So, for example, if 'seed availability' is assessed as the problem, seed-based interventions, such as seed importation (for acute shocks) or development of community-based seed production enterprises (for chronic stress), may be appropriate. However, a diagnosis of 'seed access' might wisely trigger a more holistic analysis of livelihood strategies. In the acute phase, providing farmers with cash or vouchers to get their desired seed might be on the mark to address short-term problems of access. However, an identification of chronic access problems should lead practitioners to look well beyond seed and seed security constraints. The inability to access a certain necessary good on a repeated basis is usually equated with problems of basic poverty. Initiatives to help farmers generate income and strengthen their livelihood base would be essential here.

Finally, we emphasize that lack of use of a Seed Security Framework (availability, access, utilization) and an acute *vs* chronic perspective has generally resulted in few explicit assessments of seed security to date. Getting a better handle on the concept of seed security is but a first important step toward designing seed security related interventions that effectively address the real problems at hand.

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Agrobiodiversity and Seed Relief

Disaster, as well as subsequent relief and recovery activities, can have significant impacts on agrobiodiversity. In this context, by agrobiodiversity we mean the full diversity of crops and their varieties that may exist in a farming system. We are not specifically addressing livestock, nor other unmanaged components of systems (such as bees or wild plants).

In terms of disaster effects and humanitarian aid, the issue of agrobiodiversity is important for three groups of stakeholders:

- For those focusing on quick recovery; greater agrobiodiversity contributes to production stability. It helps farmers to avoid and mitigate different risks, because different crops and varieties resist different diseases, insect attacks and environmental stresses such as drought better than others. A range of agrobiodiversity can also help farmers to stagger their harvest of incoming food supplies and labor needs, which is important when resources are few and far between.
- For those focusing on plant genetic resources, maintaining the diversity of crops and varieties is important in itself because this genetic diversity provides the raw material for agriculture's future adaptations as well as the genetic traits for crop improvement programs.
- For those focusing on longer-term system strengthening, the introduction of new varieties potentially increases productivity, and captures market opportunities – but also may affect agrobiodiversity negatively and positively.

This brief examines the more immediate and practical dimensions of agrobiodiversity in farming systems.

Agrobiodiversity enables farmers to spread risk and increase resilience to shock. These stabilizing features of agrobiodiversity become more important during emergency stress periods.

During normal times, a range of agrobiodiversity allows farmers to spread risk, increases their resilience to shock, and often translates into more nutritious diets. These are key issues when people live from what they sow. During emergency stress times the stabilizing features of agrobiodiversity become potentially even more important. So what features of agrobiodiversity should be considered in responding to emergencies? And what impact do different kinds of activity have on agrobiodiversity? This brief explores those questions.

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Why Agrobiodiversity is a Central Concern in Emergency Response

Issues of agrobiodiversity need to inform emergency response in several ways. First, relief efforts should not compromise functioning systems of agrobiodiversity; that is, they should not undermine the use of a wide range of adapted crops and varieties that remain productive and in wide use. Secondly, if supply-side interventions are deemed necessary, the interventions should embrace principles associated with the maintenance of agrobiodiversity. These principles include:

- Attention to local adaptedness of crops and varieties.
- Focus on crops and varieties that meet local preferences, putting multiple options on offer.
- Treating farmers as customers and giving them choice.

There is scant evidence to date that disasters (such as civil war, drought or flood) significantly alter profiles of agrobiodiversity. When loss does occur, it often proves to be only temporary. (The exceptions are cases where crops or varieties break down, usually as a result of disease or declining soil fertility.) By contrast, there are several examples where conflict-induced displacements have exposed farmers to new crops and new varieties that they then bring back with them when they return home, resulting in a gain – not a loss – of agrobiodiversity.

There is scant evidence to date that disasters themselves significantly alter agrobiodiversity profiles. It is rather the subsequent humanitarian responses which often have negative consequences.

However, an increasing number of field cases show that seed relief interventions, the humanitarian responses themselves, alter agrobiodiversity profiles and management negatively. The delivery of repeated seed aid changes farmers' seed procurement strategies away from actively sourcing several, often traditional, varieties *via* the local seed systems towards passively receiving hand outs of a small number (often only one) of modern varieties. Direct Seed Distribution, when it is of a limited number of crops (and especially with a concentration on maize), can also skew patterns of plant use towards crops that may hold up less well under the stresses that farmers routinely encounter, particularly drought.

The central need to look at agrobiodiversity within emergency responses has been formally recognized in recent guidelines issued by the United Nations agency responsible for agriculture, The Food and Agriculture Organization. FAO's *Guiding Principles for Seed Relief* asserts, *inter alia*, that:

- Depending on the context, the focus in an emergency should normally be on keeping the local seed system operational…
- Seed relief interventions should facilitate farmers' choices of crops and varieties … that are adapted to environmental conditions and farmers' needs… (See Sperling et al, 2004, full details below.)

In terms of agrobiodiversity, perhaps it is fortunate that seed aid has a circumscribed role in an emergency response. Seed aid is never provided to all farm community members – and often the better-off and less-affected farmers receive nothing.

Also, even when a family does receive seed aid, it rarely covers all of their seed requirements. So giving farmers less than their total seed needs in an emergency distribution can actually be beneficial for keeping local varieties in production.

Local crops and seed often remain in circulation and can be accessed *via* markets or exchange channels to complement the free (and often 'exotic') emergency seed assistance.

Seed Relief Approaches that Bolster and Strengthen Agrobiodiversity

Not all relief approaches are equally effective in bolstering and stabilizing seed and farming systems. We comment below on those that practitioners assert may do 'less harm' and that, in select cases, may actually support and enhance the range of crops and varieties in use.

Food Aid – Including Seed Protection Rations (SPR)

Food aid is underrated as a seed relief strategy. Delivery of such aid can allow remaining seed stocks and variety diversity to be maintained (and not eaten). The rationale for the SPR is that food aid is given particularly for the months prior to sowing time, during the 'lean times'.

A note of caution is important here in lauding the virtues of food aid as a seed rescuing (or maintaining) strategy. In farmers' minds, food aid and seed aid may not be separate entities – and gifts of food may subsequently be planted. Hence, in several countries of southern Africa, genetically-modified food aid from the US has not been accepted in recent drought years because of fears that it would find its way into the fields. Consideration also needs to be given to food aid from in-country purchases: large procurements may impact on the overall availability of grain and local prices of seed grain.

Direct Seed Distribution that Procures from Local Seed Systems

Direct Seed Distribution takes many forms – some of which can damage local seed (and economic) systems. Bringing seed in from outside can undermine functioning markets and introduce cultivars that are not well adapted to local conditions. In terms of agrobiodiversity, however, one variant of DSD seems to minimize damage to crops and varieties. When seed procurement draws from local markets, or regional traders, and when it distributes varieties from similar agro-ecological zones, farmers may get access to varieties they know and have used and that are well adapted. In variants of this local procurement strategy, implementers have *distributed variety mixes* (where these are routinely sown), and have tried to *distribute local varieties*. An inherent weakness in seed procurement is that the implementing agency must act as a competent broker for farmer clients and must know and understand seed quality and the specific preferences of farmers. Further, it is well known that local middlemen sometimes buy seed from small farmers to sell to NGOs who then distribute the seed back to the same or similar small farmers. One has to wonder whether the small farmers or the middlemen benefit most from this kind of intervention.

Seed Vouchers, Usually Combined with Fairs (SV&F)

Seed vouchers permit farmers themselves to select among the crops and varieties available within a region. These may be local (sourced from local markets or traders) or improved (sourced from commercial companies or specialized outlets). The point is that farmers themselves can choose and manage the crops and varieties they desire. Advertised seed fairs, which bring farmer buyers and sellers together in dedicated events, provide a range of seed from which farmers can choose. While fairs cannot put on offer the full set of diversity available in a farming system, the profile of crops (often 5-15) and varieties (20 upwards) available in one place is relatively broad. Of course, putting diversity on offer does not guarantee that farmers will access it. Recipients often focus on one or two crops, and choose the more popular varieties of these.

Introduction of New Varieties in Forms of Seed Relief (Under Select Circumstances)

Under select circumstances, new varieties can help to broaden the diversity available in an area (although specialists in plant genetic resources routinely assert that new varieties push out the old). Key aspects to consider if introducing new varieties in seed relief include:

- That farmers need to be given a choice on whether to use these varieties or not (i.e. that new varieties be one among several options on offer).
- That seed be given in 'test' sizes, to mitigate farmer risk.
- That sufficient information accompany the seed so that farmers can make informed use and management decisions for integrating (or not) these new elements into existing farming systems.
- That there is research involvement to learn from farmer evaluations of the new materials.
- In cases where the intervention is not needed immediately, that demonstration plots (or other field stages) are used to help farmers assess the products they may decide to sow for themselves. (See also Brief No. 5.)

> Food aid is an underrated strategy for seed-related assistance. It can allow people to save their remaining seed stocks and variety diversity, rather than be forced to sell or eat them.

Viewing emergency relief through an agrobiodiversity lens includes several basic principles (see Box 1)

In brief, the use of agrobiodiversity, that is the use of a range of crops and varieties, is a proven risk mitigation strategy that works in all sorts of situations, from drought to conflict.

BOX 1

Principles for sustaining and promoting agrobiodiversity in seed relief response

- **Do not engage in seed relief that undermines functioning systems or that may compromise already stressed ones.**
- **Do not base the seed response on a large scale transfer of seed of varieties not currently used by farmers.**
- **Think hard before importing seed into a region and never provide a single variety of just one crop for all farmers: vary crops and varieties.**
- **Build on what is working: strive to stabilize seed systems through use of the channels farmers routinely use. Keep normal flows of crops and varieties moving.**
- **If supply-side seed interventions are necessary, consider those that may maintain or add agrobiodiversity.**
- **In all cases, give farmers crop and variety options, and the leverage (as well as the information) to strategize about what does or does not fit into their agrobiodiversity planning.**
- **If new variety introductions are on offer, monitor their performance, feed back to research and the formal seed sector, and actively consider effects on agrobiodiversity.**

High levels of agrobiodiversity can also aid farmers nutritionally and economically. Seed aid should never dramatically alter such diversity either by adding or removing substantial amounts of diversity. Agrobiodiversity profiles can be dynamic, but the process has to be planned, and with farmers having the knowledge, skills and tools to make informed decisions about the crops and varieties they sow.

Acknowledgments:
L. Sperling, T. Osborn and D. Cooper 2004 Towards effective and sustainable seed relief activities: Report of the Workshop on Effective and Sustainable Seed Relief Activities. Rome, 26-28 May 2003. FAO Plant Production and Protection Paper 181.

Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Using Seed Aid to Give Farmers Access to Seed of New Varieties

Farmers are keen to obtain and evaluate new crop varieties. This process of experimentation and subsequent introduction of adapted and accepted varieties can potentially strengthen farmers' cropping systems by increasing yields, improving drought resilience, boosting resistance to pests and diseases and also by capturing new market opportunities.

Introducing new varieties can also play a role in restoring food security at times of crisis. Crises may alter preferences, for instance when populations relocate, or crisis may even be caused by crop and variety breakdowns (for example spurred by plant disease or sharply declining soil fertility). Both situations leave farmers in want of appropriate planting material. Crises may also be seen as an opportunity to introduce new varieties, *via* the extensive seed aid channels, in order to promote what are considered more 'modern' practices and thus to strengthen systems plagued by low production.

Regardless of the potential for improving smallholder productivity through the introduction of new varieties, it is important to start by questioning the legitimacy of such introductions during crises. In periods of emergency and prolonged stress, small farmers are already at levels of increased risk. They are generally poorer, having lost household assets, livestock or crops in the field, and they cannot afford to waste further often scarce land or labor resources. Further, they need to have some confidence that the next planting season will yield better than the present, stressed, one. Outside aid, minimally, should put on offer products or processes at least as good as those already in farmers' hands. While formal sector varieties are referred to as 'improved' and the quality of the seed is certified, these varieties often yield poorly in many smallholder cropping systems. Such new varieties may not be adapted to the local agro-ecological conditions and farmers may not possess the management inputs (for example fertilizers and pesticides) crucial for their growth. So an 'improved variety' does not mean that performance is guaranteed.

This brief suggests 'better practice' for introducing (or not) new varieties in situations of acute and chronic stress. It presents a series of technical guidelines that need to be considered prior to any variety introductions. The brief is also framed by a set of precautionary notes: if humanitarian assistance involves crop or variety introductions, even 'emergency' short-term interventions should be programmed within a longer-term plan of action.

New varieties can increase food security in the wake of disasters, but only if practitioners work with farm communities and other informed personnel to minimize risk. Introducing new crops and varieties, especially after crisis, also requires a multi-year vision and commitment.

Introducing Varieties in Acute Stress Periods

Seed aid that is considering the possible introduction of crops or varieties has to be programmed to embrace a well-planned set of steps. These are summarized in Box 1 and elaborated in the text that follows.

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BOX 1

Introducing New Varieties in Acute Stress Periods: Key Steps

- **Conduct a Seed System Security Assessment.**
  - **What are the current seed system weaknesses and strengths?**
  - **Would new varieties open up promising opportunities: why, how, for whom?**
  - **What are the potential risks?**
- **Work with farm communities and other informed personnel to choose possible new varieties.**
  Is there sufficient prior evidence that varieties:
  - **Are adapted to the specific agro-ecological zones?**
  - **Meet farmers' acceptability criteria (harvest and post harvest for subsistence and market use)?**
  - **Can be successfully used under farmers' own management conditions (e.g. without fertilizer)?**
- **Design introductions so as to minimize risk and maximize farmers' informed choice.**
  - **Offer 'test size' packets: introductions should be small-scale.**
  - **Give farmers choices: to use the variety or not. And if possible, put several varieties on offer.**
  - **Provide sufficient accompanying information to allow farmers to make variety choices and management decisions (planting time, levels of input use, crop associations).**
- **Build in explicit monitoring and evaluation of new varieties: are they performing? For whom? Where?**
- **Count on a multi-year process.**
  - **Can the new introductions be successfully integrated into stressed farming systems?**
  - **If yes, is further fine-tuning needed?**

Conduct a Seed System Security Assessment

Often, a disaster and its ensuing seed aid are viewed as an opportunity for large scale distribution of seed of modern varieties. An assumption may be made that farmers have experienced crisis in part due to a weakness in their crop systems – which would include under-performing crops and varieties.

Before contemplating any introduction, implementers should conduct rigorous seed system security assessments (see Brief No. 7). This should be done with the recipient communities and with informed research and development personnel who know the local agro-ecological systems well. It is important to get an overview of the strengths and weaknesses of current agricultural and seed systems. Teams also need to have an in-depth understanding of the root causes for any stress to the seed system.

> Small test packets and plenty of information will enable farmers to decide whether and how to incorporate a new variety or crop into their system.

Fundamentally, a decision to introduce new varieties needs to be founded on sufficient evidence that new varieties offer promising opportunities, and, equally, that their introduction will not expose farmers further to increased risk.

Initial prior assessments must also provide good insight into farmers' awareness of, access to and use of new varieties. Answers to key questions (Box 2) will help guide further strategy – and may be particularly important for ensuring that the right farmers (i.e. the vulnerable) are well-served by the intervention.

Work with Farm Communities and Other Informed Personnel to Choose Possible New Varieties

A Seed System Security Assessment for any given region should result in an inventory of varieties by crop, including varieties currently used by farmers, as well as new varieties not yet available to farmers for testing. New varieties of potential interest to farmers usually come from the formal sector; international research centers, national research organizations and commercial seed companies. Institutions proposing candidate varieties for use in specific farming regions should submit documentation detailing performance of the new materials to those considering the distribution of such entries (e.g. NGOs). Such documentation might also be usefully reviewed by knowledgeable local extension agents as well as key farmers (depending, of course, on its language and format).

The suitability of new materials for use in a particular zone and for a well-defined client group needs to be assessed. Not everything new is good. Appropriate varieties should have:

- Evidence of adaptability to cropping system and prevailing agro-ecological conditions.
- Evidence of acceptability according to the preferences and experiences of farmers who are most affected by the stress. If, traditionally, farmers produce for domestic consumption, varieties should be acceptable for these standards.
- Evidence that they can be used under the management regimes in routine practice, including by the vulnerable (i.e. not be highly dependent on inputs such as fertilizers that the poorest farmers often cannot access).

BOX 2 Farmers' Awareness of, Access to and Use of New Varieties: Guide Questions

- **Do farmers currently have access to formal sector seed (of improved varieties)? If not, why not?**
  - **Is it a question of purchasing power? It is often the wealthier who seek out new varieties *via* certified seed.**
  - **Might there be a lack of varieties useful for the farmers' specific agro-ecological zones? Note that many new varieties are screened particularly for higher potential areas.**
  - **Is the constraint related to lack of nearby distributors or distribution points? Formal seed stockists may tend to cluster in larger town centers.**
- **Have farmers already experimented with new varieties?**
  - **If so, with what results?**
  - **If not, why not?**
- **Are farmers aware that there are new varieties that may improve productivity or provide new market opportunities?**

Note that maize hybrids, in particular, are often promoted as new items on offer in stress contexts. However, their performance under low-input, high stress farming has been uneven, and has often failed almost completely (see Ethiopia, Kenya, Malawi and Zimbabwe cases in Brief No. 2). Simply, hybrids usually demand inputs and better soils. Furthermore, the seed supply needs to be 'bought' the next season because hybrids cannot be resown and retain their productive vigor.

It is important for implementers to be very clear about the objective of introducing new varieties. In an agricultural recovery project, introductions should give farmers access to seed of new and desired varieties, so that they can experiment with them and add them to their systems if they choose to. The objective should not be to satisfy 100% of a farmer's seed needs with commercial seed (nor, as a hidden objective, to expand the customer base for the commercial sector). It should also not be to replace local varieties that may be seen by outsiders as inferior.

Design Introductions so as to Minimize Risk and Maximize Farmers' *Informed* Choice

Even use of 'best bet' varieties (that is, those pre-screened for potential adaptability, acceptability and usability) is not risk free. In an acute crisis, farmers need access to test packets of seeds, a basket of variety choices among which to select test candidates and enough information to make informed decisions about the varieties offered.

Packets

Seed delivered in small quantities will enable farmers to learn about the new materials without compromising their production stability. Sizes should be small enough that any production loss will not dent harvests. Farmers in many African regions are used to the format of such 'peanut-sized packages' and have favorably received new varieties this way in the East, Central and Southern African regions.

Variety Basket – and Choices

Farmers should always have a choice as to whether they want to accept a new variety or not. In addition, experiences drawn from actual field practice suggest that a basket of varieties should be on offer to contribute to crop and variety diversity and to potentially increase resilience.

Sufficient Information

Farmers need solid accompanying information to make knowledgeable choices and management decisions. Written information sheets (preferably in local languages) have proved useful, as have pictures and diagrams for the less literate. Information leaflets should communicate to farmers the existence of new varieties that may be of interest, describe the attributes of the new materials and give guidance on how to manage them (including signaling management practices that may differ from farmers' norms).

Build in Explicit Monitoring and Evaluation of New Varieties

All too often seed aid is an extension of food aid: monitoring and evaluation focus on logistics and subsequent reports are administrative and perfunctory. Increasingly, however, seed aid is seen as very different from food aid. Better, more nuanced assessments of seed systems and seed security are resulting in recommendations of more complex and integrated responses. Especially when an objective of variety introduction is included, it is important to monitor and evaluate – with farmer participation – the performance of the new varieties and to report on results and recommend next steps and changes to improve the process. It is important to signal if the varieties are yielding – but for whom, and where, and under which management conditions.

An 'improved' variety does not guarantee better performance. Practitioners and farmers will want to be sure that the variety is adapted to the conditions on the ground.

BOX 3

Introducing New Varieties in Conditions of Chronic Stress: Key Steps

- **Conduct an analysis of the existing seed security situation with target communities and explore alternative solutions for solving well-defined seed security constraints – and opportunities.**
- **Expose farmers to a wide range of promising varieties of the target crops and do the testing under farmers' own management conditions.**
- **Help target communities to select varieties of their choice and to communicate back to extension and research the reasons for their preferences and selections. (Such feedback should also help to fine-tune the breeding process.)**
- **Support the multiplication of start-up materials. These include the foundation or basic seeds that are the origin stock of pure and clean varieties.**
- **Encourage and support decentralized production and distribution of preferred varieties, for example through local traders and community-based seed multipliers. (Local seed producers might demonstrate and promote their products so as to create a sustained demand for preferred varieties.)**
- **Enhance farmer capacity to produce seed for own use and for sale. (Such agro-enterprise skills can provide a real bridge toward income generation.)**
- **Eventually, ensure diffusion of seed by building on existing seed channels, agro-enterprise initiatives, but also non-seed channels such as health and nutritional centers or soft drink kiosks etc.**

Count on a Multi-Year Process even for Interventions Spurred by Acute Stress

Clearly, the introduction of new varieties cannot be a one year, one-off activity. It is essential that the performance under farmer management of the new varieties informs subsequent recovery steps and that the response to future disasters also takes this information into account. Assuming that the objective is to strengthen and integrate farmers' own seed systems, investment needs to be made to determine how to maintain the variety at least cost to farmers and how the seeds themselves can be made available and accessible on a continuing basis.

Introducing New Varieties in Contexts of Chronic or Prolonged Stress

Chronic and prolonged stress affects farmers who are subject to repeated 'disaster' situations such as frequent drought, or who experience slower stress build-ups, such as increases in pests and diseases over time. Many of these populations are also economically marginalized, trapped, and often facing destitution. Although introductions of improved varieties alone may not be enough to solve the underlying problems faced by these farm families, they can be both an effective addition and a useful entry point for more ambitious interventions to ensure longer-term development. Access by all farmers to adapted and appropriate plant material (including new variety introductions) is vital in these contexts. However, given the longer-term stress and the likelihood of such stresses recurring, the process for variety selection and introduction requires sustained and continuous commitment by scientists and farming communities alike.

Chronically-stressed farmers are not economically attractive clients for seed companies (farmers just don't have the needed cash) so the onus of maintaining varieties often rests with the communities themselves.

A number of key steps can help to make the introduction of new varieties in conditions of chronic stress an effective process and decrease the chances of failure. Note that the focus of Box 3 is a solidly developmental one.

Enabling Innovation

Marginal farmers in chronically-stressed areas are not commercially attractive clients. Therefore communities themselves have to be linked to research programs and should have access to research products. These links might be direct or through intermediary organizations such as NGOs and development organizations. In all cases, these links have to be made explicit – and institutionalized. Exposure to innovation needs to be continuous, not one-off.

- Keep farmers, local seed producers, and agro-entrepreneurs abreast of advances in breeding and give them access to a dynamic supply of promising new varieties.
- In the particularly 'hard case' areas, where the adaptation stress is high (such as regions where soils are scarce or very poor) involve farmers in sustained participatory plant breeding and selection programs to ensure that the material is adapted on site and to secure a tradition of experimentation and direct client evaluation.

Support for the decentralized selection by farmers of preferred varieties (as well as their production and marketing) should be seen as part of a wider set of interventions to decentralize service delivery to farmers. The ultimate goal goes beyond varieties and seed. The aim is to enhance the capacity of communities to implement their own recovery and development in ways that mitigate the effects of cyclical and prolonged stress periods.

Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Understanding Seed Systems Used by Small Farmers in Africa: *Focus on Markets*

A great deal has been written on formal and informal[1] seed systems in Africa. However, the importance of the local seed/grain markets[2] has gone largely unrecognized and unappreciated as a distinct and expanding presence. This brief will introduce the formal and informal seed systems and highlight the growing importance of seed/grain markets for seed system stability and growth. It will also suggest concrete opportunities for greater integration of the formal and informal seed systems – centering on the strengthening of local markets during normal times as well as during disaster periods.

There are significant opportunities to improve the integration of formal seed systems with seed/grain markets. These cluster around linking such markets to sources of new varieties, supporting training in seed production and providing business development services to emerging smaller-scale seed enterprises.

Formal and Informal Seed Systems

Farmers, particularly smallholder farmers, use many systems to access seeds.

The formal seed system can be characterized by a clear chain of activities. It usually starts with plant breeding and promotes materials for formal variety release and maintenance. Regulations exist in this system to maintain variety identity and purity as well as to guarantee physical, physiological and sanitary quality. Seed marketing takes place through officially recognized seed outlets, and by way of national agricultural research systems (Louwaars 1994) and even through relief seed programs. The central premise of the formal system is that there is a clear distinction between 'seed' and 'grain'. Formal systems are especially important when seed is used to grow crops for commercial purposes (for example export or further food processing) and the uniformity and high quality of the product has to be guaranteed.

The informal seed system is basically what the formal system is not. Seed-related activities tend to be integrated and locally organized, and the informal system embraces most of the other ways in which farmers themselves produce, disseminate and procure seed: directly from their own harvest, through barter among friends, neighbors and relatives, and through local grain markets or traders. The same general steps take place in the informal system as in the formal but as integral parts of farmers' grain production rather than as discrete activities. Local technical knowledge and standards guide informal seed system performance, including the prevailing market forces. Perhaps because of its local specificity to needs and preferences the informal system provides most of the seed farmers use, worldwide between 80% and 90% of stocks. The important exception concerns hybrid maize (see Box 1).

Figure 1 overleaf shows schematically the formal and informal dimensions of seed systems and how flows of varieties and information between the two are routine.

1 The "informal system is sometimes also referred to as 'local', 'farmer', or 'traditional' seed systems.
2 We use the word 'local' seed/grain market to distinguish it from centralized more formal commercial enterprise. Seed arriving in the local markets is sometimes sourced from areas quite distant.

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BOX 1

Hybrid Maize: The Special African Case

It is hybrid maize that provides the exception to the rule in terms of local system seed use. Maize hybrids have been the main growth engine for formal sector seed and for profitable commercial enterprise in Africa. Quite simply, maize lends itself to commercial seed production.

- **Maize outperforms other cereals (pearl millet, sorghum, upland rice) in high-potential, rain-fed agro-ecoregions. The area planted to maize is large and the demand for seed substantial.**
- **Commercial (modern) maize varieties can significantly outperform local (traditional) varieties across the better environments.**
- **Genetic quality of commercial maize varieties (especially hybrids) erodes under farmer seed management (when seed production is integrated with crop production).**
- **Hybrid maize seed production is technically complex, exceeding the management capacity of smallholder farmers.**

Throughout Africa, governments and donors have supported the maize seed sector through breeding, extension, production subsidies and support to commercial seed enterprises. Large seed enterprises exist only where maize is an important commercial crop.

In East, Central and Southern Africa, informal and formal seed systems coexist and opinions diverge on the strengths and weaknesses of each. Proponents of informal seed systems often view the formal sector as a threat to crop system resilience and agrobiodiversity. Proponents of the formal seed system believe that commercial seed production is a prerequisite for sustained increases in crop productivity through the use of high quality seed of new[3] varieties. Increasingly, however, there is a realization that farmers are sourcing less and less seed from their classic 'informal' source – their own stocks – and that this farmer seed is not being replaced by commercial seed. Rather, farmers are sourcing seed from local seed/grain markets.

In reference to markets, it is importance to distinguish between different types of seed/grain commerce. Local markets bring in grain, which is subsequently sorted and used by farmers for seed (hence the term 'seed/grain markets'). This is different from commercial, formal sector seed, which is specially produced as seed, on specialized fields, within the framework of a seed business enterprise.

Growing Importance of Seed/Grain Markets: an Evolution in Perspective

For a long time it was believed that farmers would buy seed on the local market only if they had failed to harvest own seed, or lost their stocks, or were unable to obtain seed from family, friends and neighbors. In Eritrea, for example, seed sourced in the market was commonly referred to as 'beggars' seed.

However, over the past five years, practical seed system analysis has sharpened our understanding of the role of the local seed/grain market. Thinking has evolved along these lines:

- Initial belief that sourcing seed in local markets was a symptom of the failure of the farmers' own ability to produce seed from harvest.

3 'New' is used to denote a variety developed by breeders in the formal seed system. It is used instead of 'modern' and 'improved.'

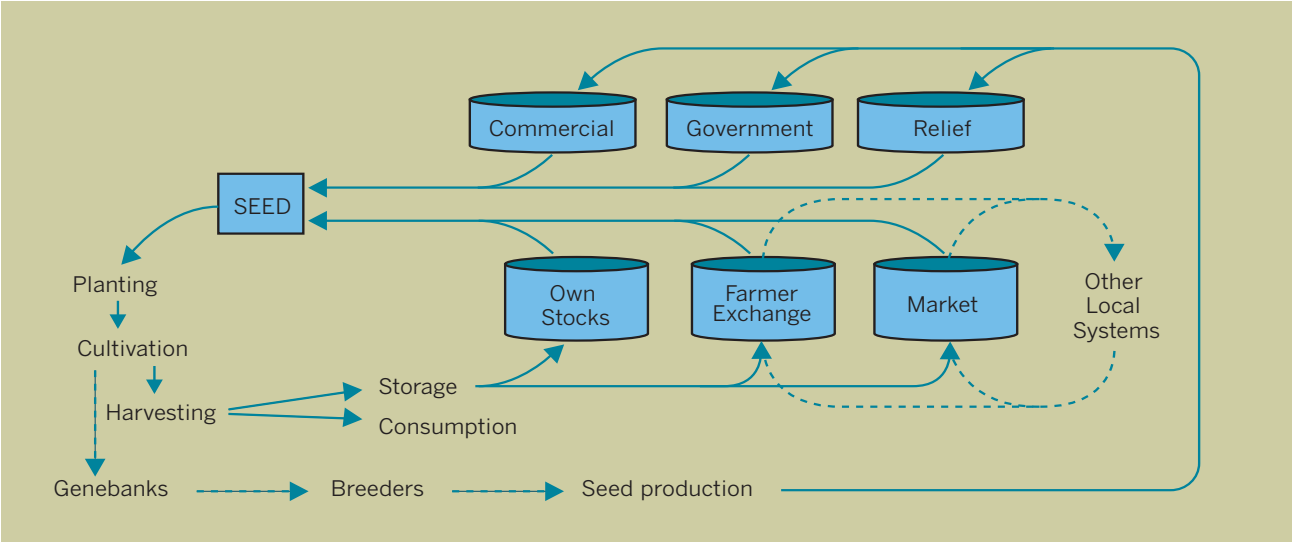

FIGURE 1: Channels through which farmers source seed are depicted by the cylinders. Own seed stocks, exchange with other farmers and purchase through local grain markets constitute informal channels. Commercial seed stockists, government or research outlets and relief supplies constitute formal channels. Adapted from Almekinders and Louwaars (1999), appearing in Sperling, Cooper and Remington, forthcoming).

- Acceptance that market seed is an important complement to farmers' own production and also to commercial, formal sector seed.
- Realization that the market seed channels are relatively efficient and that farmers rely on local market seed for sound reasons of convenience, availability of varieties, price and adequate quality.

Seed/Grain Markets: Reassessing Opportunities

Field analysis of seed systems has helped to question stereotypes and to identify opportunities rather than focus on constraints. Across Africa, market-related findings are demonstrating that:

- Market-sourced seed (especially for self-pollinated crops) serves as the core for seed security, especially among the more vulnerable farm families.
- Local grain markets, from which farmers obtain seed, prove durable in stress periods (during drought, flood and even instances of civil strife).
- The genetic quality of seed sourced in markets is most often acceptable to farmers, as it is generally grown in nearby agro-ecological contexts that match their own needs.
- The physiological and phytosanitary quality of seed purchased in local markets can be partially regulated (by sorting and acquisition from known contacts) and is often objectively good.
- Local seed/grain markets are often important channels for moving new varieties. In fact, for some crops, local markets move new varieties more effectively than formal diffusion channels.
- Markets prove to be a useful source for re-accessing seed of desired types and quantities that had been lost or temporarily abandoned in times of stress.

(See Sperling et al. 2004)

When analyzed within the context of the intensification of farming systems, the shift away from own-saved seed and toward local seed/grain markets is not surprising – particularly if markets can deliver a desirable range of crops and varieties, on time, and at acceptable quality and price. Today, seed/grain markets are the major source of seed for many farmers in many different cropping systems in Africa (for example, beans in Burundi, groundnut in Senegal and Gambia and most crops in semi-arid eastern Kenya).

Towards Integration of Local Seed/Grain Markets in Seed Sector Strategy

The Status Quo

Formal seed systems are presently poorly integrated with the local seed/grain channels. Formal systems are closely managed, from the development of varieties to multiplication and certification to marketing by commercial outlets to farmers. One might read the formal strategy as consciously avoiding integration with local seed/grain markets.

The motive in doing so is to maximize commercial seed sales and company profitability through sustained volume sales. It is not to reduce farmers' costs or to maximize farmer return on seed investments. Hybrids are a good case in point. The advantage for the seller, the commercial enterprise, is that farmers have to buy seeds every year or every other year.

Recurrent purchases by farmers are obviously important for the sustainability of the commercial seed system. When small quantities of seed from the formal sector enter the informal seed system and are then multiplied and recycled within social networks or acquired *via* grain markets, the revenues of the formal seed system remain low.

> Traders and farmers' groups need continuing support to enable them to play a greater role in delivering higher quality yet affordable seed *via* local channels.

Perhaps because the strengths of local seed/grain market channels are largely unrecognized (or actively denigrated) such channels receive no support from either governments, who bolster the formal seed system, or from NGOs, who tend to support farmer production for home or local community use. Consequently, and in spite of its significance, the local seed/grain market has almost no formal access to new varieties, to basic (foundation) seed as an input, or to seed quality control services. In spite of this lack of support, there are dramatic examples of how quickly new varieties move through the local market system (for example beans in western Kenya and green grams in eastern Kenya), fueled by farmers' word of mouth that the new varieties on offer locally really do perform.

Moving Forward Towards Integration in Normal and Emergency Periods

If farmer production is to be maintained and strengthened seed sector analysts and practitioners need to give considerable thought as to how to support the local seed/grain markets. There are significant opportunities for better integrating the formal seed systems (and expertise) with the seed/grain market channels. These broadly cluster around facilitating access of seed/grain markets to new varieties, providing training in seed production (with an emphasis on higher, but affordable, quality), and providing business development services to these emerging, smaller-scale enterprises.

During Normal Times

During normal times, initiatives could usefully focus on improving both the variety and quality of seed sold in local markets, especially as this is proving to be a core source of seed for more vulnerable farm families. These include:

- Greater support needs to be given to increasing the seed quality of crops and varieties in greatest demand at the markets. These may be local varieties or they may be new ones, but those supplying large quantities of seed/grain to the market need to be trained to produce better seed (which does not need to be certified). Up to now, such training has been localized in small community-based groups, often by development projects. General knowledge on targeted ways to raise seed quality has to be mainstreamed in farming communities.

> Market-sourced seed, particularly for self-pollinated crops, serves as the core for seed security, especially among more vulnerable farm families.

- Farmers and farmer groups need a good deal more training in agro-enterprise development. It is not enough to produce good seed. Such seed needs to bring profits on a continual basis. The commercial sector has shied away from subsistence crops and open-pollinated varieties as the profits are not sufficient. Hence, communities have to diversify production among crops and varieties and, crucially, need to have ongoing supplies of new and appreciated materials to stimulate demand.
- In reference to the point above, direct links needs to be forged between variety innovators and those who can multiply and distribute seed at a decent price. Right now, new varieties filter through to communities unacceptably slowly. Research systems have to deliver new materials not only to seed parastatals and commercial communities but directly to important community-based nodes right across the country.
- Traders and farmer groups need continued access to quality control support – which is enabling and not threatening. A trader who becomes known for truly good seed should eventually be able to garner worthwhile price margins.

Such integration would direct benefits to farmers-consumers, traders and potentially to national economies as production gains translate into increased revenues. The commercial seed sector could potentially benefit too, but only if the exposure of farmers to modestly better quality seed creates demand for the highly specialized products proffered by commercial enterprise.

During Emergency

The link between strengthened seed/grain markets in normal times and in disaster is direct. Higher quality seed and improved access is better at all times. Concerted, ongoing market strengthening should herald changes in the way such markets are regarded during periods of stress and emergency. For too long, seed for disaster relief has been sourced from the commercial seed sector, and its quality is often dubious. ('Commercial seed aid' is often but grain from market, conditioned, packaged and re-labeled; see the eastern Kenya and Zimbabwe cases in Brief No. 2).

Local seed/grain markets can increasingly be made use of in disaster response *via* distribution of vouchers, cash, or a combination of vouchers and seed fairs. In the past, such systems have delivered sufficient seed and seed of acceptable crops, varieties and quality. Local markets are also important features in regional economies. They need to be supported, not undermined, particularly in stress periods.

In sum, we need to look at local seed/grain markets as opportunities rather than constraints. With more targeted alliances, such markets can be crucial for moving new varieties from the formal sector more rapidly and more widely. With strategic support the products that local seed/grain markets offer can change from being 'farmer-acceptable and known' to 'much better than what the farmers have in their hands'. Finally, because the local seed/grain markets are so crucial to farmers' welfare, improvements in normal times immediately translate into improvements during periods of stress.

References:

Almekinders, C. & Louwaars, N., (1999). Farmers' seed production: new approaches and practices. London: Intermediate Technology Publications, Ltd.

Louwaars, N. (1994). Seed supply systems in the tropics: international course on seed production and seed technology. Wageningen, The Netherlands: International Agriculture Centre.

Sperling, L., Remington, T., Haugen, J.M., and Nagoda, S., eds. 2004, Addressing seed security in disaster response: linking relief with development. Cali, Colombia: International Center for Tropical Agriculture. (http://www.ciat.cgiar.org/africa/pdf/emergency_seed_aid_case_studies.pdf.

Sperling, L., H.D. Cooper, and T. Remington, forthcoming: Moving towards more effective seed aid, ms.

Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Assessing Seed System Security

This brief maps the steps needed to assess seed security system and is intended for non-specialist emergency response practitioners and donors. It presents a number of insights that have evolved through recent research. The brief seeks to:

- Expose stakeholders to agriculture disaster assessment methods, with a focus on seed systems.
- Facilitate changes in knowledge, attitude and practice with regard to seed system security.
- Assist in identifying strategies for rapid and effective agricultural recovery.

Seed systems are complex and so are the impacts of interventions. Every organization approaches a situation with a unique set of values, experience and commitment. While the assessment approach presented here aims to promote a rigorous seed system security assessment (SSSA), we realize that actual practice is often rushed and based on less-than-perfect information and judgments. This tool may help practitioners to avoid some common shortfalls and promote reflection on how seed systems function.

This brief identifies the key seed security issues. Although the intention is to provide guidance to help practitioners move forward, certain institutions may, after reading this brief, decide not to do seed aid at all, but rather to leave such assistance to others with greater capacity. In general, it is probably preferable to offer seed aid only in concert with seed system security assessments.

Note that this brief is an excerpt from a larger manual (see below for full details); our aim here is simply to introduce the concept of SSSA and give an overview of process.

The steps needed to attain seed security are quite different from those needed for food security. Explicit seed system security assessments are a prerequisite for effective action and vital for determining the strategic goals for seed-related assistance.

The State of Seed Security Assessments

Farm families are seed secure when they have access to seed and planting material of adequate quantity, acceptable quality and in time for planting. Seed security is best framed within the broader context of food and livelihood security. Helping farmers to obtain the planting materials they need will enable them to produce for their own consumption as well as for sale.

Achieving seed security is quite different from attaining food security, despite their obvious links. One can have enough seed to sow a plot, but lack sufficient food to eat, for example during the 'hungry season' prior to harvest. Conversely, a household can have adequate food, but lack access to seed for planting. Despite these important differences between food security and seed security, determinations of seed security are invariably based, implicitly or explicitly, on food security assessments. This results from a lack of appreciation and understanding of seed security issues, caused in part by

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a paucity of methods for assessing seed security in either emergency situations (that is, rapidly) or in depth on a larger scale beyond the community level.

Below we present the basic steps for a seed system security assessment. We note first that the context for any SSSA must first be well understood before one homes in on the agricultural or seed system *per se*. The patterns and causes of the disaster, for example its timing and duration and distribution in space and across communities, have to be analyzed and mapped. Further, the broad effects on the five capitals (natural, human, social, financial and physical) need to be well understood (see the detailed CIAT/CRS document for a set of guide questions). This brief is restricted to seed security concerns to draw attention to this relatively new area of assessment.

A shortfall in production does not necessarily imply a seed shortfall.

Basic Elements for Assessing Seed System Security

Methods for seed system security assessment are in the process of being tested and refined under the OFDA/MFA-funded Seed Systems under Stress project. A number of basic elements are integral for an accurate assessment of seed security.

Box 1 shows the five main elements in a seed system security analysis, with the subsequent text briefly highlighting key points in each. While presented sequentially, the process is iterative, going back and forth as one starts to understand what is really going on. The analysis is geared particularly to areas of acute shock (emergency), although most elements would also be relevant for agricultural and seed systems that are more chronically stressed.

BOX 1 Assessing Seed System Security: Five Basic Elements

1. **Carry out quick farming system and seed system profiles for regions of concern: normal times.**
2. **Determine the goals for seed relief and recovery, including farmer demand and needs: post crisis.**

AFTER DYNAMIC DEMANDS AND NEEDS HAVE BEEN DETERMINED:

3. **Analyze seed channel functioning post-crisis (framed in relation to demands and needs set).**
4. **Probe for more chronic (versus acute) stress manifestations as well as for emerging development opportunities – so as to distinguish between immediate and longer-term needs and strategies.**
5. **Match possible responses to priority constraints, opportunities and demands.**

1 Carry Out Quick Farming Systems and Seed System Profile for Regions of Concern: *Normal Times*

As a first step to understanding seed security, one has to have a good grasp of how the farming system and the seed system function in normal times; that is, what was the *status quo*. Much of this information can be gathered pre-disaster, through desk-based research and by informant or focus group interviews. The agricultural and seed system basics are straightforward:

- What are farmers' most important crops in normal times? What do they use them for? Consumption, income or both? What lesser crops might become important in times of stress?
- How do farmers' usually get seed or planting material for these crops?
- What are the sowing basics for each major crop? (Average areas sown, seed rates, multiplication rates.)
- Are there important or preferred varieties, by crop?
- Which inputs and management practices might be essential for particular crops or varieties?
- Who within the household is responsible for decision-making and actual management of the diverse crops, at various stages of production and post-production?

Some of the answers to these questions may be valid across households and socioeconomic groups, while others may not. So, repeating the analysis for distinct types of households or target groups, for example female-headed households, could be important. Some of these answers may also vary by ethnic group, and certainly will vary by agro-ecological region, so that doing an assessment in a small area will not be appropriate for country-wide interventions. We briefly elaborate on several of these items to show how decision-making can start to unfold even in routine information collection.

Important Crops (normal and stress)

Not all crops are equally important for farmers' livelihoods. A quick analysis can highlight the central ones, both for direct consumption and for income (the latter being crucial for purchase of survival

items in times of stress). Note that the profile of crops will change by season. The general profile of crops might also alter in stress periods – and these minor crop variations can usually be anticipated. Finally, as crops critical for poorer farmers may not be the same as for the better off, it is often useful to focus on the more vulnerable population segments immediately.

TABLE 1
Most important crops, theoretical example for East Africa

CROP	For Consumption	For Income	Other (Specify)
Beans	+		
Sorghum	+	+ (beer)	
Maize	+		

How (through which channels) farmers normally obtain seed for these most important crops

Farmers normally get seed from a range of channels, even for the same crop. For example, a farmer might get some of her bean seed from own stocks, and some from local markets to top up inadequate home harvest or storage conditions. The use of multiple seed channels for the same crop is important because a failure of one channel can be compensated for by using another.

Seed for different crops, for example maize and sorghum, may also routinely be accessed through quite different channels. For example, hybrid maize might need to be accessed from the formal sector or commercial sellers, while seed for sorghum can easily be obtained from home harvests because its multiplication rate is high and the harvest can be directly used for seed.

Through time, the range of channels from which farmers access seed may change, as more integrated seed suppliers emerge, such as informal traders who move higher quality (but still not certified) seed. Similarly, with increasingly poverty, relief seed is becoming routine in many contexts. Hence it is important to be aware of the full range of channels that farmers use and to keep up-to-date on changes over time.

Are there important or preferred varieties (by crop)?

Different varieties may serve different purposes in a single household. While certain varieties may be preferred for home consumption, others may be preferred for sale. Elements of post-harvest processing, such as ease of threshing, may cause women to prefer different varieties from men. The role of different varieties may vary across households, reflecting, *inter alia*, differences in agro-ecological and socio-economic conditions. For example, households with easy access to markets may access fertilizers and pesticides, thereby making a variety with traits such as tolerance to local production constraints (for example pests and poor soils) less relevant. Note also that the relevance of different varieties may change through time, even within a household, for example as socio-economic conditions change.

For many crops, small farmers are increasingly obtaining their seed off-farm through local vendors and markets.

STEP 2 Determine the Goals for Seed Relief and Recovery, Including Farmer Demand and Needs: *Post Crisis*

One of the early steps to shaping a seed system security assessment centers on weighing the objectives for relief and recovery. It is only with this strategic reflection that practitioners increase their chance of meeting the needs of populations in stress. Strategic reflection is vitally important and should replace the simple response of merely delivering inputs such as seed, which may or may

TABLE 2
Seed sources (percent from different sources) for most important crops, theoretical example for East Africa

CROP	Own Production	Social Networks, Neighbors & Friends	Local markets	Formal Sector	Other (Specify)
Beans	50	5	45		
Sorghum	95	5			
Maize	20			80	

A response may do a disservice to stressed populations if it restores a system that is gradually deteriorating.

not be appropriate for the context and, even if appropriate, may not be used for other reasons.

In considering objectives, practitioners may either elect to restore the system to the *status quo ante* (as it was before) or actively aim to promote a different and presumably improved crop and agricultural system. In planning either thrust, it is necessary to ensure that the response addresses immediate needs and demand. The rationale for this Step 2 is that the aims of the relief and recovery should be considered explicitly – so that the SSSA is shaped to maximize understanding of the dynamics (constraints and opportunities) in the systems.

Several points merit consideration. First, farming systems are not static: rather they are dynamic and change in positive as well as negative ways. Secondly, one cannot intervene in the full farming system, across all crops; choices have to be made as to whether the crop focus should promote quick recovery or maximize return on investment. Third is the principle of 'Do No Harm'. A response may do a disservice to stressed populations – reinforcing vulnerability – if it restores a system that is gradually deteriorating. Finally, it has to be made clear from the outset to which groups the SSSA gives priority (Farmers? Seed companies? Traders? Others?)

Box 2 suggests the kinds of guiding questions needed to frame the setting of aims.

BOX 2 Defining a Strategy for Relief and Recovery: *Guide Questions*

The following presents guidance as to whether the goal of the intervention should be to restore the agricultural system to its pre-crisis status quo, or if it should aim at promoting a different (and presumably improved) system.

OVERVIEW

- **What are the strengths and weaknesses of the pre-crisis cropping and seed system practices?**
- **Are the crops and varieties that people can access generally appropriate?**
- **Do people have access to markets for inputs and produce?**
- **Are there social networks and institutions that function to diffuse knowledge and planting material?**
- **Is there a culture of experimentation and evaluation with new seed?**
- **Are people eager to explore new niches such as seed trading?**
- **What opportunities exist that can be exploited?**
- **What changes are already taking place that shape crop and variety profiles, and with what effects?**

If strengths and opportunities exist and predominate, an overall aim for any intervention should be to 'do no harm'. Changing a system may put existing strengths at risk. However, if sound changes are already going on, these changes may be undermined by interventions that aim to restore the pre-crisis status.

GUIDING QUESTIONS FOR RESTORING THE SYSTEM TO THE STATUS QUO ANTE

- **If the aim is to restore, should the focus of intervention be on the income-generating crops, the staple crops, or crops that are key for system resilience, and why?**
- **Which crops have been affected most by the crisis? Should the focus be on these? Why? Why not?**
- **Are the crops affected critical for immediate food security? Are there no substitutes (or other opportunities) locally to fill the gap?**

GUIDING QUESTIONS FOR IMPROVING THE CROP, SEED OR AGRICULTURAL SYSTEM

- **What evidence is there that change is needed? What types of change?**
- **What should the level of effort on strengthening be in relation to efforts on system restoration? What strengths and opportunities exist in the surviving system that can be exploited? (See above)**
- **Should the crops of intervention focus be the same as before? Why? Should there be a partial combination of old and new crops? Note that the introduction of a new crop implies the identification of a new market.**
- **Should crop diversification be promoted as an explicit strategy?**
- **Should the priority varieties of intervention focus be the same as before? Why? Should there be a partial combination of old and new varieties?**
- **Is there evidence of seed quality concerns? How might these be addressed?**
- **Is there evidence of accessibility of novel crops and varieties? Bottlenecks, or otherwise, in formal sector, local seed/grain markets and exchange networks?**
- **What are the risks involved in the strengthening strategy? How might they be anticipated and responded to?**

RESPONDING TO IMMEDIATE FARMER DEMAND

Focusing on farmers and local economy trends, is there evidence for shifts in immediate demand and needs?

TABLE 3
Rating the parameters, bean example.

Crop	Availability (high to low)	Access (easy to difficult)	Variety & Physiological Quality (acceptable or not)
Own production and home stocks	low	easy	acceptable
Local grain/seed markets	high	difficult (high price)	moderately acceptable: variety is adapted but seed is of medium physiological quality
Formal Sector	low	difficult	moderately acceptable: variety is not totally suited to marginal zones, but seed is of high physiological quality

STEP Analyze Seed Channel Functioning: *Post-Crisis*

This step provides the core of the seed system security assessment. Some channels may be more resilient to different kinds of stress than others, and one should not assume that a breakdown in one channel means a breakdown in all. So, for instance, in times of bureaucratic upheaval such as civil war, when government services may halt, formal channels like seed parastatals often cease to function, while local ones, such as the seed/grain markets, often continue to operate.

In assessing seed channel functioning, three basic dimensions of seed security need to be evaluated to understand seed system functioning (see Brief No. 3 and Table 3 above).
Seed availability: Is seed available in the area?
Access to seed: Can farmers access the seed, particularly in terms of price and distance?
Seed quality: Is seed of the right variety? Is it sufficiently clean and healthy? Will use of this seed introduce unwarranted risk?

A channel is functioning (or can be helped to function) only when all three features can be managed to farmers' satisfaction. Very often during a crisis one may have to think hard about how to weigh each of these features. Minimally, enough seed has to be made accessible for basic sowing. The issues often most hotly debated include 'of which crops and varieties', and 'of what quality'.

Key Insights for Assessing Seed Channel Functioning

In the majority of cases, for poorer farmers, two channels in particular merit focus in stress periods: seed sourced from home production and from local seed/grain markets.

Home Production

The important message concerning home production (that is seed derived from own harvests) is that a production shortfall does not necessarily imply a seed shortfall. Crops have different seeding rates (that is, the amount of seed required to sow a given area) and different multiplication rates (that is, the amount of seed harvested in relation to the amount of seed sown). As an example, in East Africa for some of the basic staples, like beans or sorghum, farmers can lose most of the harvest (for beans 88% and for sorghum even 99%) and still have enough seed to sow – assuming all crop harvested can be saved for actual planting. But note that saving seed is not always easy, particularly in areas with only one agricultural season per year.

TABLE 4
The relation between harvests (home production) and seed needed for sowing, theoretical example for East Africa.

Crop	Beans	Sorghum
Surface Area per household	1/4 ha	1/4 ha
Seeding Rates (kg/ha)	100	10
Sowing Needs	25 kg	2.5 kg
Multiplication Rates	8	100
Harvest	200 kg	250 kg
% of harvest needed to meet basic sowing needs	12.5	1.0

Local Markets

Analyses that show how farmers actually obtain seed, both in normal and stress times, also deliver an important message about local markets. For many crops, small farmers are increasingly obtaining their seed through local vendors and markets, either to top up their home supplies, or to obtain the bulk of their seed, because they felt forced (or chose) to eat their household stocks. This trend toward market purchase is being documented again and again as land holdings become smaller and more fragmented, and as soil fertility progressively declines, particularly in East, Central and Southern Africa. The key question for understanding seed security thus shifts from 'do farmers produce enough seed' to 'can farmers access seed elsewhere'. Assessing how markets function involves tracing the locations of seeds and the paths along which seed moves in a stressed region, the availability of seed at important markets, transport and time costs, and the price at which seed is ultimately put on offer locally. Interviews with key regional traders can be especially useful for understanding the position of seed stocks and price margins (and this can be done quickly). Again, case studies are showing that for most basic crops it is rare that seed is not available within reasonable trading vicinity – even in time of crisis.

STEP 4 Probe for More Chronic (versus Acute) Stress Manifestations as well as for Emerging Development Opportunities

The last key step – before analyzing possible responses – centers on looking at the longer-term, so as to understand what is actually happening at the present moment. If the focus remains on the acute or short-term, SSSA may fail to grasp ongoing processes and dynamism in the system, and subsequently may misdiagnose the real set of local strengths and weaknesses. An SSSA has to systematically probe for longer-term patterns and key signals, which enlighten seed system functioning.

BOX 3 Guide Questions for Looking at the Longer-Term: Chronic Stress? Developmental Opportunities?

SEED AVAILABLITY

- **Do farmers lament a general shortage of any seed or planting material of a specific crop, which forces them to plant smaller areas than they wish?**
- **If so, do they cite reasons for these crops and varieties not being available locally? Marketing problems perhaps? Poor transport? (If farmers complain of high price, or not having funds to buy what is on offer, this reflects a problem of access.)**

SEED ACCESSIBILITY

- **Do farmers complain of high seed prices, or cost of seed in general, which has forced significant changes in their agricultural strategy, such as planting smaller areas, using non-preferred seed or changing the area planted to different crops?**
- **Do farmers mention decline of seed bartering networks that gave them access to seed and no local market mechanism to fill the gap and deliver the seed they want?**

SEED QUALITY

- **Are farmers planting what they consider unadapted (or 'inferior') crop varieties because they cannot find anything better (crops with low yields, wrong cycles, poor taste, poor marketing qualities)?**
- **Are farmers planting what they consider low quality seed because they cannot find anything better?**
- **Do farmers continually have to resow fields because of germination or emergence failures?**

GENERAL CONCERNS

- **Do farmers comment on a decline of seed quantity, quality or accessibility over the longer-term? (Maybe take a 5 to 10 season view.) If so, why? Are these problems they feel they cannot solve?**
- **Have the farmers been the recipients of seed aid on a repeated and relatively regular basis (say 1 in 3 seasons)? If so, why?**
- **Are there farmers who exhibit 'positive deviancy'? That is, who always have seed available, who never have a problem accessing seed and who are satisfied with the varieties and the quality of their seed? Why are these farmers seed secure and what can one learn from them?**

LOOKING TO THE FUTURE

- **Do promising new varieties exist for the agro-ecosystems in question, and do farmers have access to them? (Aim to understand how farmers use new varieties and under what circumstances.)**
- **Have there been positive trends in crop choice and evolution? If so, for whom? What were the conditions for success and how can these be sustained further?**
- **Have agro-enterprises been developed regionally? If so, what were the salient features for start up and success? (Try to analyze also those that may have failed.)**

Threshold or trigger indicators that might signal chronic stress include:

- Aid is being given season after season, in absence of acute outside stress such as floods.
- Crop failure, and purported lack of seed, becomes cyclical, say every 2 to 3 years.
- Lack of seed stored in houses and communities where it is normally maintained in quantity.
- Dramatic declines in seed quality and viability, or farmers sowing seed that they know to be of significantly inferior quality for germination rate or plant health.
- Changing crop profiles because of a lack of a particular seed or crop.
- Sharp increases in use of non-preferred or disliked varieties.

On the more developmental side, similarly, key signals can serve to stimulate reflections. Note that possible seed system strengthening might be framed both to respond to existing problems and to explore novel opportunities. In terms of opportunities, trigger signals on the more developmental side might include:

- Lack of farmer awareness of, access to, or use of new varieties (see also Brief No. 5).
- Heavy reliance on a narrow range of subsistence crops.
- Lack of agro-enterprise in general (with most crop production for local consumption and sale.

Box 3 (opposite) suggests guide questions to help assess whether seed systems are stressed on a more chronic basis and to suggest ways to start to explore more developmental options that go beyond short-term responses to emergencies.

TABLE 5
Seed problems and broadly appropriate responses

Parameter of the problem	Short-term response (acute)	Long-term response (chronic)
Unavailability of seed	*Where farmers source seed predominately through informal seed channels:* Enhance immediate operation of local and regional markets (e.g. offer inventory credit to traders, facilitate improved access to market information, including advance notice of demand subsidies or of purchase). *Where farmers source seed predominately through formal seed channels:* Direct distribution of seed.	*Where farmers source seed predominately through informal seed channels:* Support development of local and regional markets (e.g. encourage more access to credit, better established market information channels, perhaps more effective transport and seed storage support). *Where farmers source seed predominately through formal seed channels:* Support development of quality assured seed production or supply chains, including commercial enterprises where viable.
Poor and vulnerable farmers do not have access to seed	Cash disbursement. Seed Fairs with vouchers or cash. Local procurement and distribution (if the disaster rendered the communities dysfunctional).	Poverty reduction programs.
Seed of poor quality and lack of appropriate varieties	Seed fairs with quality controls. Direct distribution of test samples of quality seed or sale of subsidized test samples. Distribution of foundation seed to a limited number of farmers, making use of informal seed channels to diffuse the seed to others.	Programs to improve seed quality (on farm and in seed/grain markets). Participatory variety selection. Participatory plant breeding.

STEP 5 Match Possible Responses to Priority Constraints, Opportunities and Demand

Finally, the strength of the assessment (its accuracy, comprehensiveness and scope) must be double-checked *via* the reflective process of linking problem definitions and concrete action on the ground. The SSSA should be sufficient to guide subsequent field action and to help weigh among a variety (or cluster) of options. The process of pondering responses will reveal the extent to which information is sufficient, and whether the dynamics of seed system function are truly understood.

Without prescribing a scenario such as 'If A is found, then B response is appropriate', we suggest in Table 5 below the broad overview of possible seed system-related problems and how they may link to possible alleviating actions (see CIAT/CRS ms. for an in-depth table). For instance, during an acute crisis such as a flood, an assessment that shows a 'lack of seed available' (a rare case) might be immediately linked to actions to import seed from elsewhere, whereas an assessment that diagnoses 'lack of access' as the problem (perhaps due to a drop in ability to purchase or to barter) might focus on supplying vouchers (perhaps coupled with seed fairs). Assessments that show the stress to be a chronic one, spanning many seasons, might recommend a move away from seed-based interventions altogether. In the case of chronic access problems, the development of income-generating activities or agro-enterprises might better help alleviate the poverty problems at hand.

Conclusions

New insights on seed aid and an appreciation of the resilience and complexity of seed systems are emerging. This has resulted in a significant 'raising of the bar' in how seed system security is assessed and analyzed and how seed interventions are designed.

A seed system security assessment, not surprisingly, focuses on seed systems. It therefore does not replace disaster and food security assessments, but rather it complements them. SSSA itself also goes well beyond a seed focus *per se* and beyond reductionist calculations of seed needs. SSSA is an iterative process – part desk-based, part field analysis – with reflections on short- as well as long-term trends in the seed, farming and livelihood systems.

This brief introduces a tool that practitioners can use to assist farming communities recover from disaster. It provides concrete guidance for understanding problems and identifying opportunities for strengthening and integrating the different seed systems on which farm families rely.

References

CIAT/CRS, ms Seed System Security Assessment: A Thinking Guide. Version February, 2006.

Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Seed Relief Responses: *an Overview*

This Brief describes the predominant approaches to seed aid used to respond to acute, emergency stresses. Such approaches generally either deliver direct forms of aid and assume a lack of available seed as the driving need, or are market-based and give recipients cash or vouchers to procure seed and hence assume lack of access as the driving need. (These distinctions are discussed in more detail in Brief No. 3.) This Brief looks at the range of interventions, suggests some of their strengths and weaknesses, and highlights how they are evolving over time.

Responses to seed relief are changing, from a historic dominance of direct seed distribution (previously called seeds & tools) to market-based options. While direct aid assumes 'lack of available seed' as the driving need, the market-based approaches, focus on concerns of 'lack of access.'

Direct Aid Approaches

Direct seed aid generally engages implementers in procuring, transporting and distributing seed. Direct Seed Distribution, its main variant, is the oldest form of seed aid and has been practiced, at least in Africa, for more than 20 years. Food aid that is given explicitly to protect seed stocks (known as Seed Protection Rations) might also be included in this category. We briefly discuss these direct aid approaches below.

Direct Seed Distribution

Direct Seed Distribution (DSD) is the dominant approach to seed relief. It is sometimes referred to as seeds and tools (S&T) because the distribution of seed is often accompanied by the provision of a hand hoe, and is also known as conventional seed aid, denoting its longstanding position as the standard response. DSD is a classic supply-side approach; the implementing agency decides what quantities of which crops and varieties to purchase and to distribute as a package to farmers. It is based on an assumption that the problem is a lack of available seed or of seed quality; although seed might be available, it is considered to be of inferior varieties or of poor quality. Tenders are issued for commercial seed, if available in the country, or for farmer seed if not. This might be done by the concerned government, by the Food and Agriculture Organization (FAO) or by non-governmental organizations (NGOs) The transport and distribution of the seed is usually undertaken by NGOs who may already be engaged in distributing relief supplies (food and non-food). DSD approaches differ mainly in the source from which they procure seed – the commercial sector or farmer-based systems (see Bramel et al. 2004).

Commercial Seed-Based DSD

Direct seed distribution based on commercial seed is widely used in countries with a commercial maize seed sector such as Kenya, Malawi, Tanzania, Uganda and Zimbabwe. This may be because governments use the relief opportunity to promote their seed industry. However, it has also been used in southern Sudan, where there is no formal seed system, with seed sourced in neighboring

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Uganda and Kenya. Seed is procured either from government seed parastatals or from private companies who procure certified seed of varieties that have been developed by private or public sector research.

Commercially-based DSD by its nature is restricted to a narrow range of crops and varieties that the seed business sector has deemed potentially profitable. Many of these crop and variety types have been selected for medium and high potential environments, or may be hybrids, because the commercial sector is geared towards those farmers who can afford to pay for new varieties or who seek to renew their seed stocks regularly.

Farmer Seed-Based DSD

Direct Seed Distribution is not based on the commercial sector in countries such as Ethiopia, Eritrea and Burundi because the commercial sector there is nonexistent or too small to meet the relief demand or because the government discourages the importation of seed into the country. In these countries, DSD consists of sourcing seed from the farmers directly, via larger-scale traders, or by purchases in grain markets. In farmer-based DSD (as with commercial-based DSD) implementing agencies decide on crops, varieties and their relative quantities. Tenders are issued, seed is purchased, aggregated, transported and distributed to farmers.

TABLE 1
Range of seed relief approaches used in periods of acute emergency stress

DIRECT AID APPROACHES	
1. Direct Seed Distribution: Commercial-Based a.k.a Convention Seed Aid, Seeds and tools.	Procurement of quality seed from outside the region, for delivery to farmers. The most widely used approach to seed relief. Short-term response best suited to address problems of seed availability especially in situations of total crop failure and long-term displacement of farmers.
2. Direct Seed Distribution: Farmer-based or Local procurement and distribution of seed.	Procurement of quality seed from within the region, for delivery to farmers, a variant of 1. Short-term response to address problems of seed access or highly localized problems of seed availability.
3. Food aid, Seed Protection Ration.	Food aid is often supplied in emergency situations alongside seed aid so that the farming family does not need to consume the seed provided or to eat their remaining seed stocks.
MARKET-BASED AID APPROACHES	
4. Vouchers and cash to farmers.	Vouchers or cash are provided so as to give farmers the means to access seed where it is available, from local markets or the commercial sector. Farmers can access crops and varieties of their choice. Short-term response to address problems of seed access especially in situations of local seed shortages where local markets or barter between farmers are normally used.
5. Seed Fairs.	Seed fairs provide an *ad hoc* market place to facilitate access to seeds of specific crops and varieties, from other farmers, traders, and the formal sector. Usually used in conjunction with vouchers to provide poorer farmers with purchasing power. Short or medium-term response to address problems of seed access especially for subsistence crops, and where local markets are normally used.
6. Trade-Input, Multi-Input, Livelihood Fairs.	A variant of 5. In addition to seed, such fairs facilitate farmers' access to inputs such as small livestock, animal feed, fertilizer and tools.

The fact that seed can be successfully sourced from the farmer seed system during direct seed distributions provides *prima facie* evidence that there is no problem of seed availability in the countries and regions in question, although there may be pockets of problems, for which local procurement is necessary. Supply-side interventions like DSD are generally misplaced in such situations.

Food Aid and Seed Protection Rations

The delivery of food aid may be underrated as a seed relief strategy. Delivery of food aid can allow farmers to retain, rather than eat, their remaining seed stocks. The rationale for the Seed Protection Ration is that such food aid is given particularly for the months prior to sowing, during the lean times.

Market-Based Approaches

Market-based approaches focus on giving farmers the means to obtain seed. They are based on the assumption that seed access, not seed availability, is the primary constraint. The use of seed vouchers, coupled with seed fairs, is the most common response in this genre. The seed focus has also recently expanded to embrace 'Trade-Input' or 'Multi-Input' or 'Livelihood' Fairs. Furthermore, giving vouchers or cash alone, without an accompanying fair, is increasingly being practiced as a seed aid strategy.

Seed Vouchers and Fairs

Seed vouchers are coupons or certificates with a guaranteed cash value that can be exchanged for seed from approved sellers. Seed sellers then redeem their vouchers for cash from the issuing agency. The Seed Voucher and Fair approach (SV&F) brings seed sellers together on a specific set of days and in a well-advertised local venue and then allows farmers who need seeds to select the crops and varieties they want. The SV&F approach is fairly recent in terms of an emergency response and was first implemented in July 2000 in Kenya (see Remington et al. 2002). However, its use has been scaled up quickly and as of 2005 had been implemented in some 30 African countries.

Trade-Input, Multi-Input or Livelihood Fairs

Several variants on seed fairs give farmers access to a range of inputs beyond seed, such as small livestock, animal feed, fertilizer and tools. Vouchers are issued, and sellers and buyers come together in dedicated aid events.

Cash or Vouchers Alone

Voucher distribution alone has been used in a range of aid contexts, for services as well as goods: medicines, tools, food and other items vulnerable populations might need. Their use linked to seed is somewhat more recent, and ultimately allows the recipients to decide whether seed of any kind is a priority for them.

Cash-based aid also has been around for decades, but work comparing the effectiveness of cash to vouchers and to direct aid approaches is fairly new. The first conclusions suggest that direct cash compares favorably with all alternatives, including food aid itself (see Harvey 2005).

Table 1 summarizes the range of seed relief approaches used in periods of acute emergency stress. (Modified from Anon. 2004 FAO).

Comparing the Dominant Forms of Aid: DSD and SV&F

No one approach to seed aid is inherently better than another. Much depends on features such as the nature of the emergency (man-made or natural), the seed security problems encountered and the capacities of the implementing agencies. Below we outline some of the salient advantages and disadvantages associated with the two dominant forms of seed aid: Direct Seed Distribution and Seed Vouchers & Fairs.

Advantages

Main advantages of Direct Seed Distribution:

1. **It exploits the existing disaster relief system and capacity.**
   Governments, donors and relief agencies have well established procurement processes and accountability systems. Seed can be treated as any other commodity, such as food, blankets, tarpaulins etc. Tenders are issued, sealed bids accepted, seed is purchased, transported and distributed.

2. **It is easy to scale up quickly.**
   If seed is available, it can be sourced, transported and distributed to large numbers of farmers in a short period of time.

3. **It supports the formal seed system.**
   The purchase of commercial seed is very profitable to seed companies because orders are large, NGOs pay up front and they also handle transport and distribution. It is especially lucrative when seed companies can purchase and condition grain to sell as 'emergency grade' seed.

4. **It is an opportunity to finance the large scale dissemination of seed of new promising research varieties.** Seed of new varieties reaches many more farmers more quickly than through the commercial channels.

Main advantages of Seed Vouchers & Fairs:

1. **SV&F builds and strengthens local farmer systems.**
   Although recovering from disaster, demand by farmers for seed is usually constrained by their lack of financial capital. Increasing demand by issuing vouchers enables farmers to access seed from a range of sources such as other farmers, market traders and the commercial seed sector. When managed by competent staff, seed fairs provide an opportunity to identify ways to strengthen seed systems by supporting seed production, marketing and system integration.

2. **SV&F increases financial and social capital in the target communities.**
   Unlike DSD, where seed companies, procurement agencies, large traders and transporters capture most of the benefit, the proceeds from the sale of seed is shared mostly among community-based traders (many of whom are women). This results in increased financial and social capital in the communities.

3. **SV&F strengthens the integration of the formal and farmer seed systems.**
   SV&F provides an opportunity for sellers of commercial and farmer seed to compete for customers. Where commercial seed companies or stockists have been represented at fairs, farmers have often opted to spend at least a portion of their vouchers on commercial seed, for example on hybrid maize or on a new variety of bean or pigeonpea.

4. **SV&F gives farmers relative choice of crop and varieties.**
   A diversity of crops and varieties are on offer at seed fairs, usually reflecting the predominant crops sold also at local seed/grain markets. Farmers have the option to use their vouchers to obtain crops and varieties of particular interest and to access multiple types of seed.

Disadvantages

Main disadvantages of Direct Seed Distribution:

1. **The approach tends to be top down and centralized.**
   DSD is generally not planned and implemented with communities. As a supply-side approach, the implementers tend to make the major decisions on seed procurement and distribution.

2. **There are important risks of wrong varieties or crops.**
   Because seed is sourced either commercially or in bulk, a narrow range of crops and varieties tend to be on offer in DSD. Particularly where companies and seed parastatals are targeted towards medium and higher potential farming areas, the crops and varieties on offer for emergency may not be suitable for the conditions of vulnerable or marginal small farmers.

3. **The large scale of seed acquisition results in a skewed distribution of benefits.**
   Mega-tendering (that is purchasing large amounts of seed) means mega-profit for the successful bidders and transporters. The value of the seed received by farmers is but a small fraction of the total project cost.

4. **Emergency DSD purchase undermines market functioning.**
   The free delivery of seed, directly and on a large scale, undermines the functioning of local seed/grain markets and compromises the development of longer-term more commercial seed supply systems. Furthermore, while DSD can be quite profitable for seed companies, such enterprises often opt for sales to emergency NGOs after a disaster and may neglect their network of rural stockists and customers.

Main disadvantages of Seed Vouchers & Fairs:

1. **The approach is difficult to implement quickly and to scale up.**
   SV&F is decentralized and management intensive. Many NGOs have never implemented SV&F and so they require training, which takes time. Each fair can serve on average only 500 farmers – which means that multiple teams have to operate concurrently and for several weeks to reach even 10,000 farmers.

2. **SV&F requires knowledge and capacity of seed systems.**
   Unlike DSD, SV&Fs are not once-off distributions. Rather they are the start of a process of relief, recovery and development that spans three years or more. This process requires competent and dedicated agriculture staff, which most relief agencies currently lack.

3. **SV&F practitioners have less access to seed of commercial and researcher varieties.**
   Given a choice, seed companies will prefer DSD over SV&F. In DSD the relief agency is the customer and relief agencies are ideal customers because they place large orders, always pay on time and rarely complain. In contrast, reaching rural farmers is expensive and risky because smallholders may decide not to purchase the more expensive commercial seed.

Concerns Common to Both: Seed Quality

It is essential that the seed delivered by seed aid is of acceptable quality, so that it can hasten the process of recovery. Concerns about quality are often at the heart of critiques of both approaches, DSD and SV&F.

Stereotypes often judge seed from the formal or commercial sector as high quality, healthy and having high germination, while seed from the informal sector (home-produced and procured from the market) is deemed of poor seed quality.

However, grounded analyses show that such labels can be deceptive (see Brief No. 2). The health quality of formal-sector seed may not be as advertised, while at the same time select laboratory analyses have demonstrated good quality in farmer seed and market seed (western Kenya case). Overall, emergency-grade seed is variable in health and genetic quality (eastern Kenya case). The point is not to assume the quality of seed from a given source because of the source. Other methods may be needed to verify standards.

The focus on seed health as a measure of quality in emergency seed aid has diverted attention from what is probably the more important quality issue: suitability. The seed on offer must be adapted to the growing and stress conditions at hand, and should have generally acceptable crop characteristics. It is puzzling that genetic quality has in practice been given second priority in emergency responses. While relatively few crops and varieties are multiplied by the formal sector, those emerging from formal research sectors or on offer from commercial companies are assumed to be good enough for emergency distribution, regardless of whether they have been selected for use in the regions of stress, can be grown under the management conditions actually practiced by farmers, or are acceptable to those preparing food. On this last point, farmers may be given orange-fleshed sweet potatoes or yellow maize when cultural preferences abhor such choices, preferring white sweet potatoes or white maize. In the relief business there are often trade-offs between accessing seed with locally-accepted agronomic and consumer qualities *versus* seed with highly defined health and viability standards.

Looking Forward: Direct versus Market-Based Aid

Concern has been growing among donors, agriculture researchers and NGO practitioners that Direct Seed Distribution has become repetitive and is expensive, with little impact beyond the few kilograms of seed received by farmers. In addition, evidence is accumulating that the seed security problem is often not one of seed availability or quality, but rather of lack of access to seed. Hence there is now increased interest in the use of a range of market-based approaches to emergency seed aid.

With growing donor support (particularly from the Office of Foreign Disaster Assistance/ USAID), large NGOs such as CRS, CARE, World Vision International, and Save the Children UK are increasingly using Seed Vouchers & Fairs in their relief and recovery efforts. One of the more dramatic shifts to date has been in Mozambique, where the government has dropped DSD and shifted to vouchers with support from the International Center for Research in the Semi-Arid Tropics (ICRISAT) and FAO.

There are a number of important challenges related to SV&F implementation, including the requirement for increased agricultural technical competence, the need to engage the formal seed sector – especially agricultural research – to enable farmers to access seed of new and promising varieties, and the pull for SV&F to remain innovative and not become stagnant or repetitive. Relief agencies that want to implement SV&F need to hire, train and retain competent agricultural staff. This will not be easy as many agencies have no agriculture capacity and treat seed as they would any other relief commodity.

Furthermore, in order to give farmers access to seed of new and promising varieties at seed fairs, research organizations will also need support to ensure that seed is multiplied and on offer at the fairs. Finally, effective monitoring and evaluation and

> Direct seed distribution is easy to scale up, supports the formal sector and can be used to disseminate new varieties widely. Seed vouchers and fairs strengthen local systems and strengthen social and financial capital in communities. They offer farmers more choice (of both local and new crops and varieties) and can pave the way for integration between formal and informal systems.

timely reporting are needed to continue to capture opportunities created by SV&F.

The increasing use of vouchers and direct cash approaches more generally to address the problem of lack of access is both a promising sign and a strong signal. Homing in on the problem of access and letting farmers make their emergency choices should enhance the odds that immediate aid meets priority needs. However, the recognition that concerns about access are central should serve to help shift aid away from emergency responses altogether for seed and non-seed. The inability to access a good is one of the problems of basic poverty. Hence, the scope of assistance needs to go well beyond emergency aid, and towards approaches that strengthen basic livelihood strategies, for example agro-enterprise and income generation programs.

References

Anon 2004. Summary Tables: seed relief interventions and tools and guidance. In. L. Sperling, T. Osborn and D. Cooper eds. Towards effective and sustainable seed relief activities. Report of the Workshop on Effective and Sustainable Seed Relief Activities, Rome 26-28 May 2003. Rome: FAO Plant Production and Protection Paper 181.

Bramel, P., Remington, T. and McNeil, M. CRS Seed Vouchers & Fairs, 2004: Using markets in disaster response. Nairobi, Kenya: CRS East Africa.

Remington, T., Maroko, J., Walsh, S., Omanga, P. and Charles, E., 2002, Getting off the seed and tools treadmill with CRS seed vouchers and fairs. Disasters 26(4):

Harvey P, 2005, Cash and vouchers in emergencies, HPG Discussion Paper, February 2005. London: Overseas Development Institute.

Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

The Power of Evaluation

The current state of evaluation in seed aid is dismal indeed. In principle at least, practitioners understand and embrace the importance of evaluation in learning from experience and improving performance. Unfortunately, however, seed interventions are often seen as straightforward, one-off, and output focused: react quickly, distribute seed and close out. Evaluations are not relevant.

This attitude has resulted in a remarkable stagnation in how seed security is understood and assessed and how interventions are planned and implemented. Fortunately, ideas are changing. With a growing realization that seed systems are complex and resilient and that local institutions – especially markets – can and should play a central role in recovery, initial seed aid responses are now seen as the first important step in an ongoing process that may last many years. Evaluation has become essential to ensure that experience leads to learning and that learning informs the next step in the process. This will lead to better projects, which in turn will result in stronger and more resilient seed systems that underpin sustainable seed security. Evaluations should help to correct common and immediate problems such as poor targeting, unsuitable crops or varieties on offer and dependency creation.

Rather than turning their attention to evaluation at the end of implementation, practitioners should reflect on the evaluation when designing the intervention. What should be the outcomes of the intervention and for whom? For how long, and at what intervals, will the agency need to monitor the range of effects of its assistance? Time and budget commitments should be made accordingly.

Practitioners should embrace evaluation as an exceptional learning opportunity. Donors need to support practitioners in contributing to the body of knowledge, rather than merely holding them accountable for mistakes made.

Types of evaluation

There are several different types of evaluations.

Real time evaluations

One can use interviews, for example just after seed distribution or as people leave seed fairs, to obtain feedback from beneficiaries. This feedback is then used immediately to inform the next planned event. Real time evaluations monitor information to ensure that the process is on track and that problems are identified and corrected as quickly as possible.

Output evaluations

Interviews are conducted right after the intervention (within one month) to provide feedback from practitioners, partners and beneficiaries on the logistics of the intervention (its timing, targeting, distribution mode, etc.). This is the classic type of post-mortem evaluation that satisfies donor requirements and closes a project.

Outcome evaluations

At the end of the cropping season interviews evaluate the effectiveness or outcome of the intervention in terms of impact on crop production and next

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season's seed security. An outcome evaluation shifts the focus from what was done (outputs) to what might be done next to support continuing recovery.

Impact evaluations
Longer term follow up, conducted after three to five seasons, aims to evaluate the broader impact of the interventions on seed system resilience and food security. This type of evaluation seeks to capture and share learning and best practices for the wider practitioner community.

Meta-analyses and evaluations
This type of evaluation compares several interventions at once. The interventions may be of the same type (for instance, a range of direct seed distributions) or they may represent different approaches, such as direct seed distribution and seed vouchers and fairs. Meta-analyses may even assess the totality of seed system interventions in a given geographical area. Such evaluations can also be used to compare performance across countries, with different seed systems, experiencing different disasters and different levels of seed insecurity.

> Evaluations must address concerns of basic intervention effectiveness. Have activities made a difference to farmers, farming systems and the local economy?

Meta-analyses generally focus on the effectiveness of the approach itself. They are of special interest to practitioners committed to learning how to improve seed-aid planning and implementation by deepening their understanding of seed systems and the strengths and weaknesses of different kinds of response.

Evaluation as the cornerstone of learning

Evaluations present a wonderful opportunity for learning – first and foremost for the implementers but also for the wider practitioner and donor communities. The challenge for practitioners is to stop treating evaluations as an onerous requirement and to recognize them as the exceptional learning opportunities that they are. The discussion of whether evaluations should be internal or external misses the point – which is that they should focus on learning. That requires the practitioners to be actively involved in the evaluation with the intention of using the results to improve practices. Therefore, perhaps one of the better models involves an externally-facilitated evaluation.

Although donors accept output-focused post mortems, they also support rigorous outcome evaluations. The challenge for seed aid donors is to become more proactive in supporting evaluation. This will require donors to embrace learning and sharing as the principle objectives of evaluation, rather than regarding evaluation as simply reporting and closing. Donors need to communicate their support for learning-focused evaluations. They should shift their focus from holding practitioners accountable for mistakes made to supporting practitioners in contributing to the body of knowledge on seed assistance. It is also vital that donors give attention to how those implementing – and everyone else involved in seed aid – subsequently apply the lessons learned during the evaluation.

Guide Questions for Different Types of Evaluation

In the table opposite we suggest some of the varied issues that might be embraced by the different types of evaluations introduced in the previous section. The list is suggestive, to give examples of key issues at different levels of evaluation, and is a long way from being exhaustive. What is important is to emphasize that:

- The key evaluation issues change through time.
- All four types of evaluations are important and are not interchangeable.
- The recipients' views and actual effects on the ground have to figure among the essential elements.

Note that current evaluation and monitoring, if done at all within seed aid projects, is generally limited to the inputs distributed and the efficiencies of the operation (its timeliness and numbers of beneficiaries reached). Evaluations have to address concerns of basic intervention effectiveness, such as whether the precise activities made a difference to the farmers in the farming system and more broadly to the local economy. While the insights of implementers are important for improving practice, the recipients' point of view should be given equal weight; to do so requires considerable field time to be allocated for evaluation.

To reiterate, evaluations at all levels present important opportunities for learning and thus to improve practice. However, such evaluations require real reflection and commitment as well as time, energy and financial resources. In completing the cycle, practitioners have to be prepared to use the results for specific projects and to incorporate their wider lessons into future program design.

TABLE 1
Themes to address in evaluation

Seed System Relief and Evaluation Overview: Select themes to be addressed		
Type of Evaluation	**Agency's assessments of**	**Recipients' assessments of**
Real-time (during intervention)	Insights (from diverse perspectives) on: ■ Products on offer (crop and variety choice, seed quality, seed amounts) ■ The immediate intervention process, whatever recipients signal as important, e.g. • Length of intervention, including waiting time • Number and order of farmers served • Adequacy of support personnel	
Output (after about one-month)	Insights (from diverse perspectives) on the efficiency, organization and logistics of intervention. ■ Timing (especially in relation to subsequent planting) ■ Targeting (process and perceived 'fairness') ■ Choice of locales ■ Choice of crops and varieties ■ Adequacy of seed quality on offer (and validity of process guiding quality verification) ■ Adequacy of preparatory information or sessions ■ Scale (numbers served, overall amounts of seed or products delivered or made accessible) What worked? What was missing? What modifications should be made in future?	
Outcome (after first season)	Insights on first effects of intervention. Recipient Focus: ■ Yield performance and farmer satisfaction with crops and varieties obtained as aid (qualitative and quantitative variety attributes) ■ Importance of seed aid in relation to farmers' other seed sources • What proportion of the aid given was sown and why? • What proportion of the total seed sown came from aid (versus home-saved seed, local markets, exchange) and why? Farming System and Implementer Focus: ■ Was the impact of the disaster on farming systems sufficiently understood to guide planning (looking with hindsight)? ■ Was the general choice of intervention valid (and linked to a specific seed security need?) ■ Was the intervention actually needed? Evidence? ■ Did the intervention strengthen or protect seed security? Evidence? ■ Which broad groups were reached by the intervention and which not? ■ Were there any unanticipated positive effects? ■ Were there any unanticipated negative effects? What worked? What was missing? What modifications should be made in future?	
Impact evaluations (after several seasons)	Impact – positive **and** negative – of intervention on: ■ Stability of production and food security ■ Biodiversity of crops and varieties ■ Household income and local economy ■ Seed channel functioning, including local seed/grain markets and development of commercial enterprises ■ System resilience to possible next set of shocks	

CONTINUED ON PAGE 4

Seed System Relief and Evaluation Overview: Select themes to be addressed		
Type of Evaluation	**Agency's assessments of**	**Recipients' assessments of**
Meta-analyses (after cluster of interventions completed)	Content here would vary according to what is being compared. Some general guide themes. Strengths and weakness of a specific type of intervention (e.g. Direct Seed Distribution) for specific contexts (e.g. civil strife, flood, drought). ■ For whom? • farmers – male – female • children • traders • commercial companies ■ immediate effects • range of benefits and costs – agronomic – environmental – economic – social ■ longer-term effects • range of benefits and costs – agronomic – environmental – economic – social Comparative advantages among different interventions (e.g. cash and voucher delivery, direct seed distribution, seed vouchers and fairs, seed protection rations) ■ Which contexts? ■ For whom? ■ Immediate effects? ■ Longer-term effects?	

Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Developing a Seed-Aid Proposal: *A Rapid Review Checklist for Practitioners*

Working through a set of guiding criteria, practitioners can ensure that any proposals for implementing seed system support are well-grounded and stand a good chance of achieving their objectives.

Disaster has a devastating impact on agricultural livelihoods and often demands support in the food security sector. Even as immediate needs are being considered, attention turns to supporting agricultural recovery, and that often includes seed assistance. The design of these seed-aid proposals is challenging for three reasons: seed interventions are complex and context-specific, especially so following a disaster; time is short as seed is needed before the next planting season; and the implementing agency best placed to respond often lacks experience and expertise in seed systems and seed security analysis.

This rapid review checklist is intended to assist practitioner agencies to review and provide feedback to people who are developing proposals focused on seed security. It can help to determine whether proposals have exploited the seed-assistance body of knowledge, whether they are grounded in an understanding and appreciation of farmer systems and capacity, and whether they reflect better seed-aid practices. Proposal writers too can use it to determine whether they have covered the major topics before prescribing a response of seed aid. It can also be used by donors to complement other project review guidance.

The checklist highlights issues that are unique and critical for guiding seed security strategy and the design of broad seed system interventions. It is emphatically not a 'how to do seed aid' manual. The Table overleaf presents the various elements of the checklist. Each of the assessment criteria is then discussed in more detail.

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TABLE 1
Rapid Review Checklist

CRITERIA		Y	N	Further Needs/Comments
Assessments				
1	Is the disaster sufficiently well described, in terms of scope and detail, to provide context for the intervention?			
2	Have the *ex ante* cropping systems been adequately and accurately described?			
3	Have the *ex ante* seed systems been adequately and accurately described?			
4	Is the diagnosis of the impact of the disaster on seed security supported?			
5	From the assessment, does it appear appropriate and feasible to consider a farming-related intervention within the period specified?			
Intervention Objectives and Strategy				
6	Are the proposed objectives for seed-related assistance clear?			
7	Do the objectives and proposed strategy address the seed security problem? • short term • longer term			
8	Is the proposed strategy sound and supported by past experience?			
9	Have the populations needing seed-related assistance been adequately defined?			
10	Are the choices for seed channels clearly explained and justified? (Distinguish between seed multiplication and distribution, if appropriate.)			
Implementation and Activity programming				
11	If seed is to be made available through some form of aid, are the activities for ensuring variety and seed quality explicit and sufficient?			
12	Are monitoring, evaluation and reporting planned and budgeted? (Distinguish short-term focus on outputs and longer-term focus on impact and learning.)			
13	Is an exit strategy articulated?			
14	Does the proposal engage and empower women and communities?			
15	Is there the required expertise and capacity to achieve the objectives (both within the institution and *via* collaborators)?			
16	Is the timing feasible to achieve the objectives?			
17	Have possible negative effects been anticipated (with necessary actions programmed)?			

Explanation of Review Criteria

1. Is the disaster sufficiently well described, in terms of scope and detail, to provide context for the intervention?
Before focusing on the seed or agricultural systems, one needs to have an overview of the effects of the disaster, to assess whether an agricultural intervention is warranted at all. Obviously, the scale and scope of the disaster need to be understood, including details of the people and regions affected. For seed-related interventions, the heterogeneity of impact is particularly important, because less-affected regions may provide useful supplies of locally-adapted seed. Some guiding questions:
Is there reason to believe that the agricultural system was affected?

- Did the stress affect natural capital?
  - Land degradation (soil erosion)
  - Access to land (in cases of conflict and displacement)
  - Water shortage (drought)
- Did the stress affect human capital associated with agriculture?
  - Was there large loss of agricultural knowledge and labor due to death, displacement or migration?
- Did the stress affect social capital associated with agriculture?
  - Did war, civil strife, political tensions mean that labor sharing, seed exchange or cooperative arrangements may be altered?
- Did the stress change financial arrangements, for example access to agricultural credit or increases in debt?
- Did the stress potentially affect physical capital?
  - Loss of productive assets; draft animals, tools, granaries, crops and livestock
  - Loss of domestic assets; homes, furnishing
  - Loss of roads to market and damage to bridges
  - Market function disrupted

2. Have the *ex ante* cropping systems been adequately and accurately described?
An understanding and appreciation of the existing cropping systems, before the stress or shock, needs to inform proposal development (whether or not one aims to maintain the pre-crisis status quo). The types of crops and varieties grown, their seasonality, and their end uses (for home consumption, income or both) are important kinds of information. Not all crops are equally important for farmers' livelihoods, and the profile of crops critical for poorer farmers may not be the same as for the better off. Input use and special management practices should also be noted.

3. Have the *ex ante* seed systems been adequately and accurately described?
Understanding the existing seed systems that farmers use in the target area informs the design of recovery activities. There is a better chance that recovery will be rapid and sustainable when an intervention is grounded in the dominant seed systems. Practitioners often source seed directly from the commercial seed sector in spite of the fact that poor farm families do not normally purchase commercial seed, because of the crops and varieties on offer and the cost. Farmers may normally get their seed from a range of channels: home production, local markets or from neighbors, and sometimes from more formal seed sellers as systems intensify. It is also important to understand that a disaster impacts each of these seed channels differently, some being more resilient than others.

4. Is the diagnosis of the impact of the disaster on seed security valid?
Seed security needs to be diagnosed independently of food security, as the two are not always highly correlated. Households can have enough seed to sow a plot, but very little to eat at any one time.

Conversely, households can have adequate food, but lack access to the seed they need to make their plots productive. In assessing disaster impacts, quick deductions also need to be avoided, particularly the false notion that a drop in harvest, or production shortfall, automatically means that there is a seed shortfall. Similarly, when there is food insecurity, it is important not to hastily conclude that farm families have eaten all their seed. Seed insecurity can generally be understood as a problem of availability, a problem of access (related often to cost of seed) or a problem of seed quality or a lack of preferred crops and especially varieties. These problems also have to be framed as either short term (acute) or long term (chronic).

A solid aid proposal builds from an understanding of seed systems and crop systems before as well as after the disaster. Recovery can be rapid and sustainable only when interventions work to support the dominant functioning systems.

5. From the assessment, does it appear appropriate and feasible to consider a farming-related intervention within the period specified?
Are the people affected by the disaster otherwise seed secure? Are farmers confident that stability (security) is all they need to enable them to successfully cultivate and harvest? Do they have sufficient access to fields and other means of production (such as labor) to follow through an agricultural season? Are they willing to re-engage in agriculture?

6. Are the proposed objectives for seed aid clear and do they address the seed security problem?
In reflecting on relief and recovery objectives, several points are important. Farming systems are not static; they change continuously in positive as well as negative ways. Furthermore, the demands of farmers for the things they need immediately, and which can spur them to recovery, should also be put in focus. The default objective is usually to facilitate the quick return of the cropping system to the *status quo ante*. If this is the chosen strategy, the strengths and weaknesses of the existing system should be understood, and built on accordingly. (Similarly, choices need to be made of the crops to focus on. Those most affected? Income generating crops? Crops for quick food recovery?) When a different objective is proposed, such as strengthening or improving the seed or crop system, perhaps by introducing new crops and varieties, this needs to be explained and justified in the context of an emergency response. In all cases, the risks involved need to be carefully analyzed.

Seed system proposals need to be reviewed not only in terms of what they can strengthen, but also in terms of what they may damage.

7. Do the objectives and proposed strategy address the seed security problem, in the short and the long term?
A clear diagnosis of seed security status and a vision of whether the system should stay as it is or evolve should then lead to a set of activities that addresses the problems at hand. Are there clear links between the identified seed problem and the cluster of proposed relief activities? For instance, if the objective is to ensure that farmers have seed to plant in conditions of chronic drought, are the choice of crop and variety and the chosen seed system channel appropriate? Emergency proposals are by definition focused on response and short-term recovery. However, it is important that they be designed within the context of what was in the past and what is desired in the future.

8. Is the proposed strategy sound and supported by past experience?
This simple criterion is important because it indicates whether the practitioner is grounded in relevant past experience, either direct experience or indirect experience gathered from the growing body of knowledge on better seed-aid practices. More of the same may not be what is needed. In some cases capacity building (to test new options) may have to be built into proposal development.

9. Have the populations needing seed-related assistance been adequately defined?
Seed is a relatively expensive commodity because only certain types are adapted and not all available seed will be of adequate quality. Targeting those who require seeds (as opposed to those who need food) can be important for ensuring that supplies are adequate. Defining target groups is also important in determining which crops and varieties to give prominence. Women's needs and preferences may differ from those of men; different ethnic groups may have different needs, as will those geared to growing for market compared to those growing for subsistence.

10. Are the choices of seed channels clearly explained and justified?
Individual farmers use seed channels differently, at different times and to differing degrees, to obtain seed of different crops and varieties. Some farmers use their own saved seed or seed obtained from neighbors for certain crops, others rely on the market for those same crops and still others prefer to purchase and plant commercial seed. Disaster influences farmer demand for seed from different channels for several reasons; lack of seed in a preferred channel, increase in price, lack of cash to purchase seed. The choice of a seed channel for aid must be grounded in an analysis of what farmers need in times of crisis, rather than being based on possibly vested interests on the supply side. Multiplication of seed, if programmed within the proposal, needs to be consciously designed from the beginning with an explicit linkage between production and distribution and marketing.

11. If seed is to be made available through some form of aid, are the activities for ensuring variety and seed quality explicit and sufficient?
There are no absolute rules about what types of crops or varieties or what quality of seed should be given in an emergency. Ironically, donor demands rather than farmer needs sometimes dictate this critical item. Minimally, what is given or offered in a crisis should be at least as good and trustworthy as what farmers normally use. The proposal should show some evidence that what is on offer will do no harm and, more positively, that it may actually spur farmers onto a path of recovery. Involving farming communities and specific target groups in these critical choices increases the chances that seed given as aid will actually be sown and will subsequently grow and yield.

12. Are monitoring, evaluation and reporting planned and budgeted?
In responding to an emergency, time may not be taken for rigorous monitoring, thoughtful evaluation and effective reporting. This has often been the case with seed aid, as year follows year of repetitive seed aid with no change in knowledge, attitudes or practice. Monitoring and evaluation have to go beyond an analysis of efficiency, focused on inputs, whether they were delivered on time and how many people were reached. They have to address basic issues of effectiveness: whether the activities made a difference to the farming system, perhaps in terms of crops and varieties, and more broadly to the local economy. Negative and positive reflections are equally important and integral to evaluation.

13. Is an exit strategy articulated?
There need to be benchmarks to seed system assistance beyond the delivery of seed. At some point, one should be able to exit from emergency activity and begin to program real development. Seed deliveries that last more than three or four seasons signal that aid action is off-course.

14. Does the proposal engage and empower women and communities?
Enabling communities to participate in their own development is always a challenge. Involving them in their own recovery from disaster is even more so. Nevertheless, it is important to engage communities in articulating the problem, identifying solutions, planning, implementing, monitoring and evaluating. Women often play key roles in managing varieties and seed selection on farm, and in many regions (particularly in Africa) they are key sellers in local seed/grain markets. An intervention that empowers women results in quicker recovery and strengthens their traditional roles in seed systems.

15. Is there the required expertise and capacity to achieve the objectives (both within the institution and via collaborators)?
Seed aid is not a logistical exercise and is distinctly different from food aid. Such aid, better phrased as 'seed system support', intervenes at the heart of an agricultural system, makes use of farmers' land and labor at a risky and perhaps unstable period, and may have effects for seasons to come. Seed-aid planning demands sound technical expertise and strategic farming-system thinking. Even during an emergency, it also requires a longer-term perspective. Agricultural expertise has to guide the center of seed assistance development (i.e. support should be cut to those who buy and distribute seed – and then move on to the next relief activity).

16. Is the timing feasible to achieve the objectives?
The pivotal issue is to ensure that farmers have seed in time, not only for planting but also in time to strategize about which crops and which varieties to plant in which fields. This means that seed has to be in farmers' hands several weeks prior to sowing. Does the implementing agency have time to complete the range of logistical issues and still deliver seed far enough in advance of planting? Issues such as proposal review and responding to feedback, coordination among implementers, acquiring any needed inputs, field staff coordination, and interaction with communities and local authorities all need to be considered to assess whether the timing is feasible.

17. Have possible negative effects been anticipated (with necessary actions programmed)?
Finally, seed interventions are a serious business. If done poorly and repetitively they can create dependencies, increase the risk of harvest failure, negatively change agrobioversity profiles and undermine functioning seed markets. Proposals need to be reviewed not only in terms of what they may strengthen but also in terms of what they may damage.

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Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

When and How to Respond with Vegetable Seed Programming

Interest in relief activities focusing on vegetable seeds is growing due to the unique role they can play in supporting both nutrition and income. This brief will inform and guide the interest in vegetables and highlight distinct features of vegetable seed response, compared with staple crop seed response.[1]

In many settings and situations, vegetables can help in special ways due to their inherent position in agriculture, commerce, and culture. These are summarized in Table 1 through three key lenses: cropping strategies, marketing strategies, and nutrition, with more detail offered later in the brief.

Vegetable seeds can help spur nutrition and income gains.

Such gains are not, however, automatic. Ensuring access to novel farming techniques, marketing, and food preparation practices can help enhance success with seeds.

TABLE 1

Why Vegetable Seed May Be Helpful in a Crisis

	Cropping	Marketing/ Livelihood	Nutrition
Vegetable programs can increase agro-biodiversity.	**Decreases risk from any particular crop of crop loss and failure.**	**Spreads risk that demand will be absent or pricing unfavorable.**	**Can increase dietary diversity.**
Vegetables can be grown intensively in a small space with focused attention on soil improvement, watering, and other management.	**More easily managed when a crisis displaces/ distracts some of the labor force. May be more viable when a natural disaster compromises soil in fields.**	**More easily grown and sold on a household scale than some crops.**	
Many vegetables have shorter days to maturity than staple crops.	**Reduces risk simply by the crop facing less time exposure to possible disruptions.**	**Potential income in the near-term in crises where any other type of income is lost.**	**Provides calories and micronutrients in the near-term in crises where a staple/storage crop is lost.**
In some cultures with work roles strictly divided by gender, women grow vegetables. (Men may be the preferred sellers, though).	**When men are displaced or distracted due to crisis, vegetable growing may rise in importance as a food source.**	**Can be processed into value-added products, preserved using simple techniques (solar drying).**	**Also common for women to prepare food – a good match with growing it.**

[1] This brief was prepared by Peter Marks (Seed Programs International), with inputs from Julie March (USAID US/OFDA), Louise Sperling (CIAT), and Anne Turner (CRS). Above photo: Gabrielle Ludlow

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Vegetable Seed Supply and Security in Normal Times: Assessment

Prior to planning a vegetable seed intervention, an assessment to address the following questions must be considered:

What were vegetable farming and gardening methods during normal times? Are these disrupted, or not?

- How was seed procured or produced?
- Are there missing inputs which would prohibit successful production such as manure/fertilizers? Certain materials, such as rough posts and thatch to build and shade above-ground seedling nursery beds?
- What were the seasonal cropping patterns? Some vegetables have 2–4 possible growing seasons per year. How have weather, displacement, or natural disaster modified this?
- What strategies were used to reduce risk? Most vegetables face highly crop-specific pests and diseases.

What crops and varieties were selected in normal times, and why? Were certain varieties grown because of interest in:

- Processing, such as a type of pumpkin with seeds that dry well?
- Storage, such as a type of cabbage that can be stored buried in a pit?
- Sale, such as a form of lettuce in demand in local markets?
- Performance in a certain stress condition, such as a mustard green that persists through drought?
- A particular flavor or texture profile?

What happened after harvest?

- What were key outlet markets? Are they disrupted, or not?
- What were key food preparation strategies? Are they disrupted, or not?
- Who grows vegetables – women, men, what ages? Who takes them to market? How has this demographic changed?

Understanding of how the situation has shifted or been disrupted is crucial to designing an appropriate program. It is important to plan the right intervention, not just the intervention that's easiest to implement.

Local engagement at all levels can help protect against inadvisable program design choices. An FAO response to chronic stress and seed access barriers in Gaza Strip provided seed for melons, okra, and squash. The program involved "local village councils, farmer cooperatives and associations, the Ministry of Agriculture, and local partners to avoid duplication and increase synergy" (Saleh, 2014).

To clarify: pre-crisis *status quo* should not be treated as sacrosanct. Vegetables may not have been of high importance before – or their production may not be highly disrupted – but elevating the role of vegetable production in crisis response may still be well-advised. A well-designed intervention allows for a smooth transition to locally-controlled perpetuation of strategies after the crisis recedes.

"Readiness" for Vegetable-Based Crisis Relief

Many practitioners now maintain some ongoing support presence in crisis-prone settings before or between crises. This is a time when assessment of vegetable/seed utilization in farming and diet, and training therein, become even more practical and paramount.

Vegetable growing efforts benefit from some trial and error – and experimentation is a risk that is not always appropriate to ask farmers in crisis to take. In normal times, and even in a crisis, practitioners find that some farmers are early adopters of new ideas and eager to take some risk as part of a balanced strategy to ensure survival. Such farmers are worth identifying as they can lead the way toward effective spreading of new practices to others.

BOX 1 Vegetable Seed Relief Before, During, and After a Crisis

When a tsunami devastated the Solomon Islands in 2007, local NGO Kastom Gardens Association had been assisting a community seed-saving and horticulture support program for more than a decade. Because much soil was saturated with saltwater after the tsunami, vegetable production in raised beds became a key crisis response. KGA was able to release more seed than usual and utilize a voucher program to ensure distribution to those most in need. Ten+ years of engagement around vegetable-growing and utilization topics gave much assurance that seeds would be well-used. In the second and third years following the flooding, Kastom Gardens ramped up local seed-multiplication efforts, with education intensifying as well (Martin, 2014). This type of extended response certainly increases the positive impact of vegetable seed aid.

Nutrition as a Purpose for Vegetable Seed Programming

In chronic stress situations, those fresh vegetables eaten, if any, may not be historic to the culture. The old micronutrient sources (whether vegetable, perennial, or tree-based) may have been lost due to environmental degradation or population displacement from historic settings. Diets sometimes become too starch-dominant because grains and tubers can be stored and eaten, or purchased most times of year. Repeated seed and food aid may contribute to constriction of diets.

While vegetables provide micronutrients like vitamin A (essential to sight and the immune system) and iron (key for pregnant women), they are also strong sources of calories, fiber, and some protein. Still, vegetables typically complete a diet rather than provide the initial main caloric basis for a diet. Therefore seed systems intervention to increase access

to vegetables can be seen as a supplementary approach when crisis or chronic stress has reduced diets to very little beyond starch, or when all food is scarce and another relief strategy is providing starchy foods.

To harvest, prepare, and taste new foods is an experiment for families in crisis and may not happen automatically, even when aid recipients face hunger and malnutrition. Knowledge of nutrition can also be lost across generations of stress and displacement. People may not understand how eating vegetables is helpful to themselves or their children. They may not have recipes or tools needed for vegetable growing and preparation. Leafy and soft vegetables are more perishable than many other foods, so gains from eating are very short-term unless post-harvest handling and processing information is distributed along with seed or vouchers.

For all these reasons, a focus on nutrition training is key to any vegetable seed program.

BOX 2 Subjects for Training: Nutrition and Vegetables

A program must include specific strategies to make nutrition gains through a vegetable program. The following training subjects may be considered for those who maintain an ongoing support presence in crisis-prone areas so as to boost "crisis-readiness." Some may also be appropriate for rapid deployment as part of crisis response.

- **Nutrition education as to health benefits**
- **Integration with pre/post-natal education and clinic programs**
- **Post-harvest practices to retain nutrient value**
- **Vegetable preservation methods**
- **Food preparation/recipes**
- **Food safety – preventing contamination in field and in handling**

Income as a Purpose for Vegetable Seed Programming

Regardless of the type of crisis, today's relief practitioners understand that ensuring recovery requires several years of continuing effort. Vegetable-growing programs are unlikely to be the very first response in a crisis, but they can be an enduring stabilizing element. Economists and disaster victims alike know that post-crisis food markets can feature marked shortages and surpluses, price spikes and crashes, and food quality concerns.

In the farm or garden plot itself, vegetables are typically grown in a mix, and include a diverse set of species. Dietary diversification on the household level, taken collectively, can help entire communities and regions to widen their food economy and buffer against this post-crisis roller coaster of supply and demand.

Income generation of the poor worldwide is often not a single job but a patchwork, pieced together from multiple seasonal sources. This pattern surges post-crisis when regular chief income sources may be disrupted. Vegetables may be sold in small quantities via informal markets and fill a niche which lacks scaled-up competition. By "niche markets", we mean that each small grower can potentially apply a business plan (formal or informal/unstated) to find her/his own unique blend of crops, harvest dates, packaging/presentation styles, and outlet markets. This sidesteps the issue of the larger scale producer and buyer competition that drives down prices. Also, excess vegetables from household-scale gardening can comprise a piece of the patchwork income for the family.

Vegetables are perishable so training on storage, post-harvest handling, and processing may be key to vegetable seed interventions.

In a crisis, beware that access to niche sales markets may be decreased due to damage to roads and sales venues, fear of travel, or simple distraction by pressing crisis recovery concerns. This is one downside of the more entrepreneurial market outlets as opposed to formal buyer networks for larger-scale production – being an entrepreneur takes time and resources. In project planning, know that each step in a value chain typically does, in fact, add value. "Middlemen" should not be automatically demonized as taking a share of the farmer's dollar. Intermediate handlers and distributors can bring convenience and connectivity to growers. So, even when operating small, entrepreneurial vegetable-growing businesses, growers may choose to sell some of their yield direct to end consumers and other portions for a lower price to intermediaries. This type of diversified marketing plan spreads risk and helps ensure success during unstable times.

As with nutrition gains, we cannot assume that increased seed access automatically leads to increased income. Training helps connect the seeds with the desired outcome. Market assessment is especially key (see Box 4).

BOX 3 Subjects for Training: Income from Vegetables

Here are relevant training topics to consider:

- **Business planning/pricing**
- **Marketing planning**
- **Cooperative marketing**
- **Salesmanship, especially when accessing unfamiliar customer types**
- **Post-harvest handling for marketing purposes**
- **Recordkeeping**

Four Principles in Designing the Project to the Strengths of Vegetable Growing

1. Design the project for the household scale

Vegetable growing is a humanitarian response strategy that can be managed and supported on the household scale with harvests moving right to the kitchen. Vegetables are readily grown in small, mixed plots, where soil improvement, consistent water access, and protection from livestock and wildlife are more manageable. This production mode is hand-labor intensive. But with the farm or garden in a concentrated space close to home, it's labor that can be integrated with other daily household tasks.

Both conflict and natural disasters can reduce access to large growing areas. When opportunities for large-scale production or production in fields that are some distance from home are disrupted, vegetable growing can offer an alternative. A number of successful interventions have utilized minimal space within internally displaced persons' (IDP) camps for vegetable production.

BOX 4 Market Assessment and Vegetables

Access to markets and a proximity to areas of high demand (cities, towns, roadside markets) helps growers maximize their use of vegetable production as part of the income patchwork. Assessment of markets and providing training on marketing aspects can help.

Market research will teach that scale matters. Enabling a number of farmers to all grow the same vegetable crops out of scale with local demand will crash prices, even where vegetables are scarce and even where demand is high. Seed or voucher distribution programs can be designed to avoid this trap by keeping them in scale, considering both "internal markets" (i.e., consumption) and external markets (sale). On an appropriate scale, diversified vegetable growing can work for each farmer to find niche markets while also eating well.

Market research must support programs that otherwise assume that vegetables will aid in livelihood restoration. For example, in providing vegetable seeds for recovery from the impact of violence in Uganda, Samaritan's Purse found that cabbage and large tomatoes were well-valued on the market, but other locally-common vegetables such as okra, amaranth greens, and eggplant were not (Langford 2014).

Just as farming requires the right tools, so does marketing. A seed system and market assessment may suggest a project design that provides marketing tools along with seeds, vouchers, and/or other materials. For example, one might connect program participants with a supply of trays and shrink wrap to create retail displays with the modernity expected by urban shoppers. Packaging can add sales value that pays for itself, while also protecting vegetables from dust and jostling.

2. Prepare to support quick harvest

Staple crops tend to have a single, longer growing season each year. Crises often feature the loss of a staple crop due to disease, pest, natural disaster, or population displacement caused by unrest.

In these scenarios, vegetable availability may be less impacted because growing seasons are typically shorter. Vegetables can be short-term dietary alternatives to staple crops with some providing equivalent calories per planted area with greater overall nutrition – but with less storage potential. For example, after 2011 floods in Cambodia destroyed a wet-season rice crop, the Japanese relief agency FIDR provided seeds to 7,000 families for convolvulus, amaranth, chinese cabbage, radish, cucumber, pumpkin, wax gourd, and green bean (Sokmom, 2012). This seed set matures to a food crop in 30 to 90 days, all faster than rice matures.

3. Design the project to strengthen, not undermine, existing resilience strategies

With increasing research on resilience in all sectors of humanitarian relief, we now see the importance of preserving informal, social network-based strategies used to spread risk and provide self-insurance against disasters of all kinds.

For vegetable seed such strategies might include:

- planting of many vegetable cultivars/species or many succession plantings of one cultivar;
- maintaining/saving seed from genetically diverse plots instead of breeding uniform cultivars; and/or
- maintaining of local and long distance trade relationships to ensure consistent seed supply.

4. Make the right delivery choice: vouchers and direct distribution

A major impetus for performing seed system assessments is to best understand whether seed is accessible and or available and to select a distribution method that best supports strengthening of local seed systems. Vouchers exemplify a set of market-side strategies (along with loans and direct cash distributions) that are most appropriate when an assessment has determined that seed is available but people cannot access it.

Voucher programs typically gain advantage from the fact that local supply chains for staple crops are already in place and that community-based traders (often women) hold a leading role. For vegetable seed, because trading patterns may be weaker and more external to communities, achieving the same benefit could require a greater up-front investment in organizing and coordinating the flow of goods to make the voucher use feasible.

Direct seed distribution (DSD) for vegetables (whether provided free, by loan, or at partial value) can reach those who are most remote from possible seed fair sites or vendor sales points. Areas of high conflict or where local market infrastructure is non-existent can be one good match. When planting time is urgently upon a crisis-affected population, DSD may be the most expedient route to help.

Whether providing seed or vouchers, you can ease later transition out of the aid paradigm by activating existing social and organizational networks to take part in distribution. Churches, schools, medical clinics, community councils, savings/lending groups, or partnering local NGOs can act as vegetable garden demonstration sites along with distribution points. Seed Program International partners in Haiti and The Gambia ask parents to attend training at their child's school before receiving seed. Practitioners with an in-country presence pre-crisis may have a demonstration farm or garden site which can serve a similar dual distribution/ training purpose in a crisis.

All projects, whether using direct seed distribution, vouchers, or cash gifts/loans, face concerns that relief efforts can do harm as well as good. As vegetable seed commerce expands into remote areas, aid should not damage current or future enterprises nor make beneficiaries over-reliant on aid.

Programs which give incentive to use specific vegetable seeds – by offering them repeatedly, for free, or with conditional side-benefit support such as tools or loans – may pull farmers away from their own self-insurance strategies and make them more vulnerable to future crises. They may also limit incentives for traders to stock quality seed and for lasting linkages between farmers and traders to be forged.

BOX 5 Further Tips to Maximize Benefit and Reduce Harm from Seed or Voucher Distribution

- **Distribute (or give vouchers for) small packets at multiple points in time and/or train to encourage succession planting. For vegetables, the shorter harvest time and sensitivity to conditions during germination makes small, repeated plantings a smart choice.**
- **Reduce fraudulent use by avoiding free or cheap distribution of retail packets that show price value in foreign or local currency.**
- **If purchasing seed for distribution or identifying seed fair dealers, consider local sources as possible origins for appropriate seed. Future access to the same source, via local NGOs or dealers, may be part of the eventual exit strategy from crisis relief. For example, Tearfund UK sourced vegetable seed from Bukavu, DR Congo, for crisis relief work in Fizi Territory, about 250km south (Sissons, 2014). Their strategy supported relatively local, rather imported, seed procurement.**

Finally, as a summary, we review the larger challenges in providing vegetable seed that need to steer program planning in Table 2.

TABLE 2
Challenges in Providing Vegetable Seed Aid and Their Strategic Impacts

Factor	Action considerations
Established practices for consuming vegetables and appreciation of their nutritional value are not understood.	**Reconsider the relief strategy or ensure that adequate time and resources to deliver nutrition/food preparation training are in place along with seeds and other inputs.**
Sales markets for vegetables are weak, poorly understood, and/or impacted by the crisis.	**If income is a goal, consider including market research, market development, and sales/marketing training in the strategic mix.**
Vegetables are perishable.	**Reconsider the relief strategy, consider carefully the seed selections, and/or ensure that adequate time and resources are in place to deliver appropriate storage/ processing technology training and materials.**
Maximum program impact may not occur in the immediate post-crisis period.	**Consider making a multi-year commitment and/or determining exit strategies that activate locally-driven program support and seed supply.**

References

Food and Agriculture Organization, 2007. Diversity of Experiences: Understanding Change in Crop and Seed Diversity. FAO, Rome.

Elizabeth Langford, Personal Communication, 2014.

Greg Martin, Personal Communication, 2014.

Azzam Saleh, Personal Communication, 2014.

Corrie Sissons, Personal Communication, 2014.

Sokmom, N., 2012. FIDR To Distribute Vegetable Seeds to Flood-Affected Families in Kampong Chhnang. Retrieved March 30, 2014 www.akp.gov.kh/?p=14734.

Sperling. L. and McGuire, S., 2012. Fatal Gaps in Seed Security Strategy. *Food Security*, 4(4), 569-579.

Sperling, L., Remington, T., Haugen, J.M., 2006. *Seed aid for seed security: advice for practitioners*, practice briefs No. 1–10. CIAT and Catholic Relief Services, Rome. http://seedsystem.org/aid-response-advice/

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Seed Aid for Seed Security

ADVICE FOR PRACTITIONERS

Vegetable Seed Supply and Selection in Humanitarian Response

Vegetable seeds are increasingly used to advance nutrition and income goals in humanitarian response. Understanding crop choice and how seeds are sourced and supplied can support these interventions.[1]

Diverse vegetables demand quite diverse seed management practices. Farmers can easily save seed from some vegetable types, while other types are more reliably sourced from commercial suppliers.

Seed Supply: Commercial

Worldwide, commercial vegetable seed supply is narrow, with few primary producers servicing a large downstream distribution network. Seed traders frequently experience this effect. For example, a crop failure for one major pepper seed producer can cascade into a worldwide supply shortage (and price spike) for all pepper seed across multiple years.

Producing vegetable seed to commercial specifications is technically challenging. Compared with cereal and legume seed, worldwide demand for vegetable seed is lower. Commercial vegetable seed production is slow to emerge in the developing world. As a result, beyond the seed saved by small-scale farmers themselves, vegetable seed is more likely (than cereal or legume seed) to originate from imported sources, either before or after its final packaging.

For this reason, when local seed production, saving, and/or commerce have been disrupted by crisis, the nearest sales outposts of vegetable seed companies with global or countrywide reach may be willing to engage with crisis relief work. Potentially, such companies could offer technical support or engage with small-scale commerce. National labs, as well as organizations like the World Vegetable Center (AVRDC), ECHO, and Seed Programs International (SPI) may be able to offer crisis-appropriate seed options at varying quantities, selections, and prices.

Even in remote locations, vegetable seed may be seen in all kinds of small shops and from markets, not just agro-dealers. Restoring this type of trade, if damaged by crisis, can be one goal of crisis response, alongside efforts to foster renewed vegetable seed production and saving by farmers.

Seed Saving and Storage: Local Production

In an attempt to build resilience at the household level, local seed saving and production can also be highlighted as an end goal for seed provision. Know from the start that seed selection, saving, and processing techniques across the range of common vegetables can be a lot to master, especially in the humid tropics and especially during crisis recovery. On the positive side, seed for fresh vegetables tends to be small (in seed size but more so in volume saved to plant a crop) and therefore easier in storage to tuck away from insect pests and other damaging factors. But, as a group, vegetable seed is more susceptible to death by humidity and heat damage than maize or legume seed.

Techniques can be learned to save seed effectively if training is budgeted and deployed. Training themes might include successful variety isolation, selection, saving, and storage of seed. As all these activities do add labor requirement to what are an already time-intensive

[1] This brief was prepared by Peter Marks (Seed Programs International), with inputs from Julie March (USAID US/OFDA), Louise Sperling (CIAT), and Anne Turner (CRS). Special thanks to Julian Hoyle for providing much of the information in Table 1.

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set of crops, do factor in 'labor added' when planning seed saving projects, and especially in crisis situations when farmer resources might already be stretched.

The ease or difficulty of saving seed varies greatly by crop type with some specific advice given in Table 1. Seed of crops such as peppers, squashes, many local greens are fairly easy to save. However, a few types of vegetable seed cannot readily be produced in the tropics at all. Carrots, for example, are a biennial crop (producing seed their second year) with a vernalization requirement (an uninterrupted period of cold triggers seed production).

Also, remember that crops many evolve in their traits over time, whether through unintentional farmer selection, outcrossing in the field, or crop failure. Hence, seed saving

TABLE 1
Ease of Saving Seed from Some Vegetable Crops

Crop	Ease of saving seed	Instructions for saving seed
Beet	Difficult	Roots need a period of cold weather for growth to stop and for flowering and seed production to start. Not recommended for tropical countries.
Broccoli, Cabbage, Chinese Cabbage	Difficult	Plants require cold weather conditions to cause plant to flower and produce seed. Some tropical varieties may flower if left to mature completely. If seed production is attempted for cabbage, the head must be cut open carefully to expose the growing point and produce flowers. After flowering, allow the pods to dry, then remove seed.
Cantaloupe	Easy	Allow plants to mature completely, and fruits are past normal market stage. Extract seeds, wash in clean water, and dry well in shade.
Carrot	Difficult	Roots need a period of cold weather for growth to stop and for flowering and seed production to start. Not recommended for tropical countries.
Cucumber / Gourd	Easy	Allow plants to grow well past normal market stage, and fruits turn a yellowish color, and plant is no longer growing. Harvest fruits, extract seed, wash in clean water, and dry in shade. If seeds are encased in heavy pulp, fermentation will help separate them.
Lettuce	Moderate	Plants will start flowering under hot conditions, but head lettuce needs to have heads cut open when young to allow flower stalk to grow up. For all lettuce types, do not select seed from early flowering plants. Harvest seed when flowers appear white and fluffy.
Mustard	Easy	Most plants will flower and produce seed. After flowering, allow the pods to dry, then remove seed.
Okra	Easy	Harvest pods when fully mature (brown) but before shattering. Remove seed.
Onion	Difficult	Bulbs need a period of cold weather for growth to stop and for flowering and seed production to start. Not recommended for tropical countries.
Pepper	Easy	Will cross in the field if not isolated. Allow plant to grow to full maturity and final color. Cut open fruits, extract seed, and dry in shade.
Radish	Easy	Most small red radish varieties will flower easily and produce seeds. When seed pods are dry, remove seed. Some Asian varieties, especially daikon, require cold weather to cause plants to flower. These are difficult to produce in tropical countries.
Regionally Important Greens	Easy	Food plants such as amaranth, jute, and Malabar spinach tend to have short seasons and readily go to seed. Techniques vary with species but are generally easily learned.
Squash/"Pumpkin"	Easy	Allow plants to grow well past normal market stage, and fruits turn a yellowish color, and plant is no longer growing. Harvest fruits, extract seed, wash in clean water, and dry in shade.
Tomato/Eggplant	Difficult, or Moderate with traning	Allow fruits to ripen to full color. Extract seed into a container – drier eggplant may require soaking – and allow to sit in a cool place for 24–48 hours for natural fermentation to take place. Wash seed with clean water, strain, and dry in shade.
Watermelon	Easy	Allow fruits to mature to full market stage. Open fruit and extract seed. Wash with clean water, and dry in shade.

Source: Dr. Julian Hoyle, manuscript.

TABLE 2
Vegetable Seed Supply and What it Means for Crisis Response Practitioners

Seed Supply Factor	Action considerations
Global supply is narrow for commercial vegetable seed in particular.	Local sourcing of appropriate seed may be difficult post-crisis for a key set of vegetables.
Supply may be imported in the first place as opposed to available from locally-produced sources.	Concern about impact on local economy may be reduced. The importance of the "informal retail" sector in seed distribution may be increased.
Seed saving for vegetables, as a group, can pose challenges especially in the humid tropics.	Bridging informal local distribution networks with formal (global) seed commerce should be considered as one path to vegetable seed security. Assess whether seed saving training is feasible within the context of crisis intervention.
In contrast with cereals and legumes, "seed" and "food" are not interchangeable for most vegetable crops in a crisis.	Farmer seed self-insurance options are reduced for the vegetable crops. Crisis seed aid may therefore be a greater need for these crops.

cannot not be seen as 100% reliable for maintaining original genetic traits. Within seed saving programs, it is wise, then, to plan for a way that farmers can renew original seed stock periodically as needed.

Seed vs. Food

Vegetable seed security is also driven by harvest timing in relation to seed production by the plant. Most vegetable species as defined for this brief are consumed or sold before the plant has produced mature seed, or even – as for leafy greens – before the plant has begun to produce seed at all. For most cereal and legume crops, seed and food are readily interchanged in the informal sector, even in normal times. Then, in a crisis, "seed" may become "food" and vice versa, each providing insurance against loss of the other. Vegetables eaten as leaves, roots, stems, or immature fruits offer no such automatic development of seed. For vegetables, it may be the practice in normal times to let part of a crop mature to seed after the harvest of food. This practice may be interrupted by crisis.

Table 2 summarizes how the above factors may impact program design and feasibility decisions, especially in contrast with staple crops.

Selecting Vegetable Seeds for Use in Relief and Recovery

Beyond crop type, there are other key issues associated with selecting among types of vegetable seeds in relief and recovery periods. As a baseline, there should be prior evidence that any varieties selected are adapted to the agro-ecological zones, using farmers' known management practices, and, that they will have a good degree of farmer acceptability. Select other issues are listed below.

Hybrid vs. Open Pollinated

Open-pollinated (OP) seed is desirable where seed saving is a goal. Assuming plants are not allowed to cross with other cultivars in the garden, offspring will be genetically similar to parent plants. Almost all commercially-available OP vegetable seed is highly inbred (very similar genetics in all plants), allowing the saving of seed to yield predictable results.

Hybrid seed is the result of a controlled cross between parent plants. The parent plants are chosen for their desirable and often divergent characteristics; many hybrid varieties include genetic material from wild ancestors of food crops. The disease and stress resistance found in these wild lines was often lost in early human efforts to breed larger, more flavorful plants for gardening. Seed cannot be saved with predictable results from hybrid plants, but if a project's main concern is reliable production in the first season, hybrids can be a superior choice. Hybrid seed is much more expensive than open-pollinated seed due to the laborious work of crossing the parent plants.

Commercial hybrid varieties produce genetically uniform crops. Because OP seed is inbred, plants grown from commercial OP seed are also quite genetically uniform. From a risk management perspective, arguably both of these seed types are an inferior product of the commercial age. Traditionally, farmers maintained wide genetic diversity in any one field and would save seed from the whole set together – this is what is known as a landrace. For example, one plot of okra would contain plants able to persist through different types of stress mixed with plants that have the highest yield or best flavor. In contrast with a uniform plot of a high-yielding variety, this mixed plot could yield much less in a favorable year, but much more in a year challenged by weather, pests, disease, or low farmer resources. The only way to replicate this smart strategy with either OP or hybrid commercial seed is to grow multiple varieties. Local sourcing and voucher programs can turn up landrace seed for vegetables.

GMO vs. Not

Commercialization of GMO varieties has been extremely limited for the common annual vegetables described here (i.e., excluding staple crops like maize). A few GM summer squash varieties are in commerce since 1995 for their virus resistant qualities. Otherwise, as of this writing, those identifying vegetable seed sources for crisis response are unlikely to encounter GM seed.

Seed Treatment

For commercial, non-organic planting purposes, much seed worldwide is treated. Treatments contain fungicide, bactericide, inoculant, and/or an inert coating meant to

make the shape of the seed more smooth or uniform for commercial planting equipment. Extension of seed distribution infrastructure into the developing world is largely to serve business needs and less so the small-scale farmer. Therefore, untreated seed may be less prevalent than it is in places like the U.S. and Europe. Some countries, like Honduras, may require treatment of almost all imported seed.

Global standards call for bright coloring to be added to seed treatments so that the added chemicals are evident. But this system is not guaranteed to be in place. Humanitarian aid programs should consider any requirements for clear labeling to avoid consumption of treated seed and ensure that they are in line with requirements in terms of use of pesticides, herbicides and fungicides. Training on treated seed should accompany its distribution, especially when eating seed is a concern, when farmers sow by mouth, and where hand-washing capacity is limited. Projects that expect to train seed aid recipients in strictly organic growing methods will also want to avoid treated seed. Conversely, if a setting faces impact from fungal diseases and/or insects during the germination stage, project planners may consider seed treatment desirable.

Seed Viability Standards/Maintaining Quality

Seed "quality" is multi-faceted when suitability for local conditions and culture is considered. But the basic viability of seed to grow at all remains a key issue. An essential resource is FAO's 2010 publication *Seeds in Emergencies: A Technical Handbook*. Here, FAO gives detailed instructions for sampling and testing seed along with sourcing advice. FAO gives a general standard of 70%+ germination if sourced locally and 80%+ if sourced internationally.

In understanding seed viability, a key concept is that any seed is a living organism. Poor germination indicates (most often) that some of the seed is simply dead, or else so compromised in its internal resources that it dies shortly upon first sprouting. Extreme high heat and humidity can kill seed quickly no matter how new or old it is, and no matter how long seed of that species "should" last.

Many types of vegetables may be appropriate in humanitarian response. Reflect closely on crop choice.

Ideal storage conditions rarely exist in the field. Humidity is the biggest enemy of seed – small, light vegetable seed can absorb a harmful level of water from the air in short order, then heat can cook the living organism inside. Moisture invites damaging organisms and starts physiological processes in seed that deplete reserves and decrease germination.

Given these dangers, consider the Key Pointers in Box 1.

BOX 1 Key Pointers for Sourcing, Storing, and Delivering Vegetable Seed

- **In response to natural disasters, many seed vendors or producers may hold supply with compromised quality. Assess this prior to sourcing seeds locally or approving vendors for receipt of vouchers. If organizing a seed fair, consider a quality testing program to certify suppliers in advance. Visual seed inspection on fair day is helpful but does not tell the whole story, especially for vegetable seed. Seed can even be faked, such as by saving and drying the seed from foods over the course of time and resealing commercial packets with these contents.**
- **Vegetable seed is small and planted intensively, so does not face the same storage and transport issues as grain and legume seed – seed to grow a lot of vegetables can fit in a small space. A project element could be to identify key buildings (such as medical clinics) in targeted regions or communities where electricity and/or climate control is most dependable. Then, form alliances or agreements establishing these facilities as seed storage and distribution points.**
- **If seed sourced is in an airtight package or container, keep it sealed until as close to planting time as possible. Hermetically sealed individual garden-sized packets are increasingly available and coming down in price.**
- **Train seed recipients and intermediary distributors in basic seed testing, storage principles, and appropriate technologies. For example, seed in an airtight container can be buried to protect against excess heat. If distributing seed, source it in packages sized for final recipients to begin with. The more times seed gets unpacked and repacked in varying conditions, the higher the risk.**
- **Provide access to seed packets with instructions as to plant spacing, days to harvest, days to germination, and other key details. Information should be in local or national languages or provided graphically. Watch out for seed packets that give misleading planting dates and seasons specific to Europe, Asia, or other locations.**
- **Expiration dates can be lost when seed is repackaged, or absent when bought from informal sources. Work to include dates, but also train that they are only a guideline – seed may last much shorter or longer than dates shown – and that farmers should instead rely on their own germination testing when quality is in doubt.**
- **Provide small quantities or vouchers at multiple time points, if logistics allow, so that those with highest capacity to store seeds are primary holders over time. For some vegetables there are two to four planting seasons per year (with staggered planting possible within each).**

Which Vegetables?

Beyond issues of seed per se, different vegetables have very distinct advantages or raise quite specific concerns. Table 3 suggests some of the specific issues to consider in focusing on which vegetables to promote.[2,3]

[2] For the tropics, an additional highly-recommended resource is the text and charts found in Martin, 2012. This resource covers climactic tolerances for all major vegetables along with perennial food plants, some cash crops, and staples. As Dr. Martin states, any crop-selection advice provided globally should only be used as a rough screen with the real decisions made at a locally-specific level.

[3] Underutilized traditional vegetables also comprise a vast and important topic. Such traditional vegetables can be diverse. In one Thailand study (Bates et al., 2012), 95 species were collected in just three village clusters. We cannot give this topic its due attention here and set it aside as needing further exploration through the lens of crisis relief.

TABLE 3
Discussion of Vegetable Species: Advantages, Suggestions, and Concerns

Vegetable type	Advantages	Suggestions/examples/concerns
Carrots	**Carrots produce slightly more edible calories per hectare per day than maize and potatoes, with greater micronutrients. Widely consumed and sold.**	**High heat resistance in many modern hybrids. Stump-rooted Asian Kuroda types do well in heavy soils and stress conditions – but steady moisture and weed control help all carrots.**
Onions	**Widely consumed and marketable. Strong nutritional benefits tend to be less-known than for some other vegetables.**	**Be aware of day length requirements for onions. Slow to grow from seed unless harvested in scallion stage. May prefer to grow from sets or transplants if quick harvest is the goal. Cultivars vary widely in storage potential. Seed is short-lived.**
Peppers	**Widely consumed and marketable. Nutritious, especially when ripe.**	**Disease and excess water can be a problem for plants. Slower to harvest than most vegetables listed. Shorter seed life than some.**
Tomatoes and Eggplants	**Especially good choices for marketing in peri-urban areas with a post-crisis goal of livelihood restoration.**	**What westerners know as processing tomatoes may be best choice for stress conditions. If growing these solanaceous crops in wet conditions, get expert seed selection help. Eggplant shape and species preferences vary by continent.**
Common Brassica Greens	**Fast to harvest. Nutritious and known in many cultures.**	**Examples: mustard, collard, kale. Kale is a cooler-weather crop but there are pockets of interest and familiarity in tropical highland zones.**
Cabbage	**Widely consumed and marketable. Transports well and storable in some conditions.**	**As is also true of broccoli and cauliflower, there exist tropically-adapted varieties. Success depends on selecting the right types for the setting.**
Asian Greens	**Growing in familiarity and popularity outside of Asia – consider among your choices in any setting. Often extremely fast to harvest with good nutrition.**	**Examples: pak choi, choysum, chrysanthemum, napa. There are heat tolerant varieties. But all can lose quality quickly after harvest. If seed saving is a goal, get expert help in selecting types.**
Lettuce	**Fast to harvest. Marketable if quality can be maintained.**	**Can lose quality quickly after harvest. Some leafy types have good heat resistance.**
Regionally-Important Greens	**These plants tend to "grow like a weed" in their native ranges, have high nutritional value, and knowledge of preparation is usually in place.**	**Examples: amaranth, convolvulus (morning glory), spinach, water spinach, malabar spinach, jute mallow, cleome.**
Regionally-Important Legumes	**Often multi-purpose plants, e.g. forage, green vegetable, green manure, stored dry seed/food.**	**Examples: chickpea, pigeon pea, cowpea, lablab bean, groundnut, rice bean, winged bean. If locally prevalent, seed availability is not likely to be impacted by most crises.**

(Table continued on next page)

TABLE 3 *(continued from previous page)*

Discussion of Vegetable Species: Advantages, Suggestions, and Concerns

Squash/"Pumpkin"	**Leaves are cooked and eaten in some cultures and are highly nutritious. Seeds are a protein source. Hard squashes store well. Among the easiest for seed saving (but will cross). Some types are among the few annual vegetables that thrive in humid and monsoon tropics.**	**There are at least four major species of squash (C. pepo, maxima, moschata, mixta) with differing profiles as to regional preference and disease/pest-resistance. Consult horticultural and cultural expertise. Most require large growing space and tropically-adapted pumpkins may require 100+ days to maturity.**
Watermelon & other melons	**Cantaloupe in particular is very nutritious. Seeds are a protein source consumed in some cultures. Among easiest to save seeds (but do readily cross).**	**Choose modern commercial types if ease of transport and disease resistance are goals. May be challenging in humid tropical conditions. Watermelon may be more adaptable to most stress. Require large growing space (and longer time to harvest) compared with much of list.**
Regionally-Important Cucurbits	**Where they are eaten they are often dietary staples and due to ease of saving, seed may be locally available with only access issues in crisis recovery.**	**Examples: bitter melon, winter melon, snake gourd.**
Quick-Growing Roots, e.g. Radish, Beet, Turnip	**Multi-purpose plants (greens can be eaten) and roots are stored/transported more readily than some.**	**Favor cooler weather although heat-tolerant varieties are available.**
Okra	**Consider use where extreme heat and uneven water would make other crops dubious. Transports well. Widely consumed and preserved by drying. Seed readily saved (and edible).**	**Some will want to grow as a perennial, some annual-consider this in variety selection. The hibiscus family, of which okra is a member, includes other edible crops of regional importance.**

Exit Strategies

If valid supply chains are identified as working in normal times, utilizing those vendors in intervention (such as engaging them as pick-up points for distributed seeds or as approved voucher recipients) can help ease the transition out of the aid paradigm. If such supply chains are broken by the crisis, restoring them could be part of the planned intervention.

Widespread seed saving is often positioned as an exit strategy from seed aid; for this reason relief interventions often focus on open-pollinated vegetables. Remember, however, that even in the temperate-climate developed world where conditions make most seed-saving easier, vegetable farmers at all scales don't always save seed. When farmers have both access to and availability of seed, their preference is often to turn to the local markets. Consider, then, how to make good links to local commerce as part of a sustainable intervention strategy.

One advantage of voucher or cash programs is that by design the likelihood is good that seeds similar to those selected by farmers are still available once the program is over. For direct seed distribution programs, there is no such guarantee. If distributing seed, use the following methods to aim for seed system continuity after intervention:

- Select seed for distribution that is similar to what is locally available.
- Build local supply chains for similar seed as part of the intervention. For example, develop a public/private partnership that entices a commercial seed company to establish links to lower wealth communities.
- Support local micro-entrepreneurs who can distribute seed and increase community seed system self-reliance.

If we have made farmers dependent on crop or seed choices no longer available to them, we lose the possibility of a transition from the crisis response. Remember: a good deal of vegetable seed is imported, and a large portion is bought retail. So, if populations are able to exit crisis with restored livelihood, and if communities have restored commerce, then traffic in vegetable seed may return of its own accord – as long as we get out of the way and let it do so.

References

Bates, R. et. al., 2013. Developing Value Chains To Preserve and Promote Underutilized Indigenous Vegetables. *Proceedings of the Regional Symposium on High Value Vegetables in Southeast Asia: Production, Supply and Demand.* R. Holmer et. al., eds. AVRDC – The World Vegetable Center, Publication No. 12-758. Taiwan.

FAO. 2010. *Seeds in Emergencies: A Technical Handbook.* FAO Plant Production and Protection Paper 202. Rome. http://www.fao.org/docrep/014/i1816e/i1816e00.pdf.

Martin, F., 2012. "Selecting Suitable Tropical Crops." *Agricultural Options for the Poor.* Tim Motis, Ed.: ECHO, Inc. Available online at www.echocommunity.org/resource/resmgr/a_to_z/azselect.htm

Sperling, L., Remington, T., Haugen, J.M., 2006. *Seed aid for seed security: advice for practitioners*, practice briefs No. 1–10. International Center for Tropical Agriculture and Catholic Relief Services, Rome. http://seedsystem.org/aid-response-advice/.