Moving Towards More Effective Seed Aid

Article *in* Journal of Development Studies · February 2008

DOI: 10.1080/00220380801980954 · Source: RePEc

3 authors, including:

Louise Sperling
International Center for Tropical Agriculture (CIAT)
122 PUBLICATIONS **2,247** CITATIONS
SEE PROFILE

H. David Cooper
Secretariat, Convention on Biological Diversity
45 PUBLICATIONS **4,111** CITATIONS
SEE PROFILE

This is a preprint of an article whose final and definitive form has been published in the JOURNAL OF DEVELOPMENT STUDIES, Vol 44, No.4, 573-600, April 2008 (copyright of Taylor & Francis). JDS is available on line at: http://journalsonline.tandf.co.uk/

Moving towards more effective seed aid

L. Sperling, H.D. Cooper and T. Remington

Abstract

Seed aid is increasingly applied as an emergency response throughout Africa. This article describes its rise, its goals and the seed security principles which should shape it. Drawing on evidence of the effects of disaster, the article reviews the appropriateness of current seed aid responses and suggests ways to link the type of seed security problem with the type of response employed. Direct seed distribution, the dominant form, seems suited for a subset of conditions when farmers procure seed through formal channels and when seed is not sufficiently available in an area. Seed vouchers and fairs may be more widely applicable as this approach strengthens channels farmers normally use (both formal and informal) and addresses the more common problem of farmers' lack of access to seed. Key for improving seed aid is a better understanding of how local seed markets function, as these provide a core of seed security in normal and stress periods.

I. GOALS AND BACKGROUND OF SEED AID

In recent years, seed provision to hasten the recovery of agricultural systems following disasters has become an important activity for many relief agencies. Seed aid has been seen as an innovative step in helping farmers recover and improve their farming systems as its main rationale is to decrease and shorten dependency on food aid. The logic is straightforward: communities affected by disaster (for example, drought, flood, short-term conflict) should be given the means to produce their own food.

A few cases of seed provision during emergencies can be traced back many decades. Domestically, US government agencies and churches provided seed to their devastated farmers during the Mississippi Floods and Depression of the 1920's and 30's (American Red Cross, 2001). Internationally, the Ethiopian government received donor funds to distribute seed (with oxen) as early as 1974, immediately after the cataclysmic drought (S. Adugna, former director Ethiopian Relief and Rehabilitation, personal communication, June 2006), and the Food and Agriculture Organisation of the United Nations (FAO) had one of its first cases of seed delivery, moving rice into Cambodia at the turn of the 1980's (Anon, n.d.). However, it is only since the early 1990's, and particularly in Africa, that relief agencies have engaged in seed aid as a routine complement to food aid. Today, seed aid interventions are widespread throughout East, Central and Southern Africa and are increasing in West Africa. Some countries receive seed aid on a regular basis [for instance, Burundi, 22 seasons (or 11 years) since 1995 (Sperling *et al.*, 2004a)] and the scale of seed aid projects has been growing. FAO, alone, executed some 400 seed-relief and rehabilitation projects between 2001 and 2003 (FAO, 2005a).

Within the last few years, a number of agencies, both bilateral and multilateral, have initiated reviews of their seed aid activities in light of the rapid increase in scope and scale of their use (for FAO: Sperling *et al.*, 2004b; for USAID: Sperling *et al.*, 2004a). This article builds upon and contributes to

these review processes by bringing together a growing body of field-based evidence related to seed relief interventions. Drawing on accounts from over 15 countries (and upwards of 20 interventions), this article represents a synthesis of an aid field that has received but modest academic focus to-date. By design, emergency seed interventions have an action rather than a research focus, with limited and usually internal evaluations. The qualitative and quantitative data presented within this paper are 'anecdotal' in the best sense: they are rooted in a comprehensive amassing of a growing body of 'on-the-ground' evidence.

This article is structured as follows. While this section has briefly introduced the background and rationale for seed aid, section II provides concepts for understanding seed security and the ways in which such security may be compromised. Lessons learned about seed systems under stress, drawn particularly from experience in Africa, are summarised in section III, with the current seed aid responses described in section IV. Sections V and VI suggest steps to improve the efficiency and effectiveness of seed aid, addressing the challenge of better targeting of approaches and signalling the basic gaps of: 1) initial assessment, 2) evaluation, and 3) understanding of local seed markets. Section VII presents some concluding comments.

II. CONCEPTS OF SEED SECURITY

Understanding the features which influence seed security is key for assessing the ways in which it might be threatened or reinforced. As a base for reflecting on seed security and disaster effects, we examine in this section four themes: the seed systems farmers use; the elements of seed security, the distinction between acute and chronic stress, and ways to assess seed availability.

Seed systems routinely used by farmers

Farmers, particularly small farmers, use multiple channels for procuring their seed. These channels fall within formal and informal seed systems (with the latter also sometimes labelled as the local, traditional or farmer seed system).[i]

The formal seed system involves a chain of activities leading to certified seed of named varieties. The chain usually starts with plant breeding, and promotes materials towards formal variety release. Formal regulations aim to maintain varietal identity and purity, as well as to guarantee physical, physiological and sanitary quality. Seed marketing takes place through officially recognised seed outlets, either commercially or by way of national agricultural research systems (Louwaars, 1994). Formal sector seed is also frequently distributed by seed relief agencies. The central premise of the formal system is that there is a clear distinction between 'seed' and 'grain': that is, seed must be produced in ways quite distinct from food.

The informal seed system is basically what the formal system is not. Activities tend to be locally organised, and the informal system embraces most of the ways farmers produce, disseminate and procure seed: directly from their own harvest; through gifts and barter among friends, neighbours and relatives; and through local grain markets or traders. The same general steps take place in the informal system as in the formal but they take place as integral parts of farmers' grain production, that is, farmers' seed is generally selected from the harvests or grain stocks, rather than produced separately. Local technical knowledge, standards, and social structures guide informal seed system performance (McGuire, 2001). In developing countries, somewhere between 80% and 90% of the seed sown comes

from the informal seed system (DANAGRO, 1988; FAO, 1998), although this varies by crop and region.

What is important to highlight is that farmers themselves often obtain their seed through both formal and informal channels for different kinds of crops. In Southern Africa, for example, the same small farmers may routinely procure maize hybrids through formal seed systems (stockists, commercial companies, government parastatals, and, sometimes, relief aid), beans from their own harvest or local grain markets, and sorghum seed from their neighbours (van Oosterhout, 1996). Moreover, it is not unusual for a household to meet its seed needs for a single crop from different seed channels. Bean farmers throughout Eastern and Central Africa obtain some of their seed from their own stocks, some from markets or neighbours, and may acquire a handful of new material (to test) from the extension agent or research station (Sperling, 1993; David and Sperling, 1999).

In terms of thinking about seed aid and seed security, two delivery channels merit specific focus: local grain markets and the newly emerging relief seed channels. First-hand accounts usually emphasise that farmers, particularly in isolated and vulnerable regions, strive to save their own seed and sow from previous harvests (Berg *et al.*, 1991; Jones *et al.*, 2002). While this is partially true, especially in remote areas (for example, southern Sudan), studies which quantify how seed is procured find that it is often local grain markets which prove crucial for meeting seed needs, especially for poor farmers, and in difficult times (David and Sperling, 1999). (Note that there are important exceptions to this trend as some seed types are rarely are sold in central market places, for example, the vegetatively-propagated bananas, yams, sweet potatoes, cassava). For many farmers, local markets are a good second 'best bet' (after home stocks) as they put on offer the same varieties farmers routinely sow (Sperling and Loevinsohn, 1993). In southern Somalia, where grain traders invest in obtaining good quality seed (that is, making a distinction from bulk grain), local markets can be a preferred source of replacement seed (Longley *et al.*, 2001).

Relief seed systems have also become of distinct importance on the supply side. In fact, the repetitive nature of seed relief, particularly in Africa, has spurred some to identify a 'relief seed system' as a somewhat separate type of seed procurement and distribution network (Bramel *et al.*, 2004a).

Finally, it is worth signaling that formal systems can play a key, supporting role in emergency relief, in making available new varieties and crops which might help communities combat future agricultural stress. Such introductions are usually made in small quantity and their immediate effects are delayed (Sperling and Remington, 2006a).

Figure 1 shows schematically the formal and informal seed systems (and their component channels) and how they may interact. Adapted from Almekinders and Louwaars (1999), the figure additionally highlights the importance of the local seed market and seed relief channels.

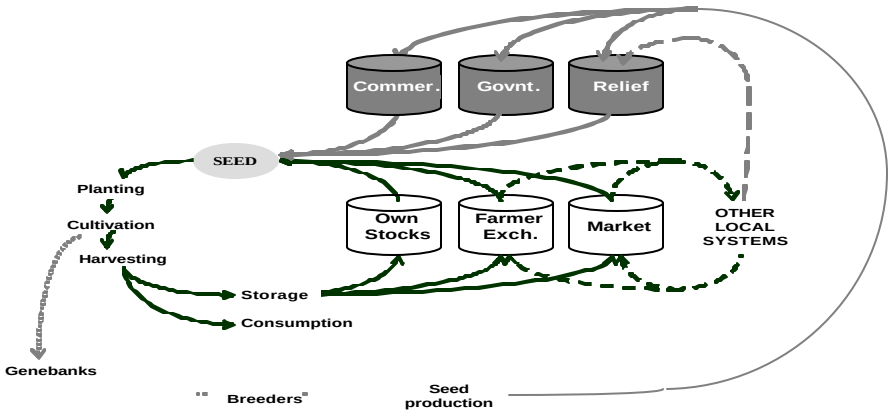

Figure 1: Channels through which Farmers Procure Seed These are depicted by the cylinders: Own seed stocks, exchange with other farmers , and purchase through local grain markets constitute 'informal' channels, while commercial seed stockists, government or research outlets , relief supplies constitute formal channels. The arrows indicate the flow of seed in the 'informal' and 'formal' sectors respectively. Adapted from Almekinders and Louwaars (1999).

The seed security framework

The Seed Security Framework (Remington, 1998; Remington *et al.*, 2002) outlines the conceptual elements inherent in seed security: seed has to be available, farmers need to be able to access it, and the seed must be of a satisfactory quality (in terms of health, adaptability and meeting farmers' varietal preferences) (Table 1). This three-fold characterisation of seed security diverges from the more popular notions which equate insecurity mainly with lack of seed from a harvest, that is, lack of self-produced seed (Cromwell, 1996). The elements of seed security are discussed further below.

TABLE 1

SEED SECURITY FRAMEWORK

Parameter	Description
Availability	Sufficient seed of appropriate crops available within reasonable proximity and in time for planting
Access	People have adequate land, income, or social connections to access seed, including through purchase or barter where necessary
Quality	Seed is of acceptable quality ✍ healthy ✍ adapted and acceptable varieties

After Remington (1998, *et al.* 2002)

Availability is defined as to whether sufficient seed is available in both a given space and time period. As primarily a geographically-based parameter, it is independent of the socio-economic status of farmers.

A*cces*s is a parameter specific to farmers or communities. It depends on assets: whether farmers have the cash (financial capital) or connections (social capital) to purchase or barter for seed. Arguably, land and physical assets also determine access: if a farmer has sufficient land to guarantee self-sufficiency, and adequate storage infrastructure, the household is likely to have sufficient access under most conditions. Problems in procuring seed might occur when channels for obtaining seed are disrupted (when harvests drop, barter networks breakdown or local markets cease to function). Seed experts often stress the *access* parameter as being pivotal as it is usually the limiting factor and therefore determines overall seed security (Scowcroft and Polak Scowcroft, 1997; FAO, 1998; van der Burg, 1998).

Quality includes physical, physiological and genetic or varietal characteristics. Many implementers, responding to donor aid procurement requirements, define quality according to the formal sector definition and equate quality with certified seed (Chemonics, 1996; Remington *et al.,* 2002). However, a growing number of studies which analyse farmer-produced seed suggest that the germination, purity and health parameters can be surprisingly high (Scheidegger and Buruchara, 1991; Tripp, 1997; Diakite, 2004; Otysula *et al.,* 2004; Rubyogo, 2006**).** Formal sector standards also tend to aim for varietal purity, while, by contrast, farmers may favour a degree of variety heterogeneity, especially when sowing in risk-prone and variable environments. Evidently, assessments of quality vary according to the assessor.

It is important to emphasise that the distinction between availability and access is dependent on scale. At some level, if one is willing to pay enough and 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 might be considered a quality concern, although one could question whether appropriate seed is available at all. Using the Seed Security Framework and discovering these types of nuances aids understanding of the underlying problems on which to base future action.

Acute and chronic seed insecurity

Analysis of seed security requires consideration of another, cross-cutting parameter, related to the duration of the stress: whether it is 'acute' or 'chronic' (recognising here also that the divisions are not absolute).

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 failure to plant, loss of a harvest, or high pest infestation of seed in storage. While in normal times households may have various degrees of seed security, all may be affected during an acute event such as a flood or short civil disturbance.

Chronic seed insecurity is independent of an acute stress or disaster, although it may be exacerbated by it. Chronic seed insecurity may be found among populations who have been marginalised in different ways: economically (for example, poor, inadequate land, insufficient labor); ecologically (for example, in areas of repeated drought and degraded land); or politically (in insecure areas, or on land with uncertain tenure arrangements). Chronically seed insecure populations may have continual shortages of seed to plant; difficulties in acquiring off-farm seed due to lack of funds; or use low quality seed and unwanted varieties on a routine basis. The result is households with built-in vulnerabilities.

Acute and chronic seed insecurity will very often exist together in emergency contexts. Indeed, in cases where emergencies are recurrent events, in drought-prone areas, for example, acute situations are nearly always superimposed on chronic problems rooted in poverty. In a disaster, all populations may be affected to some to degree, as harvests may decline and some seed stocks be lost. However, those just above the margins of security in normal times may fall into seed stress if alleviating actions are not sufficient. Similarly, those in chronic stress, may not recover above the line into seed security by simple injections of seed aid.

Seed availability: the relationship between harvest shortfall and seed shortfall

As a final conceptual aid for reflecting on seed security, we look at the relationship between harvests produced and sowing needs. The most common trigger for justifying the delivery of seed aid, and assuming that seed is not available, is a 'harvest failure' or a 'production shortfall'.

Drawing on basic agronomic knowledge, and refining it with in-the field reality, we have examined seed needs as they relate to possible harvests (Sperling and Remington, 2006b). Basically, the per cent of a normal harvest required to meet the sowing needs in the next season is the inverse of the multiplication rate. Small seeded crops generally have high multiplication rates and thus only a very small proportion of the harvest is needed as seed. For the dominant small grain crops of dryland Africa -- millet and sorghum – typically less than one percent of the harvest is needed for seed. Thus, for these crops, even in a bad year, the seed requirement is unlikely to be a significant drain on the harvest, unless there is almost total harvest failure. Large seeded crops (for example, groundnut) on the other hand may require upwards of 10% of the harvest to be set aside as seed. For these crops therefore, seed availability is more likely to be an issue, especially in bad years.

As examples, Table 2a shows the basic relationship between harvests and seed need in two crops in Mali, factoring in farmers' seed sorting and re-sowing rates for this semi-arid context. Table 2b, moves towards greater precision, drawing on actual field data: for a higher and lower potential area in Ethiopia, and contrasting a good versus bad harvest year. The message from both these tables is consistent that a *production shortfall is not necessarily equal to a seed shortfall.* For many crops analysed in African contexts (for example, common bean, fava bean, maize, sorghum, groundnut, wheat, tef) harvests can drop as much as 80-90%, and enough seed is potentially available. We add the qualifier 'potentially' as the quality of seed harvested has to be adequate and farmers have to be able to save sufficient stocks till sowing time. This may be particularly challenging in regions with just one agricultural season per year.

TABLE 2

SOWING NEEDS IN RELATIONS TO HARVESTS , BY HOUSEHOLD

A. EXAMPLE FROM NORTHERN MALI

CROP	**Pearl Millet**	**Groundnut**
Sowing needs (kg/ by farmer area; (sorting and resowing factored in)	10-20	15 kg (1/4 ha)
Harvest (on normal farmer area)	430	125 kg (1/4 ha)
Per cent of harvest needed for seed	**3,4**	**12,0**

B. EXAMPLE FROM EASTERN ETHIOPIA

Crop	**Sorghum Chiro (highland)**	**Sorghum Miesso (Lowland)**
Surface Area per Household	1/2 ha.	3/4 ha
Sowing needs (kg– for area)	7-8	11-12
Harvest/yield (good year)	1250 kg	1600 kg
Per cent of harvest needed for seed : good year	**0.7**	**0.75**
Harvest/yield (bad year)	400 kg	260 kg
Per cent of harvest needed for seed :bad year	**2.0**	**4.6**

III. SEED SYSTEMS IN STRESS: LESSONS FROM THE FIELD

We now move to reviewing the effects of disasters (conflict, drought, flood) on farmers' seed security. This is a relatively new focus of humanitarian and research interest: nearly all studies on seed systems in emergency contexts date within the last 10 years, with most having been conducted in East, Central and Southern Africa.[ii] We present these emerging insights as follows:

1. **Local seed systems tend to be resilient. Farmers who have the conditions to sow (for example, those who have secure access to land and labour) generally find ways to obtain seed of at least some key crops following disaster.** For example, in Rwanda in the civil war of 1994, just three months after widespread killing and displacement, with violent events peaking near harvest time, farmers managed to plant their staple crop, beans, in quantities comparable to those during the pre-war period. They acquired seed from a range of channels, including their own stocks and local markets (Sperling, 1997). Similarly, data from Sierra Leone, during four years of civil strife, showed farmers in a war zone actually increasing their production of grain staples (Longley, 1997).

2. **Seeds are generally available in local and regional markets during crisis periods.** Interviews with seed/grain traders in Eastern Kenya (during multiple drought seasons) and northern Burundi (tracing 10 years of civil strife, coupled with intermittent drought) showed seed to be available in local and regional markets. In the Burundian case (N=42 traders), 78 per cent indicated that there had never been a time in their memory when seed was not available in the Kirundo region, despite 22 seasons (11 years) of seed aid. And most of the other reasons given by the other 22 per cent were in fact related to access (Walsh *et al.*, 2004). Interviews with commodity traders eastern Kenya (N=31) showed that seed was generally available throughout the 1990s with traders recounting how seed aid had caused local market prices to drop sharply (Walker, 2004). Interviews with traders in northern semi-arid Mali, paint a generally similar picture: after consecutive seasons of locust invasion, drought and, in some areas, flash floods, both traders and farmers overwhelmingly described their situation as 'seed secure'. However, some did recount very specific seed quality problems with a single crop. Narrowly-adapted pearl millet varieties were not sufficiently available in one market zone, although they could be found 50 km away, in

towns which specialize in such seed production. In northern Mali, a zone characterised by chronic stress (with 300-500mm rainfall/annum) where acute stress is also frequent, farmers take having *the* right variety quite seriously (CRS/Mali and Partners, 2006).

3. **Where total seed sown has been monitored, analyses show that emergency aid does contribute to seed needs, but not in a major way.** In Kenya during the 1997 drought, despite massive distributions of maize seed, over 85% of the seed sown came from local channels (Sperling, 2002). There were similar findings in regard to bean seed in Honduras after Hurricane Mitch in 1999 (Haugen and Fowler, 2003) and sorghum in drought-stricken Somalia (Longley *et al.*, 2001). This does not mean that farmers do not value or benefit from the emergency distribution, but, rather, they also value, very much, the seed they can obtain themselves of known varieties and from known channels. The major exception to this finding concerns situations where the seed on offer is of a crop that is relatively new for farmers (such as climbing beans in East Africa (Sperling, 1997)). Table 3 summarises the contribution of relief seed to total seed shown, for a range of crops and stress contexts for which we have located seed procurement data. Generally less than 1/8 of seed sown post emergency directly derived from seed aid.

4. **Local grain markets are of central importance as sources of seed in crisis periods.** As home stocks of self-saved seed go down, the gaps are filled primarily by local markets. This proves particularly true for the crop types for which seed can be reliably obtained from grain stocks: for example, for rice (Longley, 1997), beans (Sperling, 1997, Otysula *et al.*, 2004), and open-pollinated maize (Sperling, 2000). In different types of crises, analyses show that 25 to 50% of seed sown has been obtained from the local markets (Table 3). Follow-up surveys suggest a farmer preference to use local markets over external sources and interviews with traders document the degree to which seed/grain commerce functions, even during unsteady periods (Walker, 2004; Walsh *et al.*, 2004). In some regions, specialized villages for seed production have gained renown (CRS/Mali and partners, 2006) and these prove particularly important in stress periods. We do note a small number of cases, such as southern Sudan, where local seed/grain markets have never really functioned, either during normal or stress periods. These cases are just beginning to receive much needed seed security scrutiny (Jones *et al.*, 2002).

5. **Different seed channels may be affected by the crisis to different extents and in different ways.** Some seed channels are more durable than others. One salient example comes from the Rwanda war and genocide crisis. Farmers, particularly in the north, had come to rely on formal sources for potato seed, as well as for procuring new varieties. The war disrupted this supply as early as 1991–1992, as the parastatal responsible for bulking up was located in one of the war's first fronts. Development projects, also standard sources for certified seed and improved varieties, phased out activities early (1993) as insecurity grew. Local markets, in contrast, the main sources for bean seed, continued to diffuse local grain used as seed (and sometimes emergency seed as grain) during some of the worst of the events. So while potato production, relying on the formal sector for improved varieties and clean seed, virtually collapsed, bean seed channels and production, which were based on local farmers' systems, continued largely on course (Sperling, 1997).

TABLE 3

IMPORTANCE OF RELIEF SEED AND MARKET SEED IN FARMERS' SEED SUPPLY DURING DISASTER PERIODS*

Country	Trigger stress/ year	Crop	% of seed planted obtained through relief	% seed obtained through local market
Zimbabwe	drought/ political instability/2003	Pearl millet	12 **	n/a
Rwanda	civil war/1995	Beans	6, 28 ***	26,52***
Kenya	drought/1997	Maize	11	39
Somalia	drought/2000	Sorghum		
Deyr			10	25
Gu			17	25
Somalia ****	drought//2000	Maize		
Deyr			3	33
Gu			3	43
Afghanistan	civil strife 2002-2003	Range of crops	5.4-7.2*****	n/a

n/a= data not available

*Sources of data
Zimbabwe: Bramel and Remington 2004
Rwanda: Sperling 1997
Kenya: Sperling 2002
Somalia: Longley *et al.* 2001
Afghanistan: ICARDA 2005

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

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

****This data is drawn from two distinct seasons. Deyr and Gu

***** These figures represents % of relief seed sown in low (5.4%) and high (7.2%) population displacement areas respectively

6. **Farmers often adjust their seed systems to changing conditions, during or following a crisis, rather than look to restore their previous varieties.** Farmers often see their crop diversity as dynamic, during normal as well as disaster years. One compelling example comes from Sierra Leone. In 2002, after nine years of brutal war, CARE, a non-governmental organisation (NGO), put on offer a range of rice and groundnut varieties so as to allow farmers' access to a wider range of varieties, including ones that had previously been scarce, but also so as to let them choose among new varieties. While some farmers did select varieties they had planted the year before or pre-war, a considerable number sought to try totally new varieties: 56% of those selecting rice, and 36% of those selecting groundnuts were 'variety innovators' (Richards *et al.*, 2004; Richards, 2005). Similarly in Mozambique, 2000-2003, some farmers surviving a flood followed by drought did not want the 'lost' cowpeas varieties back.—because of their susceptibility to drought (Ferguson, 2003). Hence farmers in crisis may purposively seek new varieties rather than the old.

The broad trends, above, suggest the resilience and dynamism of local systems. Within and among case analysis also help refine our appreciation of differences among stress events, so as to subsequently fine-tune response. In many war contexts, for example Sierra Leone, social relationships may be so severely strained that the routine networks of gift of exchange by which seed is passed may be markedly damaged (Richards and Ruivenkamp, 1997). The local seed system during the Rwandan war and genocide, in contrast, did not particularly suffer from this problem as it was not previously grounded on an ethic of sharing (Sperling, 1997). Extreme stress can also alter farmers' use of one key channel –and shift reliance to another. In the northern Douentza zone of Mali, farmers prefer to obtain pearl millet from own stocks or through extensive gift-giving as specific varieties and seed quality are sought. During the 2003-2005 consecutive crises, however, such gift giving was widely reported as near-nil. Farmers moved to obtaining seed on local markets, even though, in normal times, this strategy would be a mark of great shame (CRS/Mali and Partners, 2006).

Both the broad trends, as well and in-depth data to-date, suggest that one widespread assumption – that of seed <u>not</u> being available in a crisis – usually does not hold under closer scrutiny, for a range of crops and contexts. We have noted above exceptions: of crops whose planting materials are generally not sold in markets and also those sites where local markets have never really developed at all. However, in the majority of cases investigated to-date, seed can be found, if one has the means. Seed access, in contrast, does tend to be a problem, again and again. Victims of the disaster may have lost considerable physical assets (houses, livestock, seed stocks) and social assets (friends and neighbours). They may simply not have the margin to re-acquire seed (from markets) or may have priorities other than buying seed (for example, an urgent need to hire labour or pay for healthcare).

IV. CURRENT MAJOR RESPONSE OPTIONS BEING USED IN EMERGENCY

This section reviews the types of seed-related interventions currently being implemented (Table 4). They are distinguished between those which deliver direct forms of aid (and generally assume 'a lack of available seed') and those which are market-based and give recipients cash or vouchers to themselves procure seed (and hence assume 'lack of access' as the driving need). We also briefly refer to responses which focus on seed quality issues, both varietal quality and seed quality per se (health, germination rates, and purity).

TABLE 4
TYPOLOGY OF CURRENT SEED SYSTEM INTERVENTIONS

	Description / Rationale	**Constraints to which they should be targeted**
Direct Aid		
1. Direct Seed Distribution Emergency Seed Provision 'Seeds and tools'	Procurement of quality seed from outside the agro-ecological region, for delivery to farmers. The most widely used approach to seed relief.	Short term response to address problems of seed availability especially in situations of total crop failure and/or long-term displacement of farmers. Response also used to introduce new crops + varieties that are usually supplied by the formal sector
2. Local procurement and distribution of seed	Procurement of quality seed from within the agro-ecological region, for delivery to farmers. A variant of 1.	Short term response to address problems of seed access or highly localised problems of seed availability
3. Food aid 'Seed aid 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. Where local seed systems are functioning, but the previous harvest was poor, food aid can similarly protect farmers own seed stocks.	Short term response accompanying direct seed distribution to address problems of seed availability
Market-based approaches		
4. Vouchers / Cash to farmers	Vouchers or cash can provide poorer farmers with the means to access seed where it is available, from local markets, or the commercial sector. Vouchers or cash enables farmers to access crops and varieties of their choice.	Short term response to address problems of seed access especially in situations of local seed shortages and where local markets or farmer-farmer barter normally used
5. Seed Fairs	Seed fairs provide an ad hoc market place to facilitate access to seeds, or 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 normally used
Seed production and varietal development		
6. Seed Production Community-based, local seed production	Farmers are trained and/or contracted to produce seed, distinct from their regular production activities, often based on formal seed standards. Some approaches focus on improving quality attributes, others are designed specifically to facilitate the movement of new 'improved varieties into local systems; still others are conceived as basically income-generating or profit-making enterprises.	Medium or long term response to address problems of seed quality (of local materials) or , access or availability of new varieties
7. Provision or development of better varieties through small packets, participatory varietal selection, or participatory plant breeding	Important where farmers need access to new genetic material	Medium or long term response to address problems of seed quality (genetic/ varietal attributes).

Direct aid approaches

Direct seed aid approaches generally engage implementers in procuring, transporting and distributing seed. Food aid explicitly given to protect seed stocks can also be encompassed under this direct aid umbrella.

Short-term direct aid

Commonly also referred to as 'Seeds & Tools' because a hand hoe often accompanies the seed package, direct seed distribution is based on the assumption that, because of disaster, farming communities cannot find seed. As seed is often brought in from outside the locality, a second and less explicit assumption is that sufficient seed is not available locally. In its classic form, direct seed distribution involves the importation of seed from certified seed sources, as such suppliers meet the requirements of donor and procurement departments (Remington *et al.*, 2002). Because of this requisite, direct seed distribution has primarily been limited to a narrow range of crops and varieties, those produced by governmental or commercial sectors and, hence, widely adapted to larger areas (Sperling, 2001). For example, a large portion of the relief in southern Africa is maize based, often including hybrids **(**for example, Rohrbach *et al.*, 2005). Vegetable seed, imported from outside Africa has also proven to be a prime input into classic direct seed distribution operations.

In several countries that do not have a strong commercial seed sector, and where the main crops include small grains such as sorghum and millet for which there are relatively few successful new varieties available (that is countries such as Ethiopia, Eritrea, Southern Sudan and Burundi), implementers of direct seed distribution have had no choice but to procure seed from seed/grain markets and traders (Remington, 2004). Even in countries with an existing maize-based commercial sector, direct seed distribution implementers, responding to requests of donors and non-governmental organisations for seed of crops other than maize, have generally moved towards procuring locally-appropriate crops and varieties. In these cases, seed companies or regional grain traders often draw upon local grain markets for crops not easily available through commercial channels (such as cowpeas, sorghum and millet). Indeed, in the predominantly dryland areas of Africa, where much seed relief has been concentrated in recent years, a significant portion of the seed delivered is, in effect, recycled grain (Makokha *et al.*, 2004; Rohrbach *et al.*, 2004).

This tendency has been taken one step further by FAO in Ethiopia, where seed has been procured from within the region for delivery to farmers during drought periods (Mburathi *et al.*, 2004). The fact that seed is procured from the within the same locality in which it is to be delivered suggests that seed is generally available in these situations and that the likely constraint facing farmers is one of seed access (Remington, 2004).

Direct seed distribution is a straightforward approach, and, in terms of simple distribution of seeds, is usually successfully carried out. However, a number of constraints in implementing this type of aid have been well documented. In the short-term, crop or variety choice may be incorrect and seed often arrives later as it needs to be procured in larger quantity (ODI, 1996; Anon, 1997; Sperling, 2000). In the longer-term, two recent collections of field studies question the overall effectiveness of the direct distribution approach itself, showing that it is not always needed and that it often fails to contribute to longer-term recovery (Longley and Sperling, 2002; Sperling *et al.*, 2004a).

Longer-term direct aid

Seed aid in the form of direct seed distribution is also being delivered on a repetitive, and often near-continuous, basis in a number of countries in Africa (Table 5). Year after year, an emergency is declared, and seed aid is given as the routine agricultural response.

TABLE 5
CHRONIC SEED AID DISTRIBUTION

Country	**Seed Aid Distributions***
Burundi	22 Seasons (11 years) : since 1995
Eastern Kenya	92-93; 95-97; 2000-2002; 2004
Ethiopia	34 years: seed aid near continuous since 1974
Malawi	9 seasons or more since 1992
Zimbabwe	Near continuous since 1991 (food aid, seed aid or both)

?? *Sources of data
Burundi: Sperling *et al.* 2004a
Eastern Kenya: Omanga *et a*l. 2004
Ethiopia: Bramel *et al*. 2004a, S. Adugna, personal communication
Malawi: Phiri *et a*l. 2004
Zimbabwe: Bramel and Remington 2004

Aside from often not addressing the correct problem, the delivery of repeated aid, is having a number of negative consequences. Increasing evidence shows that repeated distribution distorts farmers own seed procurement strategies (Sperling, 2002; Phiri *et al.,* 2004). For example, farmers in the Tana Region of Kenya, routinely list 'seed relief' as one of the basic channels on which they count on to procure seed--- season after season (Remington, 2000). In Ethiopia, the dependency on handouts has become so great (for both food and seed) that government policy strongly discourages free distribution and rather promotes relief aid which is paid for directly or reimbursed later (IRIN, 2006; A.Deressa, Ethiopian Agricultural Research Organization, personal communication, September 2005**).** In terms of markets, free seed delivery has been shown to undermine local seed/grain market functioning, particularly in terms of retail sales (Rohrbach *et al.*, 2004 ; Walsh *et al.* 2004) and even to compromise the development of longer-term more commercial seed supply systems (Tripp and Rohrbach, 2001; Bramel and Remington, 2004; Rohrbach *et al.,* 2005).

Repeated aid, not unexpectedly, is also leading to the rise of parallel delivery systems, 'relief seed systems', for example in Ethiopia, Kenya, and Zimbabwe (Bramel and Remington, 2004; Bramel *et al.,* 2004a; Sperling *et al.,* 2004a). Hence some do benefit from the repeated (almost chronic) delivery of seed aid: the entrepreneurial, who specialise in quick delivery of a small range of crops. Relief seed systems have evolved in diverse ways in Africa but their rise has been quick and steady. The

functioning of such relief systems involves a clear set of steps: a disaster is declared, seed need is assumed, and then a well-established chain of suppliers moves into action.

The foregoing underlines two sets of reasons why direct seed distribution might not necessarily be the most suitable option. First, as set out above, increasing evidence is showing seed often to be available in crisis (and hence importation not to be needed). And, as we saw in Table 3, in a range of crises, relief seed does not make a significant contribution to sowing stocks. Second, because seed need is assumed in a standard response, direct seed distribution is becoming repetitive, with a range of (mostly negative) consequences.

Market-based approaches

Market-based approaches focus on giving farmers the means to get access to seed. Use of seed vouchers, coupled with fairs, is the most common response of this genre. Giving vouchers or cash alone are also increasingly practiced (Longley, 2006).

The approach using seed vouchers and fairs in emergency contexts is relatively new, dating from about 2000. Neither seed fairs nor vouchers, however, are totally novel, and the seed fair antecedent, in particular, bears mention.

Seed fairs within agricultural development have long been associated with concerns for biodiversity and cultural heritage. Particularly in the Andean Region (Tapia and Rosa, 1993; Scurrah *et al.*, 1999) and throughout South and Southeast Asia (Sperling and Loevinsohn, 1996; Jarvis *et al.*, 2000) seed fairs are organised to help farmers maintain their seed diversity and raise awareness of its value. More recently, seed fairs have been held in Africa (Zimbabwe, Mali (Guerette *et al.*, ms; Nathaniels and Mwijage, 2000)) mainly to bolster on-farm conservation of plant genetic resources. Within biodiversity-focused fairs, many varieties are exchanged, but small quantities of seed pass hands. Their aim is not provision of seed per se but rather transfer of genetic material, with its associated knowledge and cultural heritage.

Voucher distribution 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 (Peppiatt *et al.*, 2003). Cash is also becoming increasingly popular, although implementers sometimes worry about its traceability and whether it leads to productive inputs. A recent overview of the use of both cash and vouchers in emergency situations suggests that such approaches are under-utilised in the humanitarian sector and compare positively in evaluations with food aid, direct seed distribution and other 'in-kind' approaches (Harvey, 2005).

Vouchers were first suggested for use in seed aid in the mid-1990s, when assessments after the Rwandan civil war found that seed was available in local seed systems but that farmers lacked the means to procure it (Sperling, 1997). Catholic Relief Services (CRS) was the first to test seed voucher use in an emergency in northern Uganda, in 2000, (Remington *et al.*, 2002). CRS subsequently combined voucher use with fairs in Kenya, also in 2000, so as to bring seed sellers together at the same place, simplify logistics, and minimise misuse of vouchers.

The basic premise of the seed voucher and fair approach is that seed is available in a region after a crisis. Farmers' constraints hinge on their not being able to get access the seed, usually because of sharply depleted finances sometimes combined with collapse of social networks. Another assumption is that farmers are eager, willing and capable of selecting for themselves the crops and varieties they

require for sowing, including, or even especially, in difficult periods. Seed fairs are generally organised for one to two days and are held in multiple local locations.

To date, seed voucher and fairs have been held in about 30 countries, mostly across Africa (Bramel *et al*., 2004b), and are being implemented or supported by a range of organisations (CRS, FAO, the Government of Mozambique and World Vision). They have been used in both natural (flood and drought) and manmade disaster (conflict) emergencies.

Within the last few years, the seed fair and voucher approach also has been expanded to embrace 'Input Trade Fairs' and 'Multi-Input Vouchers' which give farmers access to a range of inputs beyond seed, such as small livestock, animal feed, fertiliser and tools (Dominguez *et al.,* 2004; CRS/Kenya, 2005; CRS/Sudan, 2005).

The seed voucher and fair approach has a range of advantages. The approach not only facilitates farmers' access to seed in a timely manner, but to seed of the crops and varieties they desire. Procuring from existing markets does not mean that farmers are confined to using only local varieties. Cash and vouchers have been used to link beneficiaries to formal seed sector shops (Rohrbach *et al.*, 2004), and new varieties are often circulated through local vendors (Otysula *et al.,* 2004).[iii] The seed vouchers and fairs approach supports two types of beneficiaries, the buyers or seed voucher recipients themselves, and the sellers, including other farmers and many small traders who sell seed to generate immediate income and/or to bolster non-seed businesses. The approach seems broadly empowering (allowing, inter alia, poor households, including women, to sell), and at the same time gives economic support to local seed system entrepreneurs and private seed companies willing to compete on a level playing field. (Between 65 and 85 per cent of aid resources go back into the local economy during a fair (Walsh *et al*., 2004))[iv]. The seed fair also provides an opportunity for exchange of knowledge among farmers, and between farmers and traders, not only on seed quality and on crop varieties, but also on other issues such as HIV/AIDs (Remington *et al.,* 2002; Makokha *et al.,* 2004; Walsh *et al.,* 2004; Bramel *et al*., 2004b).

Seed voucher and fair use during emergencies is not without it critics, with two concerns consistently voiced. The first centres on the quality of the seed. Implementers feel accountable for the product they deliver and some shy from promoting use of farmer-produced seed (procured directly from producers, through traders and on local markets) (FAO Seed Working Group Discussions, reported in Sperling *et al.,* 2004b, West and Bengtsson, 2005)**.** Seed fair organisers have responded in two ways: by explicitly setting up on-site committees to screen seed on offer; and by promoting independent testing, ex-post, using formal parameters.[v] Ultimately social sanctions, or what CRS calls 'social certification', might prove the most powerful control: if a seller cheats a farmers at one fair, he/she will not be frequented at the next.

The second basic critique of seed vouchers and fairs revolves around staff capacity, logistics and scale. Seed vouchers and fairs are a decentralised form of relief implementation. As they have to be organised locally, the scale of impact is circumscribed, with an average of 500 per event or 30,000-50,000 families for any one project. Scaling up implies that multiple fair events have to be organised for coverage over a range of agro-ecological zones and communities. Scaling up also implies that organisations have to have sufficient staff expertise to work over extended geographic areas (Bramel *et al.,* 2004b).

Further criticisms of the approach include suggestions that, in some cases, it inflate the price of seed,; benefit the larger, rather than smaller trader; and that the fairs also do not always provide the range of

varieties needed or in sufficient quantity (Vandersteeg et al., 2004; West and Bengtsson, 2005). All these issues merit further follow-up.

Seed quality-related assistance

Finally, a number of activities focus specifically on varietal and seed quality. During the relief phase, injection of new varieties (and sometimes crops) is becoming increasingly popular, on the part of both farmers and implementers. Such efforts, sometimes termed 'developmental relief' as they link emergency aid to longer-term horizons, have to be planned carefully so as to increase production and minimise risks (Rohrbach *et al.* 2004; Sperling and Remington, 2006a). In the recovery and development phase, parallel interventions also promote the introduction of new 'improved' varieties into local systems through efforts such as participatory varietal selection and participatory plant breeding. Seed quality per se is also a subject of several types of interventions. Some concentrate on improvements in the physical, physiological and sanitary quality aspects of 'below-average' planting material, efforts which could be particularly key for the vegetatively-propagated crops. Others are conceived as basically profit-making enterprises and hone in on building of business skills within local communities. With the exception of discrete new variety injections, all quality-related work tends to involve medium-term commitments, which aim then to bolster systems for subsequent short-term crises. What still remains to be assessed is the extent to which such quality-enhancement enterprises are sustainable, bring economic benefits to those involved, and can actually strengthen seed system functioning.

The foregoing discussion shows that there are a number of possible seed relief interventions. However, direct seed distribution has dominated relief activities, part in due to a lack of widely accepted alternative approaches. Many donors and agencies also feel comfortable with direct seed distribution – it enables donors to spend money easily, track delivery process, and has tangible 'results' – the actual distribution of seed is almost guaranteed.. An exception to this has been the Office of Foreign Disaster Assistance of the United States Agency of International Development. OFDA/USAID has given consistent financial support for seed voucher and fairs, estimating as of mid-2006 that 60% of its emergency seed aid projects use this approach (L. Powers, Agricultural and Food Security Advisor, USAID/OFDA, May 2006).

V. MOVING TOWARDS MORE EFFECTIVE SEED AID: MATCHING RESPONSE TYPE TO PROBLEM

We have examined evidence of the effects of disasters on seed systems (section III) and described the major response options currently available (section IV). Before highlighting basic gaps in practice as well as knowledge (section VI), we would like to present a broad logic for linking problems and opportunities on the ground with the repertoire at hand (that is linking sections III and section IV). We emphasise the need to consider not only short-term responses, but also medium and longer-term options for strengthening seed security. Further, we aim both to promote positive practice as well as reduce that which is negative. The delivery of seed aid on a repeated basis over a number of countries serves as a signal that many of the cases being treated as acute stress, on closer examination, are actually chronic stress situations (Sperling *et al.,* 2004a). Our summary insights are listed below.

1. **The circumstances for which direct seed distribution may be the most appropriate option are when there is a problem of seed availability and farmers normally source**

their seed from formal channels. The response of bringing seed into an emergency affected area is designed to address problems of lack of available seed in a given region (Section IV). Current field evidence shows that lack of seed availability may occur in a restricted number of cases: from consecutive total crop failures, because farmers have been displaced from their land, seed stores or social context, when select crops and varieties have not yet entered local channels, or in rare cases where local seed markets have never really developed (Sperling, 1997, Jones *et al.*, 2002; CRS/Mali and partners, 2006). Direct seed distribution, as it often involves importation, is more appropriate when farmers obtain seed from formal channels, for example for introduced crops, commercially-oriented crops, large grained crops (where the seed rate constitutes a relatively large proportion of the total grain harvest) and clonal crops that are difficult to propagate. Where direct seed distribution is used, facilitating the choice of crops and varieties by beneficiaries should be an operative principle as it allows farmers to better target for their specific needs.

2. **From among the existing options for short term responses to perceived emergency seed situations, market-based interventions, seem to be more broadly applicable than direct seed distribution since they address the more widespread problems related to seed access.** Trader accounts and actual farmer procurement strategies show seed often to be available in a region post disaster (sections III.2 and III.3, Table 3), but with farmers' assets depleted and their ability to access seed compromised. Short-term strategies should aim to provide poor and vulnerable households with the means to procure seed. Market-based options, providing farmers with cash, vouchers or coupling vouchers with fairs, allow farmers to procure priority crops and varieties, and further support the existing trader as well as buyer economy. As they build on local and regional systems, market-options can also have key secondary effects of immediately bolstering both seed and non-seed related economies in affected zones.

3. **The possible negative effects of seed aid should be increasingly factored into decisions about what type of aid might be given, and how often. In particular direct distribution of seeds in inappropriate circumstances may undermine the functioning of local seed systems and therefore aggravate seed security problems**. Free distribution of seed, particularly if given repeatedly, denies markets to seed/grain traders (Rohrbach *et al.*, 2004; Walsh *et al.*, 2004). If free seed distribution comes to be expected, it also constitutes a perverse incentive and undermines local seed acquisition practices (cases of Tana, Kenya; and across Ethiopia more generally). Further, where unsuitable varieties or crops are introduced, the resilience of the farming system may be compromised (van Oosterhout, 1996). The giving of repeated seed aid is detrimental—full stop. It also signals that the problem being addressed has probably been misdiagnosed.

4. **In many of the cases where seed relief is conducted, seed aid may not actually be the most appropriate response at all**. Many contemporary cases of emergency are chronic cases of problems of seed access. Fundamentally, these result from poverty. One recent review showed six of the eight seed intervention cases being examined to be primarily chronic situations being subjected to acute aid responses (Sperling *et al.*, 2004a). The most appropriate short and long term responses are those aimed at eradicating poverty and stimulating local economies. Seed-related interventions, may be an appropriate component of such programs, but not necessarily so.

In Table 6, we summarise seed security response options which aim to be problem-driven. Using the dual seed security axes outlined in section II, we match seed security action response to explicit constraints in seed availability, access and quality, and in the short-term and long term.

TABLE 6

CHARACTERIZATION OF SEED PROBLEMS AND BROADLY APPROPRIATE RESPONSES

Problem	Short-term	Long-term
Unavailability of seed	*Where farmers source seed predominately through informal seed channels:*	*Where farmers source seed predominately through informal seed channels:*
	Enhance immediate operation of local and regional markets (response dependent on context: for example, offer inventory credit to traders, and facilitate improved access to market information, including advance notice of demand subsidies or of purchase)	Support development of local and regional markets (encourage more access to credit, better established market information channels, more effective transport and seed storage support.)
	Where farmers source seed predominately through formal seed channels:	*Where farmers source seed predominately through formal seed channels:*
	Direct distribution of seed	Support development of quality assured seed production or supply chains, incl. commercial enterprises where viable
Poor and vulnerable farmers do not have access to seed	Cash disbursement Voucher disbursement (w/seed fairs)	Poverty reduction programs
Seed of poor quality and/or lack of appropriate varieties	Seed fairs with quality controls Direct distribution or sale of samples of quality seed (for subsequent multiplication) Distribution of foundation (pure and healthy) 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/or in seed and grain markets) Participatory varietal selection Participatory plant breeding

It seems increasingly important to emphasize that relief seed aid can have negative as well as positive consequences and that it needs to be designed so as to promote its positive benefits and minimise its disruptive effects. As much of emergency aid also unfolds in more chronic stress contexts, there is increasing urgency to link short-term relief with more developmental perspectives (Rohrbach *et al.*, 2004). Some relief-development initiatives will be seed-related, such as introduction of new varieties and local seed/grain market strengthening (next section). Others go well beyond a seed system focus and towards a set of approaches that support and strengthen basic livelihood strategies.

VI. MOVING TOWARDS MORE EFFECTIVE SEED AID: ADDRESSING KEY GAP AREAS

We now move towards addressing major gaps areas in current seed aid practice and knowledge, and seek to priortise an agenda for 'next steps'. The methodological gaps are longstanding and fundamental: lack of systematic assessment of seed security and lack of rigorous evaluation of seed aid interventions. The knowledge challenges, in contrast, are of more novel interest, and have emerged precisely *because* of the recent advances in the seed aid field. As we start to understand better the varied effects of disasters and subsequent humanitarian response on seed system functioning, questions on how local seed markets operate become central.

Assessment

Seed systems in emergency situations are rarely assessed or properly characterised, and therefore are only poorly understood. In practice, a need for seed is assumed, either with no assessment at all or with seed needs extrapolated from assessments of food needs or crop production declines (which, as has been shown in section II, do not necessary lead to seed shortages). Where surveys of farming production systems are undertaken, they are usually completed only after emergency seed has been delivered (Sperling *et al.*, 2004a).

This lack of assessment means that seed aid is carried out in an environment of relative ignorance and that a narrow set of responses monopolise the field by default. Methodologies for seed system security assessment are available for both local-level, community analysis (ICRISAT/INIA n.d.) as well as for larger regional, agro-ecosystem scales (Sperling and Remington, 2006b). Capacity to use them, and donor encouragement to employ them, now also have to become part of routine operational standards. (They are required, for example, under the FAO's guiding principles for seed relief (FAO, 2003; Sperling *et al.*, 2004b) and the Office of Foreign Disasters Assistance/ USAID gives specific funds for their use. Recent Seed System Security Assessments (SSSA) in northern Mali (SSSA), suggest that such work can be done relatively quickly (within two weeks) and at relatively modest cost (US$ 25,000, or 5% of total project budget) (CRS/Mali and Partners, 2006).

Evaluation

The paucity of systematic evaluation of seed relief activities also remains remarkable, and is surprising given the magnitude of resources spent on seed aid. Lack of evaluation precludes opportunities for learning by doing—so, again, supply-side options persist. We note that the seed voucher and fair approach embraces within its methodology a process of exit interviews to solicit recipient response (CRS, 2002) and that several external evaluations examining the effects of direct seed distribution, seed vouchers and fairs, and vouchers alone have been recently effected (FAO, 2002; Gregg, 2005, Longley, 2006). These efforts need to be intensified, across types of response options, and through time.

Several different types of evaluations could be crucial for improving practice (Sperling and Remington, 2006c):

- Real time evaluations using post aid exit interviews (for example, as farmers leave a fair) to obtain beneficiary feedback so as to inform the next planned event. Real time evaluations use monitoring information to ensure that the process is on track and problems are identified and corrected as quickly as possible.
- Output evaluations conducted right after the intervention (that is, within one month) to provide feedback from practitioners, partners and beneficiaries on the logistics of the

intervention (timing, targeting, distribution mode, and so on.). This is the 'classic' type of evaluation that satisfies donor requirements and closes a project.

- Outcome evaluations conducted at the end of the cropping season to evaluate the effectiveness or outcome of the intervention in terms of impact on crop production and next season seed security. An outcome evaluation shifts the focus from what was done to its immediate effects and what might be done next to support continuing recovery.
- Impact evaluations conducted after several (three–five) seasons to evaluate the broader impact of the intervention on food security, income, stability of production, varietal diversity and local seed system (including local grain markets) functioning. This evaluation seeks to capture and share learning for a wider practitioner community.
- Meta-analyses and evaluations compare several interventions at once. They can compare interventions of the same type (for instance, a range of direct seed distributions), or they can be used to compare different approaches, such as direct seed distribution and seed vouchers and fairs. Such evaluations can also be used to compare performance across countries, with different seed systems, experiencing different disasters and different levels of seed security. Meta-analyses generally focus on issues relating to the effectiveness of the approach itself.

This last type of evaluation is particularly significant and could be conducted as a 'strategic evaluation' looking at the totality of seed system interventions in a given area. The longer-term evaluations (both the impact and the meta- analyses) are not likely to take place unless they are required by donors and are given specific budgets by which they can be implemented.

Local seed/grain market functioning: issues for further research

The local seed/grain markets, as a subject of inquiry, have only recently been brought into focus. Research in the early 1990s, identified them as central for seed system security particularly for the poor: for instance, studies across three countries, DR Congo, Rwanda and Burundi, showed 25-80% of poor farmers routinely obtaining their seed from the market, while corresponding figures for the rich, were generally less than 20% (Sperling, 1993). As discussed earlier (section III, Table 3) there is also evidence to suggest that local markets are pivotal for farmer seed security in crisis periods.

The growing interest in local seed/grain markets has spurred a number of novel research projects, including a cross-country investigation by FAO on seed markets and crop diversity (FAO, 2004) and inquiries into how local seed/grain traders function, in East and Central Africa (Walker, 2004; Walsh *et al.*, 2004, West and Bengtsson, 2005). While full-fledged seed/grain market analysis remains beyond the scope of this paper, we briefly suggest key gaps areas, including: promoting greater understanding of seed/grain markets, analysing the effects of outside emergency interventions on market functioning, and testing of activities to strengthen seed/grain markets.

The functioning of seed/grain markets needs to better understood so as to assess normal and risky situations and to inform the design of interventions. Case evidence suggests that farmers discern seed from grain at market stalls (Sperling, 1993; McGuire, 2005) that select traders put on offer seed as distinct from grain (Longley *et al.*, 2001.), and that specialized seed production villages exist in some zones (CRS/Mali and partners, 2006). Increasing field data also suggests that seed shortages may be overestimated during crisis periods or simply misdiagnosed as a problem all together (Walker 2004; Walsh 2004; CRS/Mali and Partners, 2006). In normal and crisis periods, market assessments need to be undertaken by region and crop: what are the regional trade paths, quantities of supplies on offer, ranges of seed price fluctuation and types of seed quality differentiation.

The effects of outside seed aid on such markets demand particular attention. It has been claimed that both direct seed distribution and seed vouchers and fairs create a range of market-related distortions (Tripp and Rohrbach, 2001; Bramel and Remington, 2004; Rohrbach *et al.*, 2005). To-date, there is insufficient evidence against which these claims can be judged. One brief overview by CRS, across fourteen countries, showed considerable variation in price at their own seed fairs. For example: "In Uganda the seed price of groundnut and in Burundi the price of sunflower was lower than the market price, In Ethiopia, Tanzania and Uganda the seed price of sorghum was over 50% higher than the market price as was the seed price of maize in Uganda. In all other cases, the seed price ranged from 0 – 25% of the prevailing market price (Bramel *et al.*, 2004b). Note that the *effects* of the fairs on markets were not directly addressed, nor have parallel studies of direct seed distribution been located. Critical need to be addressed. Overall, in which ways and to what degree do different types of interventions affect the basic structure and operations of local seed./grain markets (including local production practices). More specifically, to what extent do such aid interventions drive price up during already stressed periods and how might this affect those *not.* receiving aid, as well as the recipients?

In parallel to research to improve understanding of local markets and the impacts of seed aid on them, interventions to strengthen local markets in support of seed security could be usefully tested. A range of activities merit testing and close evaluation-- depending on crop, region, and stress at hand. Providing credit to traders, or sharing in advance 'market intelligence' of future increased demand (due to aid issuance of vouchers or cash) could potentially allow traders to procure seed from more distant sources, and to maintain larger stocks than they would do otherwise. Incentives might also be put in place to encourage traders to procure better varieties and better quality seed, and even to improve the conditions of seed storage. The role such markets in moving new varieties more swiftly might also be explored (and help link relief to development efforts in direct ways) (Sperling and Remington 2006d).

VII. CONCLUSIONS

This paper has focused on issues relating to seed security and disaster, looking specifically at the types of aid given and their appropriateness in relation to our knowledge about what happens to seed systems in crisis. We have suggested a series of practical actions for matching the type of the response more closely to the actual problem, and several conclusions merit re-emphasis.

Direct seed distribution is unsuitable for many situations, including many in which it is currently being used. More market-based approaches, including use of vouchers or cash, which may be coupled with fairs, have wider application. These conclusions are supported by problem analysis and by evidence from the field that suggests that seed availability is rarely a prime constraint. The importance of informal seed/grain markets in underpinning seed security has also been highlighted, particularly through analysis of farmers' actual seed sources during crisis periods. Initiatives to actively support and strengthen such markets , during normal and stress times, need to be tested and evaluated.

Beyond recommending that a wider range of options be used in emergency contexts, we highlight that seed aid in general, might better be framed within a broad developmental context. Much of acute humanitarian response is delivery in what are chronically- stress contexts, More developmental-type seed aid (introducing new varieties, strengthening local seed quality) can address but a portion of the concerns. In many seed aid contexts, poverty eradication might better figure as *the* central goal of assistance.

Finally, we suggest a move away from automatic 'supplying seed aid by default'. More effective seed relief activities require proper seed system security assessments and systematic evaluation. Even emergency responses, which require quick action, can be implemented in such a way that learning and progressive refining of responses are promoted.

ENDNOTES

[i] Each of these terms has a particular nuance, and each is problematic. 'Informal' systems are not purely 'farmer' systems in that markets are important. Neither are they purely 'local' since both markets and exchange through social networks connect various localities. Finally, they are not 'traditional' in the strict sense, because they are constantly evolving.

[ii] Exceptions are the seed system and disaster analysis associated with the strong Hurricane Mitch which blew through Honduras in 1999 and catalysed seed relief (Haugen and Fowler, 2003) ; and recent follow-up studies from the Afghanistan seed relief, funded by the IDRC, Canada (ICARDA, 2005).

[iii] Recent analyses by CIAT across seven Africa countries, suggests that, for common beans, local seed/.grain markets prove the most important source for new, research-derived varieties. (Kalyebara and Andima, 2006).

[iv] Seed vouchers and fairs, as any response, can be deliberately distorted. For instance in Zimbabwe, they apparently have been implemented with an explicit bias. 'In many of the seed fairs, farmers were encouraged to first use their vouchers to purchase commercial maize seed. (Rohrbach *et al*. 2006:8). In such a context it is not surprising that the majority of revenues would go to external seed traders or companies.

[v] CRS has coupled formal seed testing with fairs in Ethiopia and found an average germination percentage of 89%. However, such testing proved an imperfect guarantee as farmers were subsequently less than satisfied with plant growth Bramel and Remington, 2005).

ACKNOWLEDGMENTS

The authors thank the Food and Agriculture Organization for supporting a comprehensive review of seed security and seed relief work. This article draws upon that review, which was reported in Sperling *et al*. (2004b). The authors would also like to acknowledge the important role of those donors who have been instrumental in calling for evaluation of seed aid work and in promoting subsequent refinement of practice in this area: Laura Powers, Julie March and Eric Witte of the United States Agency for International Development (Washington, D.C); and Wardie Leppan of the International Development Research Centre (Ottawa, Canada). Finally the comments of two anonymous reviewers helped to refine this work further.

REFERENCES

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

American Red Cross (2001) As drought, fires, floods, and revolution wreak havoc around the globe, the Red Cross mothers the world. http://www.redcross.org/museum/vmuseum/19201939c.htm

Anon. 1997., Monitoring of relief seed distribution 1997. Nairobi, Kenya: Ministry of Agriculture.

Anon, n.d., Thai/Cambodia border refugee camps 1975-1999, Information and documentation website, facilitated by Rowat Computer Group. http://www.websitesrcg.com/border/border-history-1.html

Berg, T, Bjoernstad, A., Fowler, C., and Kroeppa, T. (1991) *Technology Options and the Gene Struggle.* NORAGRIC Occasional Papers Series C, Development and Environment No. 8 *(*As: Agricultural University of Norway).

Bramel, P. and Remington, T. (2004) Relief seed assistance in Zimbabwe, in: L. Sperling, T. Remington, J.M. Haugen, J.M., and S. Nagoda (eds.), *Addressing Seed Security in Disaster Response: Linking Relief with Development* (Cali, Colombia: CIAT) , pp.159-179.

Bramel. P.J. Nagoda, S., Haugen, J.M., Adugna, Taye, D., Bekel, T. (2004a) Relief seed assistance in Ethiopia. in: L. Sperling, T. Remington, J.M. Haugen, J.M., and S. Nagoda (eds.) *Addressing Seed Security in Disaster Response: Linking Relief with Development* (Cali, Colombia: CIAT), pp.111-134.

Bramel, P. Remington, T. and McNeill, M. (eds) (2004b) *CRS Seed Vouchers & Fairs: Using Markets in Disaster Response*. September 21 - 26 Symposium, Lake Baringo Kenya, Nairobi: CRS.

Bramel, P.J., and Remington, T. (2005) CRS Seed Vouchers and Fairs: a meta-analysis of their use in Zimbabwe, Ethiopia and Gambia. Catholic Relief Services, East Africa Regional Office.

CRS. (2002) *Seed Vouchers and Fairs: a Manual for Seed-Based Agricultural Recovery in Africa.* Catholic Relief Services, developed in collaboration with International Crops Research Institute for the Semi-Arid Tropics and Overseas Development Institute. Nairobi, Kenya.

CRS/Kenya (2005) Strengthening input supply systems with demand subsidies in drought prone districts of eastern Kenya, project report, August 2005. Catholic Relief Services.

CRS/Sudan (2005) Rehabilitation/Recovery in West Darfur, Sudan, project report, November 2005. Catholic Relief Services.

CRS/Mali and Partners (2006) Seed system security assessment (SSSA) Douentza, northern Mali, March 2006. Final Report June 2006. CRS/Mali, Bamako.

Chemonics (1996) Seeds for disaster mitigation and recovery in the greater horn of Africa. Report prepared by Chemonics International and USDA Famine Mitigation Activity, USAID:. Washington, DC.

Cromwell, E. (1996) Governments, farmers' and seed in a changing Africa, Wallingford and London: CAB publications and Overseas Development Institute.

DANAGRO (1988) SADCC Reproduction and supply project, main report (vol 1A) and Country Reports (vol 2A-2J).

David, S. and Sperling, L. (1999) Improving technology delivery mechanisms: lessons from bean seed systems research in Eastern and Central Africa, *Agriculture and Human Values*, **6**:381-388.

Diakite, S. (2004) Recherche participative en selection: analyse d'un systeme semencier locale. in: L. Sperling, J. Lancon and M. Loosvelt (eds), *Participatory plant breeding and participatory plant genetic resource enhancement: an Africa-wide exchange of experiences*.(Cali, Colombia: PRGA Program), pp.311-317.

Dominguez, C., Gouveia, S., Cuna, J., Gasparini, S. and B.Hald (2004) Seed relief in Mozambique: review of recent interventions, in: L. Sperling, T. Osborn, and H.D. Cooper (eds.), *Towards effective and sustainable seed relief activities*, Report on the Workshop on Effective and Sustainable Seed Relief Activities, 26-28 May 2003, FAO Plant Production and Protection Paper 181, Rome: FAO, pp.77-82.

FAO (1998) Developing seed security strategies and programmes for food security in developing countries. in: *Proceedings of the International Workshop on Seed Security for Food Security* 30 November to 1 December, 1997. Florence, Italy, Rome: Food and Agriculture Organisation of the United Nations) pp. 187-200.

FAO (2002) Comparative financial analysis of the seed vouchers and fairs scheme. Rome, Italy, FAO

FAO (2003) Strengthening seed systems. Commission on Plant Genetic Resources for Food and Agriculture, Working Group on Plant Genetic Resources for Food and Agriculture Third Session, Rome 26-28 2005 CGRFA/WG-PGR 2/03/3, Rome, Italy: FAO.

FAO (2004) Using markets to promote the sustainable utilization of crop genetic resources, Conceptual Framework for an Economics Research Project, mimeo prepared by L. Lipper and L. Andersen. Rome, Italy: FAO

FAO (2005) FAO's initiatives for capacity building to support the utilization of plant genetic resources for food and agriculture through seed systems and plant breeding and genetic enhancement. Commission on Plant Genetic Resources for Food and Agriculture, Working Group on Plant Genetic Resources for Food and Agriculture Third Session, Rome 26-28 2005 CGRFA/WG-PGR 3/05/04, Rome, Italy: FAO.

Ferguson, M. (2003) Assessment of the impact of the 2000 floods on crop diversity in Mozambique. Final Report, September-December 2002. Nairobi: ICRISAT.

Gregg, B. (2005) Evaluation of OFDA Emergency Seed Relief Drought Response, Ethiopia 2003-04 Washington, D.C. Checchi/Louise Berger. Consultant Report prepared for USAID/OFDA.

Guerette, V., .Sidbide,A. Ouatara, M. and Grum, M. ms. Measuring the impacts of seed diversity fairs as a strategy to support on-farm conservation of plant genetic resources. IPGRI/IER/USC-Canada.

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

Haugen, J. and Fowler, C. (2003) Reassessing the need for emergency seed relief post-disaster: the case of Honduras after Hurricane Mitch. *The Journal of Humanitarian Assistance*, 6 February 2003 posting. (http://www.jha/ac/articles/a113.htm).

ICARDA (2005) Project on strengthening seed systems for food security in Afghanistan. Technical progress report (October 2004-March 2005) submitted to the International Development Research Centre by the International Centre for Agricultural Research in the Dry Areas, Aleppo, Syria.

ICRISAT/.INIA. (n.d.) Guidelines for planning local seed system interventions: Maputo: International Center for Research in the Semi-Arid Tropics and Instituto Nacional de Investigacao Agronima.

Integrated Regional Information Network (IRIN) 2006. Ethiopia: struggling to end food aid dependency. news bulletin February 7, 2006.

Jarvis, D., Myer, L., Klemick, H., Guarino, L., Smale, M. Brown, A.H.D, Sadiki, M., Sthapit, B., and Hodgkin, T. (2000) A training guide for *in situ* conservation on-farm. Rome: International Plant Genetic Resources Institute.

Jones, R., Bramel, P., Longley, C, and Remington, R. (2002) The need to look beyond the production and provision of relief seed: Experiences from Southern Sudan, *Disasters* **26 (**4):302-315.

Kalyebara, R. and Andima, D. (2006) The impact of improved bush beans in Africa. Report prepared for the Joint External Evaluation Program (JEEP). International Center for Tropical Agriculture, Kampala, Uganda.

Longley, C. (1997) Effects of war and displacement on local seed systems in northern Sierra Leone. In L. Sperling (ed.) *War and Crop Diversity*. AGREN Network Paper no.75. London: Overseas Development Institute, pp. 31-40.

Longley, C., Jones, R., Ahmed, M.H., and Audi, P. (2001) Seed sector study of southern Somalia: Final Report submitted to the EC Somalia Unit. London: Overseas Development Institute / ICRISAT.

Longley, C. and Sperling, L. eds. (2002) Beyond seed and tools: effective support to farmers in emergencies, D*isasters,* **26**(4), London: Overseas Development Institute.

Longley, C. (2006) Agricultural input vouchers in emergency programming: lessons from Ethiopia and Mozambique. HPG Background paper, London: Overseas Development Institute

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

Makokha, M., Omanga, P., Onyango, A., Otado, J., and Remington, T. (2004) Comparison of seed voucher & fairs and direct seed distribution: lessons learned in eastern Kenya and critical next steps: in Sperling, L., T. Remington, J.M. Haugen, and S. Nagoda, S. (eds.) *Addressing seed security in disaster response: linkin g relief with development.* Cali, Colombia: International Center for Tropical Agriculture, pp.45-68.

McGuire, S. (2001) Analyzing farmers' seed system: some conceptual components: in L. Sperling, ed., *Targeted Seed Aid and Seed-System Interventions: Strengthening Small farmer seed systems in East and Central Africa.* Proceedings of Workshop held in Kampala Uganda 21-24 (2000. Kampala: International Center for Tropical Agriculture, pp. 1-8.

McGuire, S (2005) Getting genes: rethinking seed system analysis and reform for sorghum in Ethiopia. Wageningen University Thesis.

Mburathi, G.K., Bultman, C., Matenge, F., and Ibrahim, O. (2004) Rethinking seed relief interventions: an Ethiopian case study, in: L. Sperling, T., Osborn, T. and H.D. Cooper (eds)., *Towards effective and sustainable seed relief activities,* Report on the Workshop on Effective and Sustainable Seed Relief Activities, 26-28 May 2003, FAO Plant Production and Protection Paper 181, Rome: FAO, pp.54-67.

Nathaniels, N.Q.R, and Mwijage, A. (2000) Seed fairs and the case of Marambo village, Nachingwea District, Tanzania: implications of local informal seed supply and variety development for research and extension. AgREN Network Paper no. 101, January 2000. London: Overseas Development Institute, Agricultural Research and Extension Network.

Otysula, R., Rachier, G., Ambitsi, N. Juma, R., Ndiya, C., Buruchara, R., and Sperling, L. (2004) The use of informal seed producer groups for moving root-rot resistant varieties during periods of acute stress, in. L. Sperling, T. Remington, J.M. Haugen and S. Nagoda,(eds) *Addressing seed security in disaster response: linking relief with development.* Cali, Colombia: International Center for Tropical Agriculture, pp. 69-90.

ODI (1996) Seed provision during and after emergencies. Good Practice Review 4: London: Overseas Development Institute, Seed and Biodiversity Programme.

Peppiatt D., Mitchell, J., and Holzmann, P (2003) Cash transfers in emergencies: evaluating benefits and assessing risks. Humanitarian Practice Network paper 35, London: Overseas Development Institute.

Phiri, M.A.R., Chirwa, R. and Haugen, J.M. (2004) A review of seed security strategies in Malawi, in Sperling, L., T. Remington, J.M. Haugen, and S. Nagoda, S. (eds.) *Addressing Seed Security in Disaster Response: Linking Relief with Development.* Cali, Colombia: International Center for Tropical Agriculture, pp. 134-158.

Remington, T. (1998) Increasing the effectiveness of emergency seed aid programs in enhancing seed security in the Greater Hon of Africa:: a project proposal. submitted to USAID/OFDA, Sept 9, 1998.

Remington, T. (2000) Seed security assessment interviews in eastern Kenya. Fieldnotes. CRS: Nairobi.

Remington, T., Maroko, J., Walsh, S., Omanga, P. and Charles, E. (2002) Getting of the seed and tools treadmill with CRS seed vouchers and fairs. *Disasters* **26**(4): 302-315.

Remington, T. (2004) How attitudes towards seed systems influence recovery seed approaches. Paper presented at the CARE/Norway Seed systems under Stress Workshop, March 2- 3, 2004. Agricultural University of Norway, As, Norway.

Richards, P. and Ruivenkamp, G. (1997) Seeds and survival: crop genetic resources in war and reconstruction in Africa. Rome: International Plant Genetic Resources Institute.

Richards, P. Bah, K., and Vincent, J. (2004) Social capital and survival: prospects for community-driven development in post-conflict Sierra Leone. Social Development Papers: Community-Driven Development; Conflict Prevention and Reconstruction. Paper No. 12/April 2004. Washington, D.C.: The World Bank.

Richards, P (2005) The history and future of African rice: what we can learn from observing rice farming in west Africa war zones. paper presented at AEGIS Conference, School of Oriental and Africa Studies, London, 29/6-2/7/05.

Rohrbach, D., Charters, R., and Nyagweta, J., (2004) Guidelines for Agricultural Relief Programs in Zimbabwe. Bulawayo: International Crops Research Institute for the Semi-Arid Tropics.

Rohrbach , D., Mashingaidze, A.B., and Mudhara, M. (2005) The distribution of relief seed and fertilizer in Zimbabwe, lessons derived from the 2003/04 season, Bulawayo, Zimbabwe: The International Centre for Research in the Semi-Arid Tropics.

Rohrbach, D., Mazvimavi, K., Pedzisa, T., and Musitini, T., (2006) A review of seed fair operations and impacts in Zimbabwe. Bulawayo, Zimbabwe: The International Centre for Research in the Semi-Arid Tropics.

Rubyogo, J. C. (2006) Genetic identity and health assessment of different seed grades and sources of two popular bean Varieties (Phaseolus vulgaris, L.) from Ethiopia using molecular techniques. MSc Thesis in Crop Improvement. University of Nottingham UK

Scheidegger, U.C. and Buruchara, R. (1991) Comparisons of seed quality, from bean seed obtained from range of formal and informal sources. in CIAT Annual Report, 1991: Cali, Colombia: CIAT, pp. 310-312.

Scowcroft, W.R. and Polak Scowcroft, C.E. (1997) Seed Security: Disaster Response and Strategic Planning, in *Proceedings of the International Workshop on Seed Security for Food Security,* 30 November to 1 December, 1997. Florence, Italy: FAO, 159-180**.**

Scurrah, M., Fernandez-Baca, E., Canto, R., Nunez, E. Olivera, and Zuniga, N. (1999) Learning about biodiversity in Peru. *ILEIA* **3-4:**36-27.

Sperling, L. (1993) Analysis of bean seed channels in the Great Lakes Region: south Kivu, Zaire; southern Rwanda, and select bean-growing areas of Burundi. CIAT: Africa Occasional Publication Series, No. 13.

Sperling, L. and Loevinsohn, M. (1993) The dynamics of improved bean varieties among small farmers in Rwanda, *Agricultural Systems* **41**:441-453.

Sperling, L. and Loevinsohn, M. (1996) *Using Diversity: Enhancing and Maintaining Genetic Resources on-Farm. Proceedings of a workshop held 19-21 June 1995*, New Delhi, India. New Delhi: International Development Research Centre.

Sperling, L. (1997) The effects of the Rwandan war on crop production and varietal diversity: a comparison of two crops. in, L. Sperling, ed. *War and Crop Diversity*. AGREN Network Paper no.75. London: Overseas Development Institute, pp. 19-30.

Sperling, L. (2000) Emergency seed aid in Kenya: a case study of lessons learned.. Report submitted to the United States Agency for International Development. Washington, D.C.

Sperling, L. ed. (2001) *Targeting seed aid and seed system interventions: Strengthening small farmer seed systems in East and Central Africa*. Proceedings of a Workshop, Kampala, Uganda, 21–24 June 2000. Kampala, Uganda: International Center for Tropical Agriculture, Kampala.

Sperling, L. (2002) Emergency seed aid in Kenya. some case study insights from lessons learned during the 1990s. *Disasters* **26**, 4, pp..283-287.

Sperling, L., Remington, T., Haugen, J.M., and Nagoda, S., eds. (2004a) *Addressing Seed Security in Disaster Response: Linking Relief with Development.* Cali, Colombia: International Center for Tropical Agriculture.

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

Sperling, L.and Remington, T. with Haugen, J.M. (2006). Seed aid for seed security: advice for practitioners. Practice Briefs 1-10. Rome, Italy, International Center for Tropical Agriculture and Catholic Relief Services.

2006a Using seed aid to give farmers access to seed of new varieties. Practice Brief No. 5
2006b Assessing seed system security. Practice Brief, No. 7
2006c The power of evaluation. Practice Brief No.9.
2006d Understanding seed systems used by small farmers in Africa: focus on markets. Practice Brief No. 6.

Tapia, M.E. and Rosa, A. (1993) Seed fairs in the Andes: a strategy for local conservation of plant genetic resources. in W. DeBoef, K. Amanor, K. Wellard and A. Bebbington, eds. *Cultivating knowledge: genetic diversity, farmer experimentation and crop research*. London: Intermediate Technology Publications, pp. 111-18.

Tripp, R., ed. (1997) New seed and old laws: regulatory reform and the diversification of national seed systems. London: Intermediary Technology Publications on behalf of the Overseas Development Institute.

Tripp R, and Rohrbach D. (2001) Policies for African seed enterprise development, *Food Policy* **26**(2):147-161.

van der Burg, J. (1998) Sustainable seed security: the need for a differentiated seed technology research and development approach. , in *Proceedings of the International Workshop on Seed Security for Food Security*, 30 November to 1 December, 1997. Florence, Italy:FAO, 43-50.

van Oosterhout, S. (1996) What does *in situ* conservation mean in the life of a small scale farmer? examples from Zimbabwe's communal areas. in, L. Sperling and M. Loevinsohn (eds). *Using Diversity: Enhancing and Maintaining Genetic Resources on Farm.* New Delhi, India: International Development Research Centre, pp.35-52.

Van der Steeg, R. P., Remington, T., Grum, M., and Kemigisha, K. (2004) Seed vouchers & Fairs and Agrobiodiveristy in Western Uganda. Pages 29 to 44 in Sperling, L., Remington, T., Haugen, J.M., and Nagoda, S., eds. (2004a) *Addressing Seed Security in Disaster Response: Linking Relief with Development.* Cali, Colombia: International Center for Tropical Agriculture.

Walker, S. (2004) Analysis of seed/grain marketing functioning in stress periods in Mbeere and Tharaka Districts October, 2004. KenAgri consultancy report commissioned by CIAT/CRS. Nairobi, Kenya.

Walsh, S., Bihizi, J.M., Droeven, C., Ngendahayo, B., Ndaoroheye, B., and Sperling, L. (2004) Drought, civil strife and seed vouchers and fairs: the role of the trader in the local seed system. In, Sperling, L., Remington, T., Haugen, J.M., and Nagoda, S., (eds.) *Addressing Seed Security in*

Disaster Response: Linking Relief with Development. Cali, Colombia: International Center for Tropical Agriculture, pp. 45-68.

West, J. and Bengtsson, F. (2005) The wider context of emergency seed vouchers and fairs. Master thesis, Development Studies, Management of Natural Resources and Sustainable Agriculture. As: Norwegian University of Life Sciences.