Routledge
Taylor & Francis Group

Article Proofs Cover Sheet

Manuscript Information			
Journal acronym	CDIP	Author name	Shawn Mcguire
Volume/Issue	21/4-5	Manuscript number	562485

AUTHOR: Please find attached a copy of the proofs of your article. These have been copy-edited and now require your attention. When reviewing your proofs you should:

- Answer all queries raised during the editing of your manuscript (see below).
- Check for any other factual corrections **(NB – only minor changes can be made at this stage; major revisions cannot be accepted)**.

All required corrections should be submitted using the CATS online corrections form. Once you have added ALL query answers and corrections, please press the SUBMIT button.

PLEASE NOTE THAT ONCE YOUR CORRECTIONS HAVE BEEN ADDED TO THE ARTICLE, IT WILL BE CONSIDERED READY FOR PUBLICATION.

QUERY NO.	QUERY DETAILS
General Query 1	As an author you are required to secure permission if you want to reproduce any copyrighted material in your article. For further details, please visit http://journalauthors.tandf.co.uk/preparation/permission.asp. Please confirm that: • permission has been sought and granted to reproduce the material **in both print and online editions of the journal**; and • any required acknowledgements have been included to reflect this.
General Query 2	Please confirm that affiliation details for all authors are present and correct. Please note that with the exception of typographical errors/missing information, we are unable to make changes to authors or affiliations. For clarification, please see http://journalauthors.tandf.co.uk/preparation/writing.asp
	No Queries

CDIP562485 Techset Composition Ltd, Salisbury, U.K. 3/16/2011

Development in Practice, Volume 21, Numbers 4–5, June 2011

Routledge
Taylor & Francis Group

The links between food security and seed security: facts and fiction that guide response

Shawn McGuire and Louise Sperling

The food-price crisis has led to assumptions that food-price rises are due to inadequate food production, and that such food insecurity is linked to seed insecurity. Hence, in response to high food prices, seed resources worth hundreds of millions of US dollars are being shipped into vulnerable farming systems across the world. This article examines the evidence for linking food security to seed security, particularly in acute contexts, and shows how the challenges facing security features of availability, access, and utilisation are markedly different when assessing food-security and seed-security scenarios. The need for sharper thinking about (a) seed-security strategy per se and (b) the causal links between food security and seed security raises questions about supply-side responses which may wrongly identify both the problem and the solution. The article closes by suggesting ways to refine seed-security goals which can provide more refined strategies for addressing food-security needs.

KEY WORDS: Globalisation; Labour and livelihoods

Introduction

The 'Food Price Crisis' of 2007–08 stimulated widespread donor action in the realm of agriculture. The initial magnitude of funding to support enhanced food-production initiatives was impressive: for instance, as of October 2008, the UN Task Force's Comprehensive Framework for Action had pledges for almost US$4 billion in aid from a cluster of organisations: the World Food Program (WFP), the Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), the World Bank, and the UN Office for Coordination of Humanitarian Affairs (OCHA) (CONCORD 2008).

The general recognition of a food-price crisis also quickly, and directly, translated to a perception that there was a seed-security crisis. Aid responses implicitly diagnosed the agricultural problem as one due to lack of improved seed (and fertiliser) use across a range of small farmer systems. After a June 2008 Food Crisis Summit, the UN FAO announced that it would provide 'seeds, fertilizers and other supplies to small farmers in 48 countries as part of an initiative to help vulnerable households cope with the impact of soaring food prices'. Similarly the Asian Development Bank (ADB) and the European Union (EU) pledged significant funds for seed and fertiliser for regions spanning across Asia and Africa. While it is difficult to give precise

ISSN 0961-4524 Print/ISSN 1364-9213 Online 4–50467-15 © 2011 Taylor & Francis
Routledge Publishing DOI: 10.1080/09614524.2011.562485

totals of seed and fertiliser supplies purchased and delivered to small farming systems globally in response to the crisis, figures from the input suppliers give a sense of the magnitude of purchase – with much of it tied to crisis aid. A review of financial reports of some of the largest seed/pesticide companies in the world showed 2008 profits increasing by 37 per cent to 120 per cent over those of 2007, and respective profits for fertiliser (again from key world-class companies) increasing from 131 per cent to 430 per cent over comparable 2007 figures (GRAIN 2009).

In brief, the food-price crisis led to a perceived agricultural input-related crisis, including a focus on perceived seed insecurity. The immediate responses were supply-driven, with emphasis on seed and fertiliser deliveries. This article examines more closely the possible links between food-security crisis and seed-security crisis.

How 'the crisis' treated the relationship between food security and seed security

It is not unusual for a food-security constraint to be linked automatically to the designation of a seed-security constraint. This is the current standard practice in both emergency assessment and in emergency choice of humanitarian response. Hence, the seed-related response triggers set off by a 'food crisis' designation might have been anticipated.

In terms of assessment, seed security has rarely been assessed in its own right (Sperling and McGuire 2010a). If there is a production drop, usually labelled a 'harvest failure', seed shortage is also assumed to result. For instance, Ethiopian guidelines state that 'seed aid should be dispensed' whenever crop production drops below 50 per cent of normal levels (Sperling *et al.* 2007). Also, commonly, seed-aid funding proposals have not needed to demonstrate actual seed needs, but rather simply cite 'drought' as the reason for an emergency intervention (for example, in an appeal for aid to seven countries in Southern Africa; ReliefWeb 2002). Only recently have specific seed-security assessment guides been developed (Sperling 2008).

This conflation of seed and food security is also commonly seen in emergency aid practice on the ground. The giving of food aid is a normal catalyst for the giving of seed aid, and the two are often donated as a package to the same set of beneficiaries. As food is the catalyst for action, many of the technical issues related to seed aid *per se* have not been subject to direct humanitarian examination (Sperling and McGuire 2010a).

While the 'food-price crisis' triggered an almost predictable response – to give seed – there were aspects which marked it as distinct from a 'normal' crisis. The scale of response for agricultural aid was unusually large (for example, the US$ 4 billion pledged quickly – and without precise planning). Also, the uniformity of response was of interest: across Africa and Asia alike, improved seeds and fertilisers were identified as an important panacea. Linked to this was an evolving rhetoric which moved from 'crisis or safety response' to forward-looking ideal agendas. This food-price crisis signalled the need for a 'Green Revolution' so as to double food production by 2030. The sub-theme was that agriculture in stressed countries should now follow the more Western models of intensive, higher inputs for homogeneous agricultural environments (Henschen 2009).

Reflecting on the links between food security and seed security

The assumption that food security and seed security are closely linked, and that an insecurity in one sphere unambiguously leads to insecurity in the other, on the surface seems logical. Seed is an essential input for agriculture, so seed insecurity undermines subsequent production. Further,

many poor farmers obtain most of their seed from local production or local market channels, so food insecurity arising from poor harvests or market failures could also make seed unavailable. To put it another way, closely linking seed and food insecurity assumes that a given factor – for example, drought, or price spikes in local markets – will affect both spheres in very similar ways.

This section explores more closely the interface between food security and seed security, in order to understand better how insecurity in one sphere may affect – and sometimes lead to – insecurity in the other. We start by examining definitions and the diagnostic frameworks most commonly used to assess seed and food insecurity. These frameworks are important, because they are used not only to specify the nature of any problem with food or seed, but also to determine (and justify) specific types of intervention.

Definitions of food and seed security

Definitions of food and seed security appear, superficially, quite similar. Two widely cited definitions, both from the FAO, are the following:

- **Food security: '***All people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.' – FAO, 2002* (State of Food Insecurity in the World, pp. 4–7).
- **Seed security: '***Farming households (men and women) [having] access to adequate quantities of quality seeds and plant materials of adapted varieties at all times – good and bad'* (FAO Seed and Plant Genetic Resources Service, 1998: 187).

These definitions highlight notions of universality, access, sufficient quantity, and appropriate quality. They also set out optimal situations (although Maxwell *et al.* (2008) argue that the food-security definition includes notions of vulnerability and coping with *insecurity).* As such, the above definitions are perhaps more useful for defining rights (for example,. FAO 2005; UN 2009) than for analysing possible gaps to security.

A second set of definitions, originating from the USAID food-security framework (1995), and applied to seed security (Remington *et al.*, 2002), is more useful as a diagnostic base. These definitions specify key parameters of food/seed security: *availability* (from production, trade, and transfers), *access* (entitlements), and *utilisation* (whether food/seed can meet users' particular needs). Webb and Rogers (2003) add a fourth element, risk, to highlight (food) insecurity, when households cannot limit threats to one of the above elements. In terms of seed security, we consider the element resilience below. Table 1 juxtaposes the food-security and seed-security frameworks.

Though similar, these parameters have subtly different meanings for food and seed security. Availability, the physical presence of food/seed in the area from any source or of any quality, is a constant concern for food, so its temporal aspect is not specified, but availability of seed is critical for defined periods around planting time. Entitlements (via production, markets, barter, gifts) shape access to both food and seed, although this may come through different means, involving different actors. Utilisation has two aspects for both food and seed security: (a) physical quality – suitability for use as food or seed (i.e. can it be eaten, or will it germinate?); and (b) more innate quality with respect to specific users – does the food/seed have the right characteristics to meet their preferences and needs (for example, food that is digestible and nutritious for specific groups such as children or the ill; crop varieties with traits that users want, which can perform in their local environments). For seed, these aspects have also been described in two sub-categories respectively as seed quality *per se* and variety quality (Sperling and McGuire 2010b).

Table 1: Food-security and seed-security frameworks

Parameter	Food security	Seed security
Availability	Sufficient quantity of food within reasonable proximity to people	Sufficient quantity of seed within reasonable proximity to people (spatial availability), and on offer in time for critical sowing periods (temporal availability).
Access	People have capacity to produce, or adequate resources to otherwise obtain food	People produce own seed, or have adequate resources to otherwise obtain seeds.
Utilisation	Households can use the food they have, which meets their needs (food processing, storage, nutrition, child care, health and sanitation practices)	Seed is of acceptable quality (seed health, physiological quality), and meets farmer needs (is adapted and aligned with farmer preferences)

Source: adapted from Remington *et al.* 2002; USAID 1995; Maxwell *et al.* 2008

Ideally, emergency practitioners would use the frameworks in Table 1 to diagnose problems and guide relevant interventions and support activities. For instance, food or seed would be directly supplied to address problems with availability, and cash or vouchers would be used to address issues of access. (Sperling *et al.* 2008). These frameworks are also a good starting point for exploring how food security and seed security relate to one another. Specifically, what evidence is there for a strong correlation for individual parameters of food and seed security? When could we expect a gap in a given parameter for food security to lead to a gap in that parameter for seed security (or *vice versa*)?

To simplify this exploration, we mainly consider drivers and processes operating within an agricultural setting directly related to crop production, seed supply, and local markets. While drivers and processes operating at the macro scale, such as market regulation, labour supply, seed policies, and urban demand, are also important, they are beyond the scope of this discussion. Also, as we are particularly interested in the immediate links between food and seed security, it is relevant to first-reflect on linkages in rural contexts. To frame the discussion, we also focus on linkages in a situation of *acute* (or transitory) stress. These are situations where a discrete event, such as a drought, flood, pest attack, or market shock, has affected security. Acute stress often affects a wide range of people, not only the poor. We concentrate on the acute because these are the perceived contexts most often used as catalysts for 'emergency or crisis response'.

Availability

Food security to seed security

As mentioned above, a frequent justification for giving seed aid directly is that a drop in crop production (which may affect food availability) translates directly to less (or no) seed for the following season. The reasoning goes that, with a drop, farmers cannot spare any harvest for their seed, or they may even eat their seed as a way of coping with hunger. However, field evidence shows that there is very weak correlation between acute food unavailability and seed unavailability as, for many crops, only a very small proportion of the harvest is needed to meet sowing needs for the following season. Modest harvest needs for seed are especially characteristic of cereals, which have high multiplication rates (for example, 1 to 100). As practical examples, only 3 per cent of the harvest is needed to sow pearl millet in northern Mali (CRS

and Partners 2006); for sorghum the figure is 2–5 per cent in eastern Ethiopia (McGuire 2007). Even for crops such as groundnuts, with high seeding rates (and low multiplications rates, for example, 1 to 6) the very poorest farmers, who achieve the smallest yields, may still need only 25 per cent of their harvest to sow for the following season in Zimbabwe (CIAT *et al.* 2009). Hence, for many crops, a very large drop in harvest (>90 per cent) would still potentially leave sufficient seed for future sowing – although if prices increase in local grain markets, there may be an impact on seed access (see below). As for the notion that food-insecure farmers consume seed stocks, this goes against accepted faming coping patterns, which aim to preserve core productive assets (Corbett 1988). Also diverse field studies give little evidence of widespread seed consumption, even after periods of sustained drought (for example, in Zimbabwe or Southern Sudan; CIAT *et al.* 2009; Jones *et al.* 2002). Given such field evidence, support for seed-protection rations (SPR) which gives extra supplies of food aid to specifically keep farmers from consuming their own seed stocks might be usefully reviewed.

Seed security to food security

Impacts of seed availability on food availability are also not the norm, as seed availability is generally not a problem, for the reasons cited above (Sperling *et al.* 2008; Remington *et al.* 2002). Clearly, seed is a vital input, but farmers' production and food security are likely to be affected more by ownership of assets (especially land), use of other inputs, or climate than by small fluctuations in seed availability. Household-level seed availability may constrain very poor households in high-stress environments, who use high seeding rates or multiple sowings to address risk, but seed is almost always available at wider scales (from other farmers, in markets). For example, even in cases of repeated seed distributions (five consecutive years or more), ostensibly to address gaps in seed availability, farmers have still obtained the majority of seed actually sowed from non-aid sources (McGuire and Sperling 2008). In fact, grain traders who have a truly long perspective and broad overview attest that seed is almost always available within reach of producers or markets, following even prolonged ecological stress or in war situations, for example, in Ethiopia and in Burundi – where distributions have been ongoing for over 20 seasons (Sperling and McGuire 2010b; Walsh *et al.* 2004). Problems of seed unavailability have been noted only in three distinct contexts: when there are massive wipe-outs of systems, as in tsunami-type disasters; when disease pressure makes local germplasm unsuitable for planting (for example, as when Cassava Mosaic Virus struck in East and Central Africa); or when populations are displaced from their normal farming sites (i.e. internally displaced persons). That being said, there are some reports of dietary shifts resulting from (temporary) unavailability of seed; for instance, bean seeds were more affected than maize after Hurricane Mitch in Honduras, so farmers temporarily switched consumption to maize (de Barbentane Nagoda and Fowler 2003). This may affect nutrition in the short run (i.e. utilisation), but probably not cause widespread food insecurity as a result. Thus, there is little evidence for consistent and strong correlations between food availability and seed availability (although, as we aim for realism, there are exceptional types of scenario).

Access

Food security to seed security

Many forces could limit access to food in rural settings. Besides decreased production, a loss of assets, diminished purchasing power, weakened social capital, and social marginalisation more generally all can contribute to an entitlement failure. These same forces also affect access to

seed, as many farmers seek off-farm seed through purchases, loans, gifts, or exchanges, to complement (or replace) seed from their own harvests. Direct correlations between food and seed access, at first glance, seem strong. For instance, price increases for grain on the market will also raise the price for seed purchases on local markets, and it stands to reason that farmers with weak financial entitlements to food will also have weak entitlements to seed. Seed systems are social systems; for marginalised groups, or situations where social capital is weak (for example, post-conflict), access to seed or related information can be constrained (Bellon 2004; McGuire 2008). However, the relatively small quantity of seed needed for most situations, in comparison with food needs, suggests that increasing prices pose less of an access problem for seed than for food – simply due to scale. Even where markets were not functioning well for food, as was the case following Hurricane Mitch in Honduras or the Rwandan genocide, farmers could still access small quantities of seed if they had the means to purchase it (Mainville 2003; Sperling 1997). Also, social safety nets – supply from neighbours and kin – are more likely to operate for seed, even when food exchange has dwindled due to stress, because quantities are small, and the exchange for seed is generally one-off.

Seed security to food security

Farmers who have weak access to seed may respond in a number of ways that affect food security. Where access to high-yielding varieties (such as F_1 hybrid maize in southern Africa) is low, farmers may switch to lower-yielding open-pollinated varieties, which affect production in the short term (although arguably stabilising it over several seasons). Coping strategies may also include lowering seeding rates, or decreasing area sown, although widespread use of these practices has not been well documented. Poor seed access to any given crop, however, may or may not affect food security overall, particularly as famers may switch to different crops, or livelihood activities, in response to poor seed access, without strong impacts on food security. Poor seed access may not, in itself, guarantee that a household falls into hunger. Access problems are primarily a poverty issue, something recognised through the increasing use of cash and voucher assistance in relief as well as safety net-related interventions (for example, WFP 2008).

Access to seed and access to food appear to be correlated, al though the depth and circumstances of this correlation have received little direct study. In particular, the possibility that social and financial access poses fewer problems for seed than for food remains a hypothesis for further examination.

Utilisation/quality

Food security to seed security

There appear to be fewer obvious linkages between food and seed security around this parameter, as the storage and handling of food is usually distinct from seed, and most of the characteristics that make food valuable to a user are distinct from those for seed. Grain stores of informal merchants can be important seed sources, particularly for the poor, and in times of stress (David and Sperling 1999; McGuire and Sperling 2008); where these are affected by storage pests or spoilage/disease, both seed and food security may be affected. However, farmers exercise agency when using local markets, and traders work to maintain quality of their stores, for seed as well as for food, often managing for variety purity as well as for physical quality (Sperling and McGuire 2010b). It would seem unlikely that utilisation problems in food would frequently cause problems for seed security – although, as above, more study is clearly needed.

Seed security to food security

It is often assumed that the health and physical quality (seed quality *per se*) of seed in local systems is poorer than formally certified seed, although evidence for this is patchy, at best. Farmers and seed/grain merchants use a range of techniques to maintain seed quality, which is relatively straightforward for cereal crops in drier areas (for example, Rubyogo *et al.* 2009). However, it is possible that in stress situations farmers sow seed that they know to be of inferior quality, as seen in India and Mali (Weltzien *et al.* 2001). Inferior seed quality can depress yields and reduce food availability.

A greater problem is variety quality: are seeds in acute crises known to farmers, with desired traits, and adapted to growing conditions? Again, there are reports of farmers using unfamiliar varieties, or suboptimal varieties, in response to stress, whether knowingly or not (ibid.). This may affect future production or earnings, and thus contribute to greater food insecurity. Emergency seed aid has at times itself supplied farmers with poorly adapted (or poorly germinating) seed, which also has clearly affected food production and food security (Sperling *et al.* 2007).

Poor variety quality appears to have a direct impact on food security, though less so in the other direction. Variety quality appears to be a greater issue in terms of utilisation, as this is more difficult for farmers (or traders) to manage, and can have more long-term impacts.

Summary

For contexts of acute stress, Figure 1 summarises the above exploration on the links between food security and seed security, at least as we know them to date. Rather than direct, strong, and two-directional links across the board (as current practice would lead us to believe), a more limited and subtle set of links seems to be emerging. The big link (suggested by a relatively wide arrow in Figure 1) seems to relate to access issues – which may crosscut food and seed issues. Here the stem problems, lack of purchasing power, broken social capital, or poorly functioning markets, may be common and have strong effects on both, although (we hypothesise) less so for seed, simply due to the magnitude of need. There are also a number of smaller links (narrower arrows), also seen in field evidence, which all extend from seed insecurity towards food insecurity. There is no evidence of important causal links from the food towards seed constraints, although this is the normal (near only) direction of assumed links between the two in emergency practice.

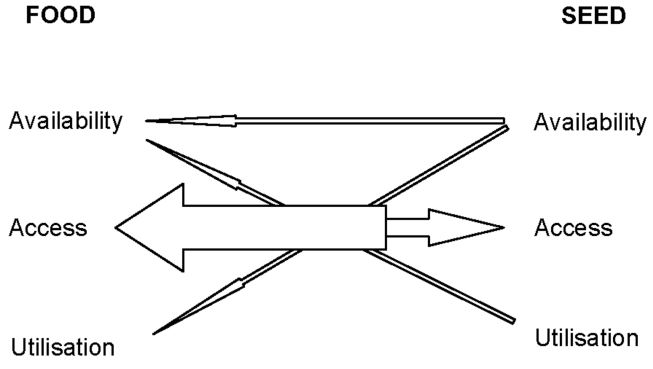

Figure 1: Schema of two-directional links between food security and seed security. The relative width of the arrow suggests the relative strength of the relationships.

A note on chronic stress: interrelationships between food and seed security

Chronic stress situations raise more complex analytical issues, as the challenges posed by chronic stress tend to be different from challenges posed by acute stress. Thus, the underlying causes and key constraints need careful definition. Clearly, chronic stress can have different causes, which often interact: for instance, long-running political crises, persistent ecological pressures such as repeated drought, or weakly developed institutions. Chronic stress is not simply the same as chronic poverty – which could be found in any situation – though it clearly overlaps with it (for example, in chronically stressed situations, most rural people may be very poor; Ellis 2008). Chronic food and seed insecurity links imply a different set of actors and greater range of potential responses than usually found in the emergency arena.

We offer some initial remarks in relation to situations of chronic ecological stress. In such contexts, little or no *seed availability* would seem unlikely. As long as there is some crop production, and markets are existing (i.e. there is at least some effective demand from some farmers), there should be seed available both on and off-farm – as the traders in Ethiopia and Burundi attested. However, availability of vegetatively propagated crops may be more constrained, as multiplication procedures can be more arduous, and dissemination of planting material remains quite local as a result. For instance, East Timorese farmers must seek sweet-potato cuttings from someone with irrigation who can maintain plants through the dry season. *Seed-access* channels may be constrained under chronic stress, but are unlikely to collapse entirely, due to the small quantities of seed required for most crops. Low effective demand in such chronically stressed situations may not stimulate really elaborate local markets (i.e. few signals to merchants to specialise in seed, with market institutions remaining generally weak), but poor farmers do continue to purchase seed (David and Sperling 1999). However, the poorest and most socially marginalised may have near-total entitlement failure, and thus lack access; this needs particular attention. *Seed quality* could be a particular issue in chronic stress situations where the varieties or crops are inappropriate for the farming (or market) situation, or cannot address newly emerging stress situations (such as the appearance of *Striga* in sorghum, or root rot in beans). Poor seed (variety) quality could reflect poor channels of access to new germplasm, or inadequate support from research and development. A more open question is: how does chronically poor seed quality affect farmers' agricultural activities? It is possible that these individuals in ecologically stressed areas may renew their seed less frequently, resort to lower-quality seed, or change crop profiles, but current evidence for these changes is scarce. Those who only use poor-quality seed in chronic stress situations will likely remain vulnerable, and may withdraw from farming altogether, if possible.

Clearly chronic stress situations – and their different root causes (political, ecological, economic) – raise important and potentially novel issues for an analysis of food and seed security. The inter-relationships between food and seed security merit further, intensive consideration. We refrain here from simply extrapolating from acute-crisis scenarios.

Linking the two positively: 'smarter' seed aid as a part of a coherent strategy to advance food-security objectives—even in times of acute stress

We now move to options for action. Better understanding of the links between food and seed security should lead to responses that are more targeted and ultimately more effective. Steps towards promoting understanding of the links have been small, and interactions have been

modest, but important. To make the best use of the positive effects of emergency aid, moving the joint analysis of food-seed security forward is key. We suggest actions in two distinct realms: (a) in the processes of assessment *per se*, and (b) in programming mutually reinforcing emergency actions.

Actions related to assessment per se

The review of our current understanding of the links between food and seed security should shape the way in which assessments are done in at least three ways:

1. Food-security assessment should no longer be used as proxies (implicitly or explicitly) for seed-security assessments. Food need does not translate to seed need. Donors, as the pivotal power point, should refuse to fund seed-aid efforts if only food security has been assessed.

2. *Punctual assessments of food and seed security might best be done as a unit.* Only by charting the two directly, in the same context, space, and time period, can we learn even more about useful reinforcing actions – and design more effective responses at the immediate point of analysis. Certainly the UN FAO/WFP system is moving towards more integrated, and technically accurate, analyses. Starting in 2010, the standard Crop and Food Supply Assessment Missions (CFSAMs) will work to incorporate a much more detailed seed-security checklist and seed-related data-gathering information system, to complement their already comprehensive food-security information-gathering procedures (S. Ahmed, FAO – personal communication, November 2009).

3. *Sharper seed-security assessments* per se *need to be promoted via a fundamental analysis of seed-system functioning.* Base analyses of seed systems – across a range of stress contexts (for example, in Ethiopia, eastern Congo, Zimbabwe, Afghanistan, Darfur, and Southern Sudan, to name a few) need to be effected. The veracity of quick, punctual assessments (such as the CFSAM) will only be as strong as their design; and their design, to hold any rigour, must shine considerable light into larger seed-system functioning. This includes, *inter alia*, understanding how formal and informal channels operate in a region, and by crop and season; which segments of the populations might normally use which channels; and how these channels are evolving, and might usefully evolve, through time.

So putting seed-security assessment on the agenda – in its own right – means that significant intellectual work and capacity building has to be programmed, and explicitly. Short-term checklist-type assessments will be useful here, but only investments in deep background analyses of seed systems will ensure that donors and practitioners understand what is really going on.

Actions related to more strategic seed-related assistance

Sharper understanding of seed security can also open up opportunities to programme 'smarter' actions which respond to a more refined understanding of food-security needs. There are multiple options, as yet insufficiently explored.

Much of the seed-security work to-date, especially in emergency or crisis periods, has focused on using a seed response solely to increase production (or to address the parameter of 'availability'). Hence, the food-price crisis response from 2007 until now has focused overwhelmingly on improved seed (invariably of a small number of crops and varieties) and fertiliser donations, even though prices for major crops as maize and wheat had reached pre-crisis levels by as early as December 2008 (UNCTAD, June 2009). Prevailing ideologies suggest intensive agriculture, which uses high external inputs, is the answer for solving food-production concerns.

However, seeing seed exclusively as a tool to drive gross production increases insufficiently reflects a 21st-century perspective of the needs of vulnerable people – especially those facing emergencies again and again, or chronic stress over years or even decades. For instance, in addition to quantity, food-security analysts very clearly emphasise need for quality (healthy, nutritional food), for securing continued access and averting risk (for example, Webb 2010). Other analysts warn of the need for new strategies for adapting to climate change (Howden *et al.* 2007). It might be wise for seed-security experts also to sharpen their vision.

Recent work on food assistance shows how a more refined understanding of food insecurity can translate into more finely targeted practice. For example, the WFP in the last few years has moved to more holistic food-related programming. Recognising that 'access' is often the key problem, WFP has promoted cash transfers and vouchers, as well as food stamps to allow vulnerable populations themselves to choose the range of foods that they may require (WFP 2008). Recognising again that 'access', including 'income generation', can be pivotal, the Purchase for Progress (P4P), launched in 2008, aims to use WFP's considerable purchasing power to connect small farmers to markets (including aid markets). Finally, plans are underway to distribute zinc- and iron-rich bean varieties as part of a food-aid package in Uganda (M. Nyagaya, personal communication), promoting nutrition (the food-security feature of 'utilisation') as well as food availability.

The seed-aid side has been less dynamic, with only modest progress in defining clearer goals – or responses intended to help to meet these goals. One important exception has been increased use of seed vouchers (and fairs) in emergency/recovery periods to address constraints of 'access' and promote local 'income generation'. Spearheaded by Catholic Relief Services (CRS) (Remington *et al.* 2002), vouchers are becoming a routine seed-aid response by a range of NGOs (for example, World Vision, Care) as well as by the big seed-aid implementer, the FAO. However, efforts explicitly to promote holistic goals such as system resilience, or enhanced nutrition, as but two examples, are sorely lacking from current emergency seed-aid policy. A narrow emphasis on overall production has resulted in sometimes misplaced action (for example, focus on a few 'improved' varieties) but, equally important, in *unexploited potential*. Seed aid, which might be best renamed 'seed assistance' or 'seed-security assistance', could potentially help farmers to face the challenges of climate change. Or seed aid could be designed explicitly to improve food quality. Moving seed aid towards a more holistic set of goals implies that the security features be stated, but also probably implies that seed assistance and food assistance be more consciously and 'strategically' linked (discussion below).

In terms of the former, targeting specific seed-security features, the current three – availability, access, and quality – seem insufficient to steer the types of tailored response currently needed. Table 2 presents a revised version. 'Resilience' is probably a security feature equal in weight to the other three. This implies that individuals as well as communities have a portfolio of options –and skills – on hand which allow them to respond to, adjust, and even have leverage on variable conditions. The security feature of 'utilisation' has been expanded to embrace the quality of the food produced from seed given, as well as the quality of the seed planted *per se*. The feature 'access' can probably stand as described in popular documents, but the description should include a dual emphasis on farmers 'getting access' through aid 'gifts' (cash and vouchers) in addition to initiatives which help farmers to generate income themselves, which also heightens their access, but in an active, rather than passive-recipient way. Information, also, is a powerful aspect of access which has been previously overlooked in standard frameworks. Information (for example, about variety traits) is important to enable farmers to make informed choices among crops and varieties, and also to manage well the planting materials eventually in hand.

Table 2: Seed Security Framework: *modified*

Parameter	Description
Availability	Sufficient quantity of seed within reasonable proximity to people (spatial availability) and on offer in time for critical sowing periods (temporal availability)
Access	People produce own seed, or have adequate resources to otherwise obtain seeds *— and relevant information*
Utilisation	Seed • is of acceptable seed quality (seed health, physiological quality) • is of acceptable variety quality (is adapted and aligned with farmers' preferences) *plus* • *produces food of higher quality per se (e. g. better inherent nutrition; or high income value)*
Resilience	*People have the knowledge, skills and planting materials to maintain a portfolio of farmer-appropriate seed quality and quantity*

Table 3 suggests some ways forward for strategically linking seed and food security, starting with seed-security goals that are more holistic than brute production. It suggests seed- assistance actions for the immediate crisis period, and for the medium term, to address these goals. Finally, it highlights key links to food security. These are suggestive examples, rather than a comprehensive agenda, to demonstrate the value of greater clarity on seed-security goals. More synthetic and systematically thinking (and programming) is critically needed.

Adaptation to climate change is a relevant goal for seed assistance, since crisis responses often relate to climate stress (for example, increased temperatures, drought), and are targeted

Table 3: Select, more specific seed-security goals, with examples of new elements of seed-security response

	Seed security goal		
	Adapt to stress/change	**Improve nutrition**	**Income generation**
Immediate actions (crisis)	• Heat- or drought-tolerant varieties • Varieties with high water-use efficiency • Provide options, allowing farmers to strategise • Schedule interventions to suit changed sowing periods	• Portfolio of crops/ varieties for nutrition as well as production stability • Seed of micronutrient-rich varieties • engage women more in planning and delivery in their role both as seed managers and family diet strategists	• Seed of high-value crops • Seed to support other livelihood activities (e.g. fodder, fibre crops) • Local procurement from traders/farmers • Strengthen relationships with traders for quick dissemination
Medium-term actions	Vouchers to provide index-linked insurance, as well as seed and other inputs	Support better local practices for seed storage	Develop partnerships through value chain to promote production and marketing activities that benefit poor groups
Food security links	Availability/resilience	Utilisation/access	Access/resilience

at locations and populations highly vulnerable to future climate change (ILRI 2006). Moreover, seed-related interventions can affect many seasons to come, potentially strengthening (or weakening) farmers' resilience and abilities to face future changes. Table 3 suggests ways in which emergency responses could redirect their hitherto production-oriented responses towards actions stabilising production in varying conditions – such as supplying varieties that still can produce under high temperatures or moisture stress. Allowing a choice of crops/varieties, and providing early information on any aid can help to build upon, rather than undermine, farmers' ability to strategise in managing uncertainty, so that fields and labour can be allotted (McGuire and Sperling 2008). Emergency workers often do not know about stress-tolerant varieties, or the details of coping strategies in small farming systems, whose 'agriculture is intensely local' (CCAFS 2009: 14). Such local and technical knowledge needs to become mainstreamed in emergency practice, which entails closer links between national R&D programmes, and with farmers. As an example of medium-term actions, practitioners could build upon current humanitarian experience with vouchers to provide insurance linked to a pre-agreed index (for example, rainfall; Ibarra and Skees 2007). These examples show, for instance, how improving utilisation in terms of seed security (variety quality) could strengthen food availability, and the resilience of food (and seed) systems in the face of uncertainty.

Seed aid can also be programmed to provide better nutrition as its goal. Recalling WFP's efforts to supply micronutrient-rich food aid, giving seed of such nutritionally enhanced crops and varieties may be an even more effective strategy in rural areas. Again, maximising farmers' choice in emergency responses could help, as could involving women more closely in the planning and delivery of assistance, to ensure that processing and consumption issues are well considered. Such efforts to enhance availability of or access to diverse types of nutrient-rich seed can strengthen access to and utilisation of food. Finally, seed aid could enhance incomes in a range of ways, by supplying seed which strengthens links to markets or other livelihood activities. Procurement from local producers, traders, or enterprises can also leverage local benefits. A medium-term agenda might explore how emergency responses could leverage markets to benefit poor groups (instead of undermining market function, as crude aid has done in the past); this would require emergency workers to learn much more about value chains. Although we know of no examples of such work in emergency seed aid, principles and approaches can be adapted from elsewhere (for example, Will 2008). Seed aid that can jump-start asset retention (or creation) can increase entitlements, and consequently strengthen access to food, and resilience to future shocks and stresses.

Achieving seed security can be but a tool for reaching a diverse range of goals, goals beyond brute production increases. However, any goal needs to be considered overtly. All too often, seed aid addresses tacit agendas (McGuire and Sperling 2008), so greater transparency about goals would be an important step forward and would facilitate more realistic assessments of impact. Moreover, goals such as adaptation to drought or heat stress, nutritional enhancement, or income generation have clear relevance for food security as well – although the strength and nature of any links between particular seed-security actions and aspects of food security need study. The suggestive examples in Table 3 need further development through practice, something that will require the building of skills and capacity within emergency practitioners to manage new agendas and partnerships.

Conclusions: reflections on responses to the food-price crisis

Initial seed-related responses to the price crisis were rather simplistic and reflected linear assumptions about how seed and food security were related. However, there is increasing

awareness that supply-driven seed aid poses a problem, particularly when actions are not based on on-the-ground assessments of needs. For instance, some donors, such as USAID's Office for Foreign Disaster Assistance, now refuse to fund seed aid without clear assessments justifying need; major implementers such as the FAO are moving away from blanket distributions of seed towards vouchers and other approaches, while major recipients, such as Ethiopia, are also starting to refuse seed aid without justification. These are welcome – albeit modest – changes in practice, although analytical approaches lag behind. This study has attempted to move this analysis forward, showing that causal links run mainly from seed security to food security, and most frequently around access. Better analysis of seed security – via rapid assessments and deeper analyses of seed systems – is needed, and can help to refine seed-assistance goals in order to address specific aspects of food security. The food-price crisis has heralded enormously increased donor interest in seed interventions. If this interest is to lead to long-term contributions to food security, then the links between seed security and food security need to be better understood, and intervention goals need to be more explicit and refined.

References

Bellon, M. R. (2004) 'Conceptualizing interventions to support on-farm genetic resource conservation', *World Development* 32 (1): 159–72.

CCAFS (2009) 'Climate, Agriculture and Food Security', A Strategy for Change', CGIAR Challenge Programe on Climate Change, Agriculture and Food Security, December 2009.

CIAT, CRS, World Vision, Care, ACRITEX, and CIMMYT (2009) 'Seed System Security Assessment, Zimbabwe', a study funded by the USAID, Office for Foreign Disaster Assistance; Rome: International Center for Tropical Agriculture.

CONCORD (2008) 'The Food Price Crisis: What Needs to be Done', European Food Security Group, October 2008.

Corbett, J. (1988) 'Famine and household coping strategies', *World Development* 16 (9): 1099–112.

CRS and Partners (2006) 'Seed System Security Assessment (SSSA), Douentza, Northern Mali', Bamako: CRS/Mali.

David, S. and L. Sperling (1999) 'Improving technology delivery mechanisms: lessons from bean seed systems research in Eastern and Central Africa', *Agriculture and Human Values* 16 (4): 381–8.

de Barbentane Nagoda, S. and C. Fowler (2003) 'Seed relief after Hurricane Mitch in Honduras: a critical analysis of institutional responses', *The Journal of Humanitarian Assistance*, 6 (February).

Ellis, F. (2008) ''We Are All Poor Here": Economic Difference, Social Divisiveness, and Targeting Cash Transfers in Sub-Saharan Africa', Social Protection for the Poor in Africa: Learning from Experience, Entebbe. <http://www.uea.ac.uk/dev/faculty/Ellis/fe-paper-sp-sept2008>.

FAO (2005) *Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security*, Rome: FAO.

FAO Seed and Plant Genetic Resources Service (1998) 'Developing seed security strategies and programmes for food security in developing countries', *Proceedings of the International Workshop on Seed Security for Food Security: Contributions for the development of seed security strategies in disaster-prone regions*, Florence, 30 November–1 December 1997.

GRAIN (2009) 'Corporations Are Still Making a Killing from Hunger', 22–23 April.

Henschen, H. (2009) 'Experts see food crisis unless agricultural aid focus shifts', Dow Jones Newswires, 24 February.

Howden, S. M., J-F. Soussana, F. Tubiello, N. Chhetri, M. Dunlop, and H. Meinke (2007) 'Adapting agriculture to climate change', *Proceedings of the National Academy of Science* 104: 19691–6.

Ibarra, H. and J. Skees (2007) 'Innovation in risk transfer for natural hazards impacting agriculture', *Environmental Hazards* 7: 62–9.

ILRI (2006) 'Mapping Out Climate Vulnerabilty and Poverty in Africa', Report to DfID. International Livestock Research Institute.

Jones, R. B., P. Bramel, C. Longley, and T. Remington (2002) 'The need to look beyond the production and provision of relief seed: experiences from Southern Sudan', *Disasters* 26 (4): 302–15.

Mainville, D. Y. (2003) 'Disasters and development in agricultural input markets: bean seed markets in Honduras after Hurricane Mitch', *Disasters* 27 (2).

Maxwell, D., K. Sadler, A. Sim, M. Mutonyi, R. Egan, and M. Webster (2008) 'Emergency Food Security Interventions', London: ODI.

McGuire, S. J. (2007) 'Vulnerability in farmer seed systems: farmer practices for coping with seed insecurity for sorghum in Eastern Ethiopia', *Economic Botany* 61 (3): 211–22.

McGuire, S. J. (2008) 'Securing access to seed: social relations and sorghum seed exchange in eastern Ethiopia', *Human Ecology* 36 (2): 217–29.

McGuire, S. J. and L. Sperling (2008) 'Leveraging farmers' strategies for coping with stress: seed aid in Ethiopia', *Global Environmental Change* 18 (4): 679–88.

ReliefWeb (2002) 'Millions struggling to survive Southern Africa drought', 6 September 2002, source: Australian Council for Overseas Aid.

Remington, T., J. Maroko, S. Walsh, P. Omanga, and E. Charles (2002) 'Getting off the seeds-and-tools treadmill with CRS seed vouchers and fairs', *Disasters* 26 (4): 316–28.

Rubyogo, J. C., M. Dickinson, S. Mayes, and T. Assefa (2009) 'Seed-health assessment of different bean seed grades and sources from Ethiopia using molecular tools', *Journal of New Seeds* 10 (4).

Sperling, L. (1997) 'War and crop diversity', in *AgREN Network Paper*, London: ODI.

Sperling, L. (2008) 'When Disaster Strikes: A Guide for Assessing Seed Security', Cali: CIAT.

Sperling, L., H. Cooper D., and T. Remington (2008) 'Moving towards more effective seed aid', *Journal of Development Studies* 44 (4): 586–612.

Sperling, L., A., S. Assefa, T. Assefa, S. McGuire J. Deressa, B. Amsalu, G. Negusse, A. Asfaw, W. Mulugeta, B. Dagne, G. Hailemariam, A. Tenaye, B. Teferra, C. Anchala, H. Admassu, H. Tsehaye, E. Geta, D. Dauro, and Y. Molla (2007) 'Long-Term Seed Aid in Ethiopia: Past, Present and Future Perspectives', Addis Ababa and Rome: EIAR, CIAT, and ODG.

Sperling, L. and S. J. McGuire (2010a) 'Persistent myths about emergency seed aid', *Food Policy*, (online 6 February 2010: doi: 10.1016/j.foodpol.2009.12.004).

Sperling, L. and S. J. McGuire (2010b) 'Understanding and strengthening informal seed markets', *Experimental Agriculture* 46 (2): 119–36.

UN (2009) 'Seed Policies and the Right to Food: Enhancing Agrobiodiversity and Encouraging Innovation', New York: Report from Special Rapporteur on the Right to Food to UN General Assembly.

USAID (1995) 'Food Aid for Food Security', policy paper', Washington, DC: Bureau for Programme and Policy Coordination, USAID.

Walsh, S., J-M. Bihizi, C. Droeven, B. Ngendahayo, B. Ndaboroheye, and L. Sperling (2004) 'Drought, civil strife, and seed vouchers & fairs: the role of the trader in the local seed system', *Addressing Seed Security in Disaster Response: Linking Relief with Development*, (eds L. Sperling, T. Remington, J. Haugen, and S. Nagoda), pp. 15–28, Cali: International Center for Tropical Agriculture.

Webb, P. (2010) 'Medium- to long-run implications of high food prices for global nutrition', *Journal of Nutrition* 140: 143S–147S.

Webb, P. and B. Rogers (2003) 'Addressing the "in" in Food Security', Washington, DC: USAID Office for Food for Peace.

Weltzien, E., T. Remington, L. Sperling, and S. De Barbentane Nagodaand others (2001) 'Seed system stress: initial thoughts on types and indicators', in *Targeted Seed Aid and Seed System Interventions: Strengthening Small Farmer Seed Systems in East and Central Africa*, pp. 85–7 (ed. L. Sperling), Proceedings of a workshop in Kampala, 21–24 June 2000: PRGA, CIAT, and IDRC.

WFP (2008) 'Vouchers and Cash Transfers as Food Assistance Instruments: Opportunities and Challenges', Rome: World Food Programme.

Will, M. (2008) 'Promoting Value Chains of Neglected and Underutilised Species for Pro-Poor Growth and Biodiversity Conservation', Guidelines and Good Practices, Rome: Global Facilitation Unit for Underutilised Species.

The authors

Shawn McGuire is a Senior Lecturer in Natural Resources, School of International Development, University of East Anglia. <S.Mcguire@uea.ac.uk>

Louise Sperling is Principal Scientist, International Center for Tropical Agriculture. <l.sperling@cgiar.org>