

The Role of Research Institutions in Seed-related Disaster Relief: Seeds of Hope Experiences in Rwanda

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The article describes the efforts of a coalition of agricultural research centres, Seeds of Hope (SOH) in the rebuilding of Rwanda, after the genocide and war of 1994. Research involvement in emergency relief and rehabilitation was unusual at the time and SOH had to forge its unique complementary role. Focusing on crop and variety development and conservation it: provided technical advice to relief agencies on seed procurement; used its baseline ken to assess the effects of war on seed diversity and seed security; made preparations to restore specific germplasm (which, fortunately, proved unnecessary) and spent substantial effort on rebuilding human resource capacity in research as well as basic scientific facilities. The involvement of SOH highlighted the critical, yet very different, roles for research during emergency versus rehabilitation periods and demonstrated the cost effectiveness of building in a diagnostic component — before massive seed or germplasm distributions are programmed.

Keywords: Rwanda, agricultural research centres, Seeds of Hope, war and varietal diversity, war and seed security.

Introduction

The article describes the efforts of a coalition of agricultural research centres in the rebuilding of Rwanda, after the genocide *and* war of 1994, during both emergency and rehabilitation phases of relief aid. At that time, such disaster-support efforts were ‘unusual’ for international and national agricultural research centres — and many of the activities — and lessons learned — came on a step-by-step basis. Since the Rwanda intervention, known as ‘Seeds of Hope’ (SOH), civil war, drought and even hurricanes have provided agricultural research institutes ample opportunity to test what might be their special roles in complementing the more standard emergency and relief bodies such as the UN agencies and a broad range of non-governmental organisations (NGOs). International agricultural research centres (IARCs) and national agricultural research

system (NARS) partners¹ have been involved in such relief efforts as ‘Seeds of Freedom’ (catalysed by the Angolan war); Seeds of Hope II (in response to Hurricane Mitch in Central America); and, at the time of writing, are launching a relief and development programme in Afghanistan. This article aims to share some of the lessons of SOH-Rwanda — and spur more general reflection on how research centres might usefully intervene in emergency and subsequent recovery situations.

Rwanda’s agricultural sector has long been the backbone of its economy, with 90 per cent of the population still living directly off the land. The agricultural sector has also long been highly stressed, due to, among other factors, high population density (445 people/km² of arable land), reduced land amount (average farm size of ≤ 1 ha) and declining productivity. It is probably not surprising that, as well as being landlocked and lacking vital mineral resources, Rwanda has one of the world’s lowest per capita incomes (US\$286 pa) (Sperling and Berkowitz, 1994).

This dependence on small farmer agriculture and the state of enduring poverty has made Rwanda a prime location for research and development (R&D) organisations aiming to improve the lot of African farmers. For almost 15 years before the 1994 genocide, collaborative efforts between the national agricultural research institute, the Institut des Sciences Agronomiques du Rwanda (ISAR), and a number of IARCs (six have had staff based in Rwanda) had resulted in considerable R&D progress, including the development of higher yielding plant varieties, agro-forestry manures and integrated pest-management techniques. Further, with its focus on crop improvement and germplasm conservation, the IARCs, NARSs and partners had conducted extensive work on five of Rwanda’s principal crops — including beans, sweet potatoes, cassava, sorghum and maize.

Part of IARC’s and NARS’s perceived strengths at the time of the acute disaster (1994) lay in their access to important international sources of crop-breeding materials (potential new varieties) and local germplasm collections. However, after one and a half decades in the field, the research institutes equally had substantial insights into the complexities of Rwanda’s agricultural production systems and the considerable skills of Rwandan men and women farmers. For example, one IARC, the International Centre for Tropical Agriculture (CIAT), had documented how Rwandans managed their bean variety mixtures, consisting of up to 30 distinct components, tailoring these mixes to different inter-cropping conditions, soils, seasons, purposes or needs (Voss, 1992; Sperling et al., 1993). Such research institutes wanted to encourage the survival of these systems and of researchers’ understanding of how they functioned, as well as the application of both their own and farmers’ skills that appeared well adapted to stress.

The war and its ‘posited’ short-term agricultural effects

In April 1994, the death of the Rwandan president in a plane crash near the capital Kigali sparked a civil war and genocide considered to be one of the worst in history. It resulted in the death of about 800,000 people and internal displacement and flight of another two million, particularly to neighbouring countries. The most intensive phase of the war unrolled during the main February–June growing season (Rwanda has two main seasons; the other is October–December) and lasted for nearly four months.

Having started mid-season, the civil war was presumed to have disrupted and even devastated agricultural production, with projections that less than 30 per cent of

crops planted would be harvested (MINAGRI/UNREO/PNUD/FAO, 1994a). As a consequence, SOH (and other potential aid givers) reflected on a number of scenarios. Little harvest from that season's crop and eating up the scant harvest could result in serious food deficits. Similarly, the situation might spur a lack or insufficiency of seed for the following season (October–December 1994). Third, displacement and harvest loss could be linked to a potential loss of a wealth of local varieties, including stocks of some 600 bean varieties, known to be the most diverse collection in active use by farmers anywhere in the world. Fourth, the death, flight or displacement of farmers, researchers and extension workers probably had led to some loss of local and external technical knowledge and insights into the complexity of crop production in Rwanda — and it was not clear that relief agencies and NGOs assisting in the restoration of food security (mostly foreign and with little prior Rwandan experience) could easily recoup this critical knowledge. Focusing specifically on what they might offer, research institutes (IARCs and neighbouring NARSSs) feared that the loss of a large body of research insights, including specific breeding trials and materials (adapted, acceptable and resistant to various constraints) would disrupt and reverse a research agenda which had been many years in the making. They also pondered the likely negative consequences of indiscriminate introduction through 'seed aid' of non- or poorly adapted germplasm — which might possibly destabilise farmer systems.

Formation and broad aims of the SOH initiative

The SOH initiative, launched in 1995, was a unique consortium of partners which included NARSSs and IARCs of the Consultative Group of International Agricultural Research (CGIAR).^{2,3} Within and beyond Rwanda, it was a somewhat unconventional intervener in emergency relief, being composed and headed by institutions with primarily research mandates. Given their decade and more of history in Rwandan laboratories, field stations and fields, SOH's in-depth perspective and experience of Rwandan agriculture were considered to be assets in guiding select efforts of relief agencies. Many of the institutes also had baseline information against which functions of agricultural systems or processes could be assessed.⁴ Further, some had good although small collections of Rwandan germplasm in their genebanks. Potential loss of diversity of germplasm of certain crops was a great concern to SOH. Such diversity (particularly in beans and sorghum) was key, both to farmers as a risk-aversion strategy against variable constraints and to the world community committed to safeguarding this rich genetic heritage.

The SOH consortium initially set itself four practical aims, all tightly allied to its members' role as research centres and ones focusing particularly on crop and variety development and conservation. First, it sought to provide technical advice to inter-governmental relief agencies and NGOs concerned with immediate procurement of adapted varieties. Second, given its baseline information and extensive technical local insight, SOH aimed to analyse the impact of war on crop variety diversity and seed security more generally and to assess the possible need for restoration of specific germplasm and crops. Following this, as a third aim if necessary, SOH was prepared to facilitate the reintroduction of seed and planting materials of crop varieties and farmers' indigenous germplasm (landraces) to the Rwandan environment. Finally,

Box 1 Rwanda Seeds of Hope: overview of activities*Emergency period*

- Assist NGOs in sourcing relief seed
- Multiply crop landraces and key improved varietal materials for possible reintroduction
- Assess impact of relief seed aid
- Broad diagnosis: effects of war on agriculture
- Specific diagnoses: varietal and genetic inventories to compare pre- and post-war crop diversity

Development/rehabilitation period

- Restore germplasm collections and active breeding material to NARSSs
- Help to rebuild more formal seed multiplication capacity, through NGOs and farmer groups
- Train new cadre of national scientists in on-station and on-farm research
- Assist in re-establishing scientific facilities (e.g., laboratories, cold chests)

once assistance entered a development phase, SOH was ready to help in rebuilding both human resource capacity in research (through training) and basic scientific facilities. How these aims eventually translated into specific activities is outlined in Box 1.

Emergency phase: provision of technical information on variety sourcing and targeting

The actions and contributions made by SOH varied with the evolution of the situation and activities in post-war Rwanda. This research consortium had a range of roles, albeit very different ones during both the emergency and rehabilitation phases (see Box 1). Here we discuss selected activities at greater length.

Within two months of the ending of the war and genocide, several NGOs and relief agencies had offered to acquire, package, transport and distribute planting materials (to anticipate the August/September planting). Seed aid transfers in the recent past in Rwanda had had a tendency to rely on exogenous genetic material of dubious adaptation. So, for instance, in August/September 1993, eight months before the central conflict, the NGO CARE had distributed bean seed to Rwandan farmers and moved only two varieties, not particularly adapted, one for high and one for low altitude (M. Campbell, CARE, pers. comm.). SOH suspected that by working with organisations such as CARE, a more farmer-sensitive seed-aid strategy could emerge.

A coordinated weekly ‘seed meeting’ forum among NGOs regularly reviewed seed needs and developed guidelines on responses. SOH participated in these meetings and provided essential advice and information to guide NGOs and relief agencies to acquire, target and distribute seed of adapted varieties. Key advice and actions included:

- Development and distribution of 1–2 page technical bulletins (beans (CIAT, 1994), maize and sorghum) which summarised particular crop-specific development issues within Rwanda.

- Development of ‘seed source maps’ which would assist relief agencies and NGOs in purchasing appropriate varieties from outside Rwanda but within the nearby region. These simple maps suggested local sourcing for materials (including from markets which farmers routinely used as well as small seed companies) and showed how regions just outside Rwanda (the borders of Uganda, Tanzania and Burundi) could provide adapted materials targeted to comparable regions just inside borders.
- Emphasis on the significance and the need for relief agencies and NGOs to encourage conservation of remaining indigenous seed stocks by giving food aid quickly and very widely.

At the time, it was novel for relief organisations to consider procuring seed from local markets — and even more unusual for them to acquire mixtures of varieties for crops such as bean and sorghum that would enable the product to keep as close as possible to what farmers normally use. Unique among the NGOs, Médecins Sans Frontières distributed four different bean mixes in the southern prefecture of Butare (three from Uganda and one from Burundi), in order to try to target different micro-niches.

Farmer evaluations showed the wisdom of distributing mixtures. Even in cases when the full aid mixture was not appreciated, farmers were able to select out varieties which later performed well (SOH Assessment Report 10).

Yield data also clearly showed the effectiveness of trying to target varieties. In one example, the sorghum varieties brought in from south-west Uganda (purchased by the Ugandan National Agricultural Research Organisation in collaboration with the International Crops Research Institute for the Semi-arid Tropics (ICRISAT)) performed significantly better at higher altitudes than some other aid varieties which were moved from lower to higher altitudes within Rwanda (about 3,200kg/ha versus 1,400kg/ha, respectively) (SOH Assessment Report 7).

In terms of food aid, massive amounts were distributed in Rwanda within just two to three months of the ending of the genocide.⁵ This swift aid response by the international community was probably the single most important factor in allowing farmers to save their own adapted seed stocks. The quick restoration of relative political security for those who remained was also critical: farmers sensed that what they would sow in September 1994 would indeed be harvested — so they were willing to continue agricultural activity. Thus, in this first post-war agricultural season, an impressive 45 per cent of the bean seed sown came from farmers’ own stocks, with 62 per cent of farmers drawing at least a portion of their seed from home stores. For maize, parallel figures were 25 per cent of the seed sown and 41 per cent of farmers (these maize figures are lower because the sample included farmers who do not normally sow it but took advantage of the aid). In addition to sowing a portion of the aid seed, farmers often mentioned that eating or selling the seed relief supplies allowed them to keep for sowing their own locally adapted varietal and seed materials (SOH Assessment Documents 1, 2, 6 and 7).

Increase, reintroduction and distribution of crop variety diversity to intermediaries

Right from the beginning, it seemed likely that for some crops, commercial varieties not really suitable for Rwanda (and Rwandan farmers) could, and would be, introduced

from neighbouring countries and elsewhere as a temporary measure. Anticipating this approach, SOH decided to increase materials adapted to specific Rwandan zones rapidly, so as to provide the initial spurt to replace less-appropriate ones. The strategy was to increase such seed and planting materials initially in neighbouring countries (mainly Tanzania and Uganda) and then to reintroduce germplasm for further increase and more extensive seed distribution inside the country. After identifying the types and sources of seed and planting materials, SOH partners accessed reserve stocks consisting of Rwanda landraces, advanced lines, improved germplasm and varieties that had previously been in diffusion or released in Rwanda. Many of these materials had previously been sent by Rwanda to neighbouring countries wishing to test them, and the regional research networks (clusters of neighbouring countries working together on complementary research themes) that had catalysed the original sharing of germplasm now assisted in its return. Starting with small reserve stocks of target crops, seed increases were made by many institutional actors including international and national research institutions and contract farmers. Seed was reintroduced for further increase by NGOs, ISAR and Service Semences Selectionnées and then programmed for distribution by NGOs.

A total of 1.5 tons of bean seed, consisting of more than 275 different genetic lines, were multiplied and introduced to Rwanda for further increase and distribution. Seven tons of sorghum seed of three Rwandan varieties adapted to the three major agro-ecologies (low, medium and high elevation) and 152 tons of three main adapted varieties of maize were multiplied and introduced into Rwanda and distributed by NGOs. Twenty tons of elite, pre-basic and basic seed (the foundation seed stocks used to ensure certified, clean seed) consisting of three major and five minor varieties of Irish potatoes were produced in Kenya and Uganda and transported into Rwanda for further seed increase and distribution. Over 15 varieties of cassava common to Rwanda and identified in neighbouring areas of Uganda and Tanzania were also multiplied in both countries near the border (although, unfortunately, plant health concerns about transmission of the African cassava mosaic virus delayed the delivery of cassava cuttings for many seasons).

Major players for the in-country multiplication of seed and planting materials introduced by SOH were Service Semences Selectionnées, World Food Programme and some NGOs notably World Vision International and CARE in collaboration with SOH. The latter continued giving technical support on agronomic characteristics of varieties, crop-protection aspects and the targeting of the varieties for years after the initial seed supplies had been delivered.

This multiplication of a very large range of key varieties — across four of the main crops used in Rwanda — was a forward-looking and precautionary measure done as a ‘service’ by the IARCs and NARSs with long years of association with Rwandan institutes and farmers. As shown below, the measure proved very important for some crops (for which key seed was indeed scarce) but less important for others.

Intensive varietal and genetic assessments and focused evaluations of ‘seed aid’

From the beginning, SOH built in an ongoing diagnostic process, which at once monitored a rapidly changing situation, evaluated activities quickly completed (such as seed distributions) and helped to steer the next steps of an ‘agenda for action’. Given

its novel involvement, SOH felt it had to learn more about the efficacy of its own strategies, as well as those promoted by other agencies.

For the first two seasons of the emergency period, SOH focused on evaluating seed-aid distributions in specific zones of action. This was both for reasons of efficiency (to find out quickly what was working) and expediency (landmines, suspicions and fear made it difficult to move more widely and ask questions). As the introduction of massive amounts of aid material also had the potential to alter significantly the stability of the local agricultural systems, SOH needed to analyse whether the seed was sown, was adapted and was valued by farmers, as well as how seed relief was incorporated into farmers' routine farm management. Such evaluations proved very useful for NGO collaborators, but also were later to double as baseline information on seed stocks, the functioning of seed systems and major constraints at a critical moment in the emergency period — the beginning of the first post-war season, when official government seed channels had yet to coalesce.

In the third post-war season, September 1995 to January 1996, SOH guided the first intensive agricultural surveys; this was the first time stability was sufficient to allow for a nation-wide, spatially extensive sample. In-depth interviews were conducted in two-thirds of Rwandan communes (90 of the 144 total), with the research on potatoes, beans, sorghum and cassava covering some 1,200 households. The sample size and distribution were comparable to that formerly used by the Ministry of Agriculture's Department of Agricultural Statistics — and facilitated pre- and post-war comparisons. The sample was also geographically extensive to be able to capture micro-variations in effects of the war across small spatial distances. While genetic resource assessments, in particular, often focus on the diversity of germplasm found nation-wide or across a large eco-agricultural zone, SOH focused on what farmers in different zones could actually access. If one is concerned with production stability and agricultural productivity, increasing attention has to be given to this micro-distribution of germplasm and how farmers value its adequacy.

The findings very much surprised SOH practitioners. Briefly, there was no significant local germplasm loss across a range of crops (including the diversity-remarkable beans and sorghum). Farmers sometimes had problems accessing specific local varieties (maybe one or two out of 20) but their constraints were economic — that is, not enough cash for purchase — rather than lack of availability. Local varieties remained available in part because of the pattern of the war, which was highly scattered, with about one-third of farmers in most zones not moving at all (Sperling, 1997). However, the main reason for enduring varietal diversity lay in the continued functioning of the local seed channels. Most Rwandan farmers re-supply local materials from small local markets, which continued to operate at some level throughout.⁶

It is interesting to note that analyses in other war scenarios parallel this 'counter-intuitive' Rwandan finding. While loss of germplasm is widely speculated where there is civil strife — in Somalia (Longley et al., 2001), Sudan (Jones et al., 2001) and Eritrea (P. Bramel, pers. comm.) focused assessments have shown local germplasm and seed channels have to be much more robustly resilient than expected.

The Rwanda diagnostic analyses, however, did reveal important constraints but in unexpected quarters. Varieties and seed coming through 'formal' channels indeed were both hard to access and scarcely available. For bean varieties distributed since about 1990, farmers had counted on outside channels for restocking, for example through development projects, NGOs or other formal sources. This was particularly the case for many improved climbing beans — which proved very hard to restock post-

war (SOH Assessment Document 8). The problem with potato seed was even more acute. The three basic varieties grown country-wide were available, but the quality of tubers on the market had long deteriorated. Pre-war, much of the production of ‘clean’ potato seed had been centralised — either in the national research programme in the northern Ruhengeri area (which was heavily subsidised) or in specific development projects supported by outside funding. Both these sources collapsed during the early seasons of the conflict (1991–3), along with supplies of fungicide and fertiliser. The results were serious: by late 1994, just post-genocide, production was dramatically cut for two-thirds of Rwanda’s potato farmers (SOH Assessment document 9).⁷

In sum, varietal and seed recovery partially depended on how farmers accessed varieties in the first place. Those varieties normally distributed through local channels again began to move through local channels. Those allied to the formal seed sector were harder to restock, owing to problems in both availability and access. These diagnoses — often considered a ‘luxury’ during emergency periods — helped SOH focus its energies on the more pressing problems (such as producing clean potato seed).

Rehabilitation phase

Right from the beginning the contribution of SOH had a strong rehabilitation element built into its strategy and activities. This was key in enabling the national agricultural research institute, ISAR, to re-establish itself and play its role more fully in developing and adapting agricultural technologies — including those related to post-war constraints. In contributing towards this, SOH specifically made contributions in the following areas.

Re-establishment of research activities

SOH partners had a particular edge: because they had been there before, and for so long. As stated by Hubert Zandstra, director-general of the International Potato Centre (CIP): ‘The Seeds of Hope Initiative ... was only possible because several CGIAR centres, including CIP, had worked on research projects for several years. That knowledge and expertise acquired on crop production and variety adaptation was crucial in re-establishing agriculture and, eventually, food security. It also prevented a complete loss of research gains’ (www.cipotato.org/market/Ars/Ar98/Desast.htm).

A number of particular efforts contributed towards re-establishment of research activities. We highlight here some germplasm-related issues.

Inventories were quickly made of germplasm either saved or not destroyed across ISAR’s research stations. This was possible partly because of the efforts of the survivors themselves. For example, in a nothing-less-than-heroic move, one Rwandan field assistant, Alexis Rumaziminsi, had maintained field trials in the midst of chaos that engulfed the country and successfully harvested and stored the bean-breeding nurseries in the highland station at Rwerere. Similarly, the inventories of the seed stock at the Tree Seed Centre done by ICRAF and its associated agro-forestry network, AFRENA, helped to guide additional collection and storage activities. SOH supplemented these in-country inventories with information — and stocks gathered over the years by regional research networks.

Using both reintroduced and recovered germplasm, SOH subsequently supported multiplication and evaluation of these materials in breeding and related nurseries. The handful of technicians who had survived the genocide or not fled was instrumental in providing continuity to these efforts. World Vision International gave unique initial financial and logistical support to the research trials.

Third, while conducting the socio-economic surveys and in an effort to compare pre- and post-war germplasm diversity, an extensive collection was made of Rwandan bean landraces. Under the SOH, the collection consisting of about 1,260 entries was characterised for agronomic characteristics, and resistance to major bean diseases such as angular leaf spot and root rot in neighbouring Uganda, and on the basis of molecular techniques and compared to previous smaller collections kept at CIAT genebank in Cali, Colombia. The collection was conserved using a simple low-moisture silica gel method and has been since returned to Rwanda for further characterisation and subsequent use.

However, by far the most important contribution made by SOH partners was in the backstopping of the new scientists of the rejuvenated ISAR in re-establishing research activities. This support for a new cadre of scientists, catalysed during the immediate post-war period, still continues some seven years later and is explored below.

Training

One of the major impacts of genocide and war was on human resources. The vast majority of scientists and technicians who worked in ISAR and the Ministry of Agriculture (MINAGRI) before the war were either killed or had fled during the war, becoming refugees outside Rwanda. The newly recruited scientists and technicians were generally young or inexperienced, with some that had never set foot in Rwanda before or returned after many years of absence. This resulted in a sudden decline in institutional memory and momentum in agricultural research in Rwanda. The pre-war collaboration of a number of SOH partners with ISAR, particularly the IARCs that were based in Rwanda together with the regional research networks, thus proved to be a form of insurance for ISAR — and for Rwanda. Most ‘foreign’ staff (whether from other countries in Africa, Europe or the US) had worked closely and knew well the activities of the different crops and natural resource management programmes: they could offer guidance, help restart still-relevant research activities, and suggest gaps or opportunities posed by the changing circumstances. Training many of the new staff, and so equip them with basic tools to initiate certain aspects of research, seemed a priority. In response, SOH partners developed and offered numerous and varied training programmes. Some sessions were quite fundamental: on basic research methods, seed production (particularly for tubers), statistical analyses, socio-economic surveys, on-farm and participatory research and technology dissemination strategies. Others were more specialised: training new technical staff in evaluation techniques; selection criteria; and initiation of new breeding activities.

Such training was offered either by a single or number of IARCs or in collaboration with other NARSS and the commodity research networks of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). These training arrangements, until then unusual institutional couplings, were facilitated and coordinated by SOH. In addition, several IARCs and NARSS offered ISAR researchers specialised individual training opportunities at their own

institutions (in Colombia, Peru, Uganda, India and Kenya) and today a number of new Rwandan researchers are already on their way to post-graduate degrees (for example, breeding, soil science, biometrics and agro-forestry). Importantly, being a member of ASARECA, ISAR was also offered preferential support in training organised by the ASARECA commodity networks. Finally, SOH partners made frequent visits to support and guide ISAR scientists ‘in the field’, that is, in farmer communities, to plan and carry out research activities.

Today, seven years later, this research is now handled by ISAR or involves ISAR working jointly with SOH partners. SOH support — through its member IARCs, networks and evolving frameworks — continued beyond the project phase, still continues and has been instrumental in a modest way in developing human capacity at ISAR.

Re-establishment of facilities and infrastructure capacity

As elsewhere, another effect of the civil war in Rwanda was looting and widespread destruction of property. Buildings (doors, windows, electrical outlets, sinks, benches) in many ISAR stations and particularly at its headquarters at Rubona were extensively damaged. All movable equipment (computers, refrigerators, office facilities) were either looted or wantonly damaged past the point of repair. Loss of vehicles and telecommunications equipment made it very difficult for ISAR and its research stations to function properly and infrastructure rehabilitation was therefore needed.

Budget constraints meant that the contribution of SOH to the rehabilitation of infrastructure was modest. In consultation with ISAR, priority areas identified and supported by SOH included the rehabilitation of the tissue-culture laboratory at Ruhengeri, greenhouse facilities at Rubona, the tree centre in Ruhunde and the purchase of second-hand vehicles and computers. A larger budget was required to provide basic research equipment to enable scientists and technicians to carry out minimum research directly related to restoring food security. Some of this was later provided by collaborative projects between ISAR, IARCs and regional commodity networks which also have continued through the years slowly to rebuild ISAR’s facilities, for example, to help renew its library and more general documentation.

Broad lessons and reflections on SOH Rwanda

The SOH initiative was probably the first of its kind to have successfully integrated agricultural research institutes into emergency relief and subsequent rehabilitation activities. Its unfolding resulted in a number of lessons of wider applicability, some of which are sketched below. Reflections include general thoughts on the roles of research to specific research-related insights about seed systems and varietal diversity.

The first broad lesson SOH demonstrated was that agricultural research (and research institutes) have critical roles to play in the emergency and rehabilitation phases of a disaster — although these roles are quite different.

Emergency

During an emergency, research can have widespread and very positive impact by taking a proactive role in backstopping implementers on the ground. Their special in-depth background knowledge can lead to quick and accurate assessments of the ‘abnormality/normality of a situation’ and their honed technical advice, for example in seed sourcing, can result in targeted, cost-effective and more sustainable support scenarios. Emergency aid can and must draw on principles of longer term knowledge. While research may take a support role to relief implementers during the emergency phase, the reverse can also be true. Research can and should take a lead in conducting comprehensive, informed system diagnoses — as swiftly as possible to steer focused action. To do so, research needs to couple with relief practitioners having sharp, nimble feet. Further, the research system, as a body of organisations, has to engage more actively with the humanitarian response system: this might take some strategic planning on how ‘to get to know each other’ (most time- and cost-effectively).

Recovery and rehabilitation

While research institutions have major roles in reconstructing research activities and facilities, two special niches merit more attention. SOH showed that institutional memory can be remarkably fragile and swiftly lost. Yet its reconstruction — through printed documents, field experiments, on-the-ground collaborative action — is a long-term enterprise. Similarly precipitous is the quick fall and very slow rise of human capital. It has taken Rwanda years to rebuild a research cadre from near nil. Thus, to its remarkable credit and despite massive personnel loss, ISAR has quickly reasserted its leadership in breeding and, for example, even regained its status as a key supplier of climbing-bean germplasm within the east and central African regions. Some support for the growth of Rwandan human capital in the area of agricultural research has been constant: for example, four IARCs (ICRAF, IITA, CIP and CIAT) and their allied ASARECA networks (PRAPACE, ECABREN and EARRNET⁸) have had a presence in Rwanda since the 1994 events.

Institutional links and broad lessons

The combination of honed technical insights (research) and strong, refined, on-the-ground ‘street smarts’ (for example, NGO implementers) is a potent one. However, the research/emergency link needs to be more systematically, and institutionally, encouraged. For research institutes, this has at least two implications: they must consider ‘emergency’ situations as within their mandate. In Africa at least, given that every country in the Horn of Africa has recent experience of drought, civil war or both, this scope should not seem unreasonable. Second, researchers have to be prepared to act as a partner, and sometimes even as supporting hands, to those with ‘street smarts’ or ‘emergency ken’ — NGOs and other quick-action implementers. The pay-offs, both in positive impact and decline in negative impact, should bring farmers gains at least comparable to those embedded in a ‘routine’ research agenda.

The second broad lesson that SOH demonstrated was that through focus on a range of crops and self-learning, SOH came to demonstrate that rehabilitation of seed

systems means a rehabilitation of all the different kinds of systems that farmers normally use: local and more formal.

The research showed how diverse crop systems, in the same locality, may be differentially affected by disaster, in this case war, and how — even for something as ‘simple’ as seed — one size does not fit all. For example, within the same household, local channels may provide the bulk of seed for one crop (beans), while formal channels (even certified seed) may be key for another (potatoes). Even within the same crop (climbing and bush beans), different key varieties may pass through different channels. To meet the needs of small-scale farmers in stress, both types of channel merit systematic assessment and support in the course of emergency and relief operations.

The third broad lesson of SOH was that the diagnostic phase proved a central — not optional — activity for making SOH assistance cost effective and focused on the truly critical problems.

It was through timely diagnosis that SOH was able to distinguish between germplasm concerns (there weren’t any) and seed problems per se (for example, the critical shortage of clean potato planting material). In effect, the diagnosis reoriented action towards the ‘crucial leverage points’ and potentially saved tens of thousands of dollars (by scaling down a programme aimed at substantial landrace multiplication). Further such diagnoses were designed to do ‘double duty’ — feed back seed aid evaluations to NGO emergency implementers and feed forward seed systems baselines to research rehabilitation actors. Of course, organisations should only carry out diagnoses if they are prepared to take the findings seriously — and redirect action if warranted.

The fourth broad lesson SOH and partners demonstrated was that varietal and crop diversity is not a ‘luxury’ concern in a crisis. It can be incorporated and promoted systematically — and lead to more permanent results.

During the emergency phase of Rwandan assistance, key implementers, backstopped by SOH, were able to distribute an impressive range of varieties (sometimes even variety mixtures) across a wide set of crops. Yields and farmer assessments of such aid proved unusually favourable. Further, through coordinated national, regional and international efforts, genebank accessions and key adapted varieties were multiplied at first in small, and then in more significant, quantities for much needed reintroduction to national institutes, as well as for possible distribution to farmers’ fields. Very happily, the latter reintroduction proved unnecessary.

Thus, during the emergency phase, a focus on diversity immediately gave farmers decreased risk — and yields more stable than is often achieved with relief seed. Post-war, preparedness to reintroduce local materials at farm level proved unnecessary, although the variety stocks did prove vital for re-invigorating research collections, laboratories and field trials.

Notes

1. Sixteen IARCS (recently re-baptised as Future Harvest Centres) are joined in an umbrella association known as the Consultative Group on International Agricultural Research (CGIAR). The centres work in more than 100 countries to mobilise cutting-edge science to reduce hunger and poverty, improve human nutrition and health, and protect the environment. NARSs work on agricultural research and development at the country level.

2. SOH was funded by a range of donors including USAID/OFDA, ODA (UK), Swiss Development Corporation, IDRC (Canada), Australian Aid and World Vision (Australia).
3. The SOH Initiative was formalised in September 1995, following several weeks of intensive planning. Many African national programmes contributed germplasm, field space and advice to the initiative, some eight international centres joined as formal partners and a range of NGOs collaborated directly in select activities. The most direct collaborators in the case of the African NARSSs were: Burundi, Ethiopia, Kenya, Malawi, Rwanda, Tanzania, Uganda, Democratic Republic of Congo and Zimbabwe. Collaborators involved in the IARCs were: CIAT, International Maize and Wheat Improvement Centre, International Potato Centre (CIP and its network PRAPACE), International Centre for Research in Agroforestry, International Institute of Tropical Agriculture, International Livestock Research Institute, International Plant Genetic Resources Institute (IPGRI) and ICRISAT. Non-governmental organisations (collaborating particularly during the diagnostic phase) were: CARE, World Vision, Catholic Relief Services, Swiss Disaster Relief and Médecins Sans Frontières.
4. A concrete example of this appeared quite early in the emergency phase. Aid agencies noted with alarm that farmers were buying bean seed from local markets and used this 'stress indicator' as a justification for importing massive amounts of seed (2,500 metric tons (MINAGRI/UNREO/PNUD/FAO, 1994b) in just the first season). However, the 'old timers' in Rwanda knew that farmers had always bought bean seed from the markets.
5. For comprehensive analysis of the full range of aid interventions carried out in Rwanda from 1994 to early 1996, food and far beyond, see Eriksson et al. (1996).
6. Note that farmer-to-farmer exchange of materials has not been important for at least two decades. While trusting social relationships are often among the first casualties of war, such 'good neighbourliness' in Rwanda had long been on the decline — largely due to very high population pressures on scarce land resources.
7. In immediate response to such findings, major potato seed multiplication activity was carried out at the CIP/KARI seed unit in 1995 with this unit producing and supplying Rwanda with 560kg (approximately 6,400 tuberlets) of its three major cultivars Sangema, Cruza and Mabondo (www.cipotato.org/market/PgmRprts/pr95-96/program5/prog51.htm). Similarly, under the umbrella of SOH, the potato programme of the National Agricultural Research Organisation of Uganda produced about 20 tonnes of pre-basic seed of Sangema, Cruza, Mabondo and Victoria varieties, as well as tubers from botanical true potato seed; these were supplied to Rwanda by Uganda's Kalyengere research station.
8. PRAPACE (translated from the French) is the Research Network on Potato and Sweet Potato in East and Central Africa; ECABREN is East and Central African Bean Research Network; EARRNET is East African Root Crops Network.

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