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

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Abstract

The article describes the efforts of a coalition of agricultural research centers, Seed of Hope in the rebuilding of Rwanda, after the genocide and war of 1994. Research involvement in emergency relief and rehabilitation was unusual at time and SOH had to forge its unique complementary roles. Focusing on crop/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 to rebuild 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.

Key Words: Rwanda, Agricultural Research Centers, Seeds of Hope, war and variety diversity, war and seed security

INTRODUCTION

The article describes the efforts of a coalition of agricultural research centers 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 centers—and many of the activities —and lessons learned-- came on a step-by-step basis. Since the Rwanda intervention, known as the 'Seeds of Hope', 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 United Nation agencies and a broad range of Non-Governmental Organizations (NGOs). International Agricultural Research Centers (IARCs) and National Agricultural Research System (NARS) partners[ii] have been involved in such relief efforts as 'Seed of Freedom' (catalyzed by the Angolan war), Seeds or Hope II (in response to Hurricane Mitch in Central America) and, at the time of writing, are launching a relief and development program in Afghanistan. This article aims to share some of the lessons of SOH-Rwanda—and spur more general reflection on how research centers might usefully intervene in emergency and subsequent recovery situations.

Rwanda's agricultural sector has long been the backbone of its economy, with 90% of the population still living directly off the land. The agricultural sector has also long been a highly stressed one due to, among other factors, a high population density (445 persons / sq km of arable land), reduced land size (average farm size of ≤ 1 ha) and declining productivity. It is probably

not surprising, that, also being landlocked and lacking vital mineral resources, Rwanda has one of the world's lowest per capita incomes ($ 286 p.a) (f 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) organizations 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 International Agricultural Research Centers (six have had staff based in Rwanda) had resulted in considerable R&D progress, inter alia in the development of higher yielding varieties, agro-forestry manures, and integrated pest management techniques. Further, with its focus on crop improvement and germplasm conservation, the IARCS, NARS and partners had conducted extensive work on five of Rwanda's principle crops, including beans, sweet potatoes, cassava, sorghum and maize. Part of the IARCS/NARS 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 Center 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. This resulted in the death of about 800,000 persons and internal displacement and flight of another 2 million persons, particularly to neighboring 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 nearly 4 months.

Having started mid-season, the civil war was presumed to have disrupted and even devastated agricultural production, with projections that less than 30% 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 / or 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 a 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 on what they specifically might offer, research institutes (IARCS and neighboring NARS) 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-- possibly de-stabilizing farmer systems.

FORMATION AND BROAD AIMS OF THE SEEDS OF HOPE INITIATIVE

The Seeds of Hope Initiative (SOH), launched in 1995, was a unique consortium of partners which included national agricultural research systems (NARS), and international agricultural research centers (IARCs) of the Consultative Group of International Agricultural Research (CGIAR).[iii] [iv]Within and beyond Rwanda, it was a somewhat unconventional intervener in emergency relief, being composed and headed by institutions which had primarily research mandates. Given their decade and more of history in Rwandan laboratories, field stations and farmers' fields, SOH's in-depth perspective and experience of Rwandan agriculture were considered as 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.[v] Further, some had good although small collections of Rwanda germplasm in their genebanks. Potential loss of diversity of germplasm of certain crops was of great concern to SOH. Such diversity (particularly in beans and sorghum) was key, both to farmers as risk aversion strategy against variable constraints and to the world community committed to safe-guarding this rich genetic heritage.

The SOH consortium initially set itself four practical aims, all tightly allied to its members' role as research centers, 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 analyze 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 third aim if necessary, SOH was prepared to facilitate re-introduction of seed and planting materials of crop varieties and farmers' indigenous germplasm (landraces) to the Rwandan environment. Finally, once assistance entered a development phase, SOH was ready to assist 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.

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 NARS**
- **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 storage chests)**

ACTION AND ACTIVITIES

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.

Emergency Phase

Provision of technical information on variety sourcing and variety targeting

Within two months of the ending of the genocide and war, several NGOs and relief agencies offered to acquire, package, transport and distribute planting materials (to anticipate the August/September planting). Seed aid transfers in the near 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, personal communication). SOH suspected that by working with organizations 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 summarized 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 (one shown below, figure 1) 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 the 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.

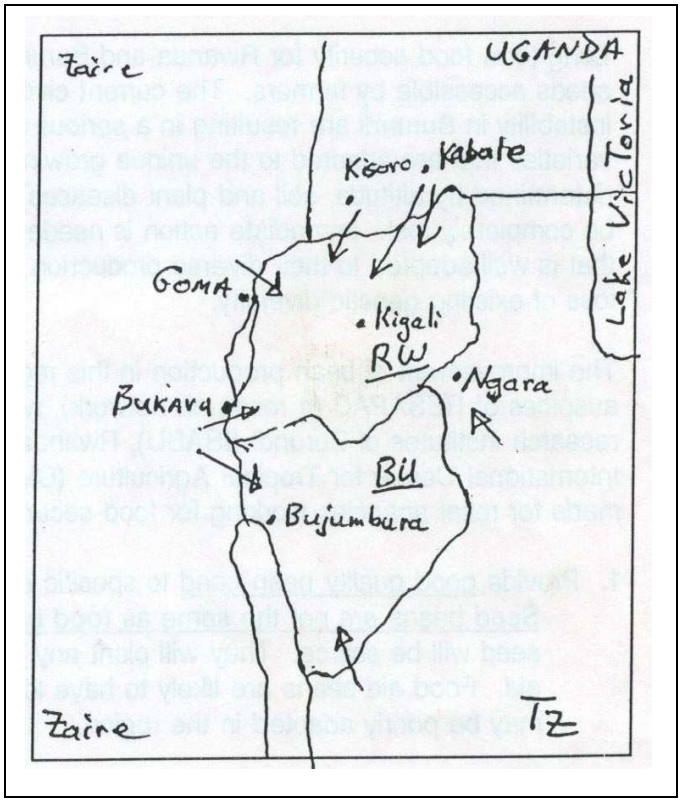

Figure 1: Map contained in the bean leaflet distributed to NGO's and aid agencies showing recommended external sources of bean seed and areas inside Rwanda and Burundi to which it should be targeted. The source and target areas have high degrees of similarity ecologically and in types of beans grown.

At the time, it was novel for relief organizations 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), so as 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 southwest Uganda (purchased by the Ugandan National Agricultural Research Organization-NARO- in collaboration with ICRISAT) performed significantly better at higher altitudes than some other aid varieties which were moved from lower to higher altitudes within Rwanda (about 3200 kg/ha vs 1400 kg/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.[vi] *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 key: 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% of the bean seed sown came from farmers' own stocks, with 62% of farmers drawing at least a portion of their seed from home stores. For maize, parallel figures were 25% of the seed sown and 41% of farmers.[vii] In addition to sowing a portion of the aid seed, farmers often mentioned that eating and 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, Re-introduction 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 neighboring countries and elsewhere as a temporary measure. Anticipating this approach, SOH decided to rapidly increase materials adapted to specific Rwandan zones, so as to provide the initial spurt to replace less appropriate ones. The strategy was to increase such seed and planting materials initially in neighboring countries (mainly Tanzania and Uganda) and then to re-introduce germplasm for further and more extensive increase and 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 neighboring countries wishing to test them, and the regional research networks (clusters of neighboring 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 re-introduced for further increase by NGOs, ISAR and Service Semences Selectionnees (SSS) 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 neighboring areas of Uganda and Tanzania were also multiplied in both countries near the border (although, unfortunately, plant health concerns about transmission of African cassava mosaic virus delayed the delivery of cassava cuttings for many seasons to come.)

Major players for the in-country multiplication of seed and planting materials introduced by SOH were Service Semencier Selectionnees (SSS), World Food Programme and some NGOs notably World Vision International (WVI) and CARE in collaboration with SOH. The latter continued giving technical support on agronomic characteristics of varieties, crop protection aspects and the targeting 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 NARS with long years of association with Rwanda 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 other crops.

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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 quickly 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 (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 potential to significantly alter the stability of the local agricultural systems, SOH analyzed 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 season post-war, September 95 to January 96, SOH guided the first intensive post-war agricultural surveys: this was the first time stability was sufficient to allow for a nationwide, 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 1200 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. In brief, 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—and these continued to operate at some level throughout. [viii]

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

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, e.g. 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 basic three 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 centralized--either in the national research program in the northern Ruhengeri area (which was heavily subsidized) or in specific development projects supported by outside funding. Both these sources broke down during the early seasons of the conflict (1991-3), along with supplies of fungicide and fertilizer. 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 [x].

In sum, varietal and seed recovery partially depended on how farmers accessed varieties in the first place. Varieties normally distributed through local channels again moved through local channels. Those allied to the formal seed sector were harder to restock, due to problems in both availability and access. It was these diagnoses--- often considered as 'luxury' during emergency periods—which helped SOH focus its energies on the more pressing problems (e.g. on 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 further 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, the Director General of the International Potato Center (CIP):: "The

Seeds of Hope Initiative…was only possible because several CGIAR centers, 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 here highlight some germplasm-related issues.

Inventories were quickly made of germplasm saved or not destroyed across ISAR's research stations. This was possible partially due to the survivors themselves. For example, in one 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 Center done by ICRAF and its associated agroforesty network AFRENA helped to guide addition collection and storage activities. SOH supplemented these in-country inventories with information—and stocks gathered over the years by regional research networks.

Using both re-introduced 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 and/or not fled were instrumental in providing continuity to these efforts. World Vision International gave unique initial financial and logistic 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 1260 entries was characterized for agronomic characteristics, and resistance to major bean diseases such as angular leaf spot and root rots in neighboring 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 characterization 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, catalyzed 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 having 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 others

countries in Africa, Europe or the US) had worked closely and knew well the activities of the different crops and natural resource management programs: they could offer guidance, help restart still relevant research activities, and suggest gaps/opportunities posed by the changing circumstances. Training many of the new staff to 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 programs. Some sessions were quite fundamental: those on basic research methods, seed production (particularly for tubers), statistical analysis, socio-economic survey, on-farm and participatory research and technology dissemination strategy. Others were more specialized: e.g., training of new technical staff in evaluation techniques, selection criteria and initiation of new breeding activities.

Such training was offered either by a single or a number of IARCs or in collaborations with other NARS 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 NARS offered ISAR researchers specialized 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 for post-graduate degrees (e.g breeding, soil science, biometrics, agroforestry, etc) Importantly, being a member of ASARECA, ISAR was also offered preferential support in training organized 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 was extensively damaged. All movable equipment (computers, fridges, office facilities) were either looted or wantonly damaged to the point where they were rendered unusable. Loss of vehicles and telecommunication equipment made it very difficult for ISAR and its research stations to function properly, and infrastructure rehabilitation was therefore needed.

Due to financial limitations, 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, and the tree center in Ruhande, and purchase of second hand vehicles and computers. A larger budget was required to provide basic research equipment to enable scientists and technician to carry out minimum research directly related to restoring food security. This was later somewhat provided by support under collaborative projects between ISAR, IARCS and regional commodity networks who also have continued through the years to slowly 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 are ordered from more general thoughts on the roles of research to more specific research-related insights relating to seed systems and varietal diversity.

1. SOH demonstrated 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.

a) Emergency

During an emergency, research can have widespread and very positive impact by taking a pro-active role in backstopping implementers on the ground. Their special in-depth background knowledge can lead to accurate and fast assessments of the 'abnormality/normality of a situation' and their honed technical advice, e.g. 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 organizations, has to more actively engage with the humanitarian response system: this might take some strategic planning on how 'to get to know each other' (most time- and cost- effectively).

b) Recovery/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 regained its leadership in breeding and, for example, has now regained its status as a key supplier of climbing bean germplasm within the east and central African region. Some support for the growth of Rwandan human capital in the area of agricultural research has been constant: eg. four IARCs (ICRAF, IITA, CIP and CIAT), and their allied ASARECA networks (PRAPACE, ECABREN and EARRNET)[xi] have had a presence in Rwanda since the 1994 events.

c) Institutional links

The combination of honed technical insights (research) and strong, refined on-the-ground street smarts (e.g. 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 have to consider 'emergency' situations as within their mandate. In

Africa at least, given that every country in the Horn of Africa has experience drought, civil war—or both, within the last ten years, this scope should not seem unreasonable. Second, Research has to be prepared to act as a partner, and sometimes even supporting hands, to those with 'street smarts' or 'emergency ken'—NGOS and other quick-action implementers. The pay-offs, both in positive impacts and decline in negative impacts, should bring farmers gains at least as comparable as those embedded in a 'routine' research agenda.

2. 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, here 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 (e.g. beans), while formal channels (even certified seed) may be key for another (e.g. potatoes). Even within the same crop (e.g. 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.*

3. The diagnostic phase proved central—not an 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 were basically none) and seed problems per se (for example, the critical shortage of clean potato planting material). In effect, *the diagnosis re-oriented action towards the 'crucial leverage points' and potentially saved tens of thousands of dollars* (by scaling down a program aimed at substantial landrace multiplication). Such diagnoses further were designed to do 'double duty'-- feeding back seed aid evaluations to NGO emergency implementers and feeding forwarding seed systems baselines to research rehabilitation actors. Of course, organizations should only carry out diagnoses if they are prepared to take the findings seriously—and re-direct action if warranted.

4. SOH and partners demonstrated that varietal and crop diversity is not a 'luxury' concern in a crisis. It can be incorporated and promoted systematically—and lead to more durable 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 favorable. Further, through coordinated national, regional and international efforts, genebanks accessions and key adapted varieties were multiplied at first in small, and then in more significant, quantities ---for much needed reintroduction to national institutes—and then, potentially for 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 the farm level proved not needed—although the variety stocks did prove vital for re-invigorating research collections, laboratories and field trials.

References:

CIAT (International Center for Tropical Agriculture) ,1994. Bean seed aid for Rwanda and Burundi. Information Leaflet, 2 p

Eriksson, J. 1996 (and collaborators) The International Response to Conflict and Genocide: Lessons from the Rwanda Experience. Published by the Joint Evaluation Of Emergency Assistance to Rwanda

Jones, R., C. Longley, T. Remington and P. Bramel, 2001. Seed security, seed relief and alternative interventions in southern Sudan: preliminary findings from the project Seeds for Survival: increasing the effectiveness of Emergency Seed Security in the Greater Horn of Africa. Nairobi: ICRISAT, ODI, CRS.

Longley, C. R. Jones, M.H. Ahmed and P. Audi. "Supporting local seed systems in southern Somalia: a developmental approach to agricultural rehabilitation in emergency situations' AgREN Netwrok Paper No. 155. London; Overseas Development Institute.

Sperling L. and Berkowitz, P, 1994. Partners in Selection: bean breeders and women bean farmer experts in Rwanda. A Publication of the Gender Programme of the CGIAR. 24 p.

MINAGRI/UNREO/PNUD/FAO. 1994a. Compte-rendu de reunion: Operation d'ugence et rehabilitation agricoles. August, 94.

MINAGRI/UNREO/PNUD/FAO. 1994b. Compte-rendu de reunion: Operation d'ugence et rehabilitation agricoles, October, 94

Seeds of Hope Assessment Document 1: Assessment of bean seed use 1995A: Summary Report. 21 p

Seeds of Hope Assessment Document 2: The impact of war on plant genetic resources: bean varietal assessment in Rwanda 1995A: Summary Report, 18 p

Seeds of Hope Assessment Document 6: Assessment of maize seed use 1995A: Summary Report. 14 p.

Seeds of Hope Assessment Document 7: Assessment of sorghum seed use 1995B in Care zone of action 14 p

Seeds of Hope Assessment Document 8 : Rwanda nationwide household survey on the status of the bean, sorghum and cassava crops 1995: The impact of war on production and varietal erosion. 92 p.

Seeds of Hope Assessment Document 9: Rwanda household survey on the status of the potato crop, 1995 27 p

Seeds of Hope Assessment Document 10: Executive summary of Seeds of Hope (SOH) socio-economic analyses in Rwanda: the impact of the war on agricultural production, 24 p.

Sperling, L, M. E. Loevinsohn and B Ntabomvura, 1993. Rethinking the farmer's role in plant breeding: local bean experts and on-station selection in Rwanda. Experimental Agriculture 29:509-519.

Sperling, L. 1997. The effect of the Rwandan War on crop production and varietal diversity ; a comparison of two crops. L. Sperling (ed). War and Crop Diversity. Agricultural Research and Extension Network. Paper 75, pp19-30. Overseas Development Institute, London. 40p.

Voss 1992 Conserving and increasing on-farm genetic diversity:farmer management of varietal bean mixtures in Central Africa. In J.L. Moock and R.E. Rhoades, eds. p 34-51 Diversity, farmer knowledge and sustainability. Ithaca and London:Cornell University Press.

Websites

(www.cipotato.org/market/PgmRprts/pr95-96/program5/prog51.htm

(www.cipotato,org/market/Ars/Ar98/Desast.htm.).

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[ii] Sixteen International Agricultural Research Centers, IARCS, (recently re-baptized as Future Harvest Centers) are joined in an umbrella association known as the Consultative Group on International Agricultural Research (CGIAR). The centers work in more than 100 countries to mobilize cutting-edge science to reduce hunger and poverty, improve human nutrition and health, and protect the environment. National Agricultural Research Systems, NARS, work on agricultural research and development at the country level. The term often focuses on the in-country cluster of public sector institutions, but is sometimes broadened to include NGO and private sector organizations, working also on agricultural R&D in a given national locale.

[iii] The Seeds of Hope was funded by a range of donors including USAID/OFDA, ODA (UK), Swiss Development Corporation (SDC), IDRC (Canada), Australian Aid, and World Vision Australia) ..

[iv] The SOH Initiative was formalized in September 1995, following several weeks of intensive planning. Many African national programs contributed germplasm, field space and advice to the initiative, some eight International Centers joined as formal partners and a range of non-governmental organizations collaborated directly in select activities. The most direct collaborators were: African National Research Systems: Burundi, Ethiopia ,Kenya, Malawi, Rwanda, Tanzania, Uganda, Democratic Republic of Congo, Zimbabwe; International Agricultural Research Centers: International Center for Tropical Agriculture (CIAT), International Maize and Wheat Improvement Center (CIMMYT), International Potato Center (CIP and its network PRAPACE), International Center for Research in Agroforestry (ICRAF), International Institute of Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), International Plant Genetic Resources Institute (IPGRI), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT); Non-Governmental Organizations (collaborating particularly during the diagnostic phase): CARE, World Vision, Catholic Relief Services, Swiss Disaster Relief, Medicins sans Frontiers.

[v] 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 [2500 metric tons (MINAGRI/UNREO/PNUD/FAO. 1994b) just the first season]. However, the 'old timers' in Rwanda knew that farmers had always bought bean seed from the markets—to augment home stocks or seek new varieties. The rate of off-farm bean purchase was slightly higher immediately after the war, but not dramatically so (Sperling, 1997).

[vi] For comprehensive analysis of the full range of aid interventions carried out in Rwanda 1994-early 1996, food and far beyond, see John Eriksson et al. The International Response to Conflict and Genocide: Lessons from the Rwanda Experience. Published by the Joint Evaluation Of Emergency Assistance to Rwanda

[vii] The figures on maize are lower because the sample included farmers who did not normally sow maize but took advantage of the gift from aid.

[viii] 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 neighborliness' in Rwanda had long been on the decline—largely due to very high population pressures on scarce land resources.

[ix] To date, in all key cases of which these authors are aware, cries of 'variety loss' in farmers' fields due to war—and need for restoration' have amounted to good-intentioned 'false alarms'.

[x] In immediate response to such findings, major potato seed multiplication activity was carried out at CIP/KARI seed unit in 1995 with this unit producing and supplying Rwanda 560 kg (approx 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 program of the National Agricultural Research Organization (NARO) 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 provided to Rwanda by Uganda's Kalyengere research station.

[xi] PRAPACE= (translated from French): Research Network on Potato and Sweetpotato in East and Central Africa
ECABREN= East and Central African Bean Research Network
EARRNET= East African Root Crops Network