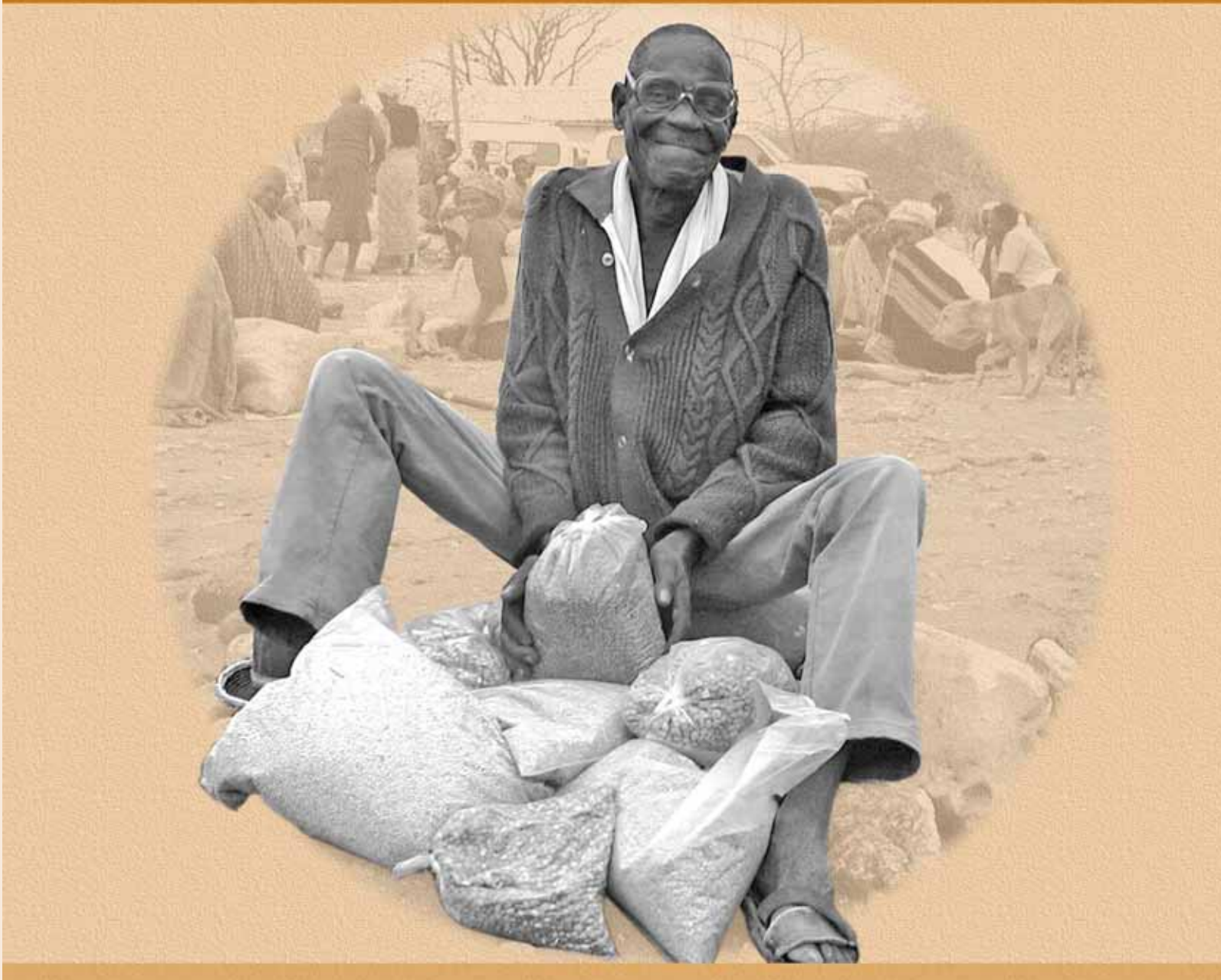
Distribution of Relief Seed and Fertilizer in Zimbabwe

Lessons from the 2003/04 season



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Abstract

Drought and flood relief programs distributing free seed and fertilizer are common in southern Africa, but little is known about their efficacy. This study summarizes the impacts of input relief programs in Zimbabwe, based on data from surveys conducted in 2004, following two consecutive drought years. The analysis reveals substantial opportunities for improving these programs. First, targeting of beneficiary households must be improved. There was little difference between recipients and non-recipients in terms of household characteristics, composition, poverty level etc. Many households received inputs from more than one NGO. Targeting can be improved through better sharing of information, and by using simpler selection criteria (eg, ownership of livestock) to identify beneficiaries.

Contrary to common perceptions, farm communities tend to be reasonably successful at maintaining seed stocks even after multiple years of drought. Correspondingly, the delivery of free seed did not contribute to an increase in planted area. If seed is provided, more emphasis is needed on quality control and proper labeling. Also contrary to common perceptions, distribution of small quantities of fertilizer offered substantially higher returns than distribution of seed. The application of as little as 10 kg of nitrogen per hectare contributed substantially to food security in drought-prone regions.

This study also compared three alternative input distribution methods: direct handouts of seed and fertilizer, seed fairs, and the use of vouchers redeemable at retail shops. While direct handouts are logistically the easiest method (and the most widely used), voucher-based programs linked with retail shops potentially offer the greatest development impacts.

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Contents

Executive Summary

Zimbabwe experiences severe drought every two to three years, and parts of the country also experience periodic floods. As a result, drought or flood relief programs are implemented regularly, to help smallholder farmers recover. The most common programs, involving seed and fertilizer distribution, have been implemented in one or another part of the country during at least 10 of the 25 years since independence.

Severe droughts occurred once again during the 2001/02 and 2002/03 cropping seasons. The impact was measurably worsened by high unemployment, high inflation (100-500%), declining GDP, and widespread HIV/AIDS. Government controls on maize import and prices further contributed to severe grain shortages on both urban and rural markets. In past years, farm households increased their food purchases during a drought year. In 2003, it was often difficult to find grain for purchase. Consequently, it was assumed that households were more likely than usual to consume their limited seed stocks.

Despite the frequency of agricultural relief programs, little is known about their efficacy. It is assumed that seed distribution will lead to an expansion of cropped area; and that distributing fertilizer will increase productivity and output. But it is difficult to find independent data measuring such gains. Each year that drought re-occurs, these programs are simply started afresh.

This study re-examines these assumptions. Three major farm surveys were conducted during the 2003/04 season (following two drought years), to assess relief distribution of seed and fertilizer. The results show that while both inputs were generally well used, there are substantial opportunities for improving the effectiveness and impact of relief programs.

Targeting of beneficiary households must be improved. Many of the NGOs distributing inputs had explicit criteria to select needy households, but these criteria were difficult to implement in practice. Consequently, there was little difference in poverty between beneficiary and non-beneficiary households. Many NGOs tried to target households affected by HIV/AIDS. Yet female-headed families or households with orphans were just as likely to have received relief inputs as male-headed households or those without orphans. Spatial targeting was also unsatisfactory. Almost 15% of households received input packages from more than one NGO. In some districts, more than 25% of households received similar inputs from multiple NGOs.

Targeting can be improved through better sharing of information on the geographical distribution of production losses and of NGO activities. In addition, simpler proxy variables are needed to identify poorer households. One such proxy that appears robust in much of Zimbabwe is ownership of draft animals (cattle or donkeys).

Seed distribution has *not* led to an expansion of cropped area. Instead, much of the relief seed appears to have replaced stocks available on local markets, or seed saved from the previous harvest. Despite grain shortages on the local market, and despite two consecutive droughts, many households were still able to retain seed stocks.

Farmers appear to have benefited most from the distribution of new, improved varieties. This was the first time in over 20 years that relief agencies were allowed to distribute open-pollinated varieties (OPVs) of maize. While virtually all smallholders in Zimbabwe have adopted hybrid maize, many are now 'recycling' hybrid seed, ie using seed saved from the previous harvest, because of high seed prices. Yields have therefore declined. The delivery of OPVs offered farmers a cheaper, more sustainable alternative. But unfortunately, most beneficiaries had no idea whether they were receiving hybrid or OPV seed. Major investments are now required to teach farmers about the differences between varieties.

The survey results also indicate the need for greater attention to seed quality. Much of the relief seed, especially for crops other than maize, was of questionable origin. A significant share appeared

simply to be grain cleaned to seed specifications for physical purity and germination. Farmers asked why they were receiving varieties they already owned. In at least two cases, seed of poorly adapted varieties – low-yielding and late-maturing – was imported and distributed; the recipients would have been better off planting seed available on local markets. These problems were worsened by poor or incomplete (and sometimes completely wrong) labeling.

As a result of these findings a relief seed protocol was drafted, calling for better labeling and the promotion of known varieties. However, these interventions alone will not solve the problem of seed shortages for crops in which commercial seed companies have little interest. One additional solution is to establish seed security stocks for promising new varieties.

The study shows that production and productivity were substantially increased by targeted application of small quantities of chemical fertilizer. More than 150 000 farmers each received 25 kg of ammonium nitrate, along with information on how to apply it in the form of micro-doses. In parallel, over 1200 demonstration trials were conducted, where yields increased by 30-50% with the application of only 10-20 kg N per hectare – about *one-fourth* the commonly recommended levels. These gains were consistent across regions and for different groups (eg richer, poorer) of farmers. In effect, small doses of nitrogen-based fertilizer appear to offer much higher returns than seed distribution – particularly if the seed is of uncertain origin.

Unexpectedly, the major determinant of the area planted by poorer households was not the availability of relief seed, but access to draft power. On average, families owning cattle or donkeys planted 60% more land than those without, and harvested 70% more grain. These results suggest the need for labor-saving tillage systems, or special programs to resolve draft power constraints.

Larger gains can also be achieved if relief programs could provide more technical assistance to farmers. Less than one-fourth of relief recipients received any kind of extension advice along with the inputs. And of this minority, most had only one extension contact during the season. Most farmers, correspondingly, could not identify what varieties they received – even if variety names were printed on the bags. An opportunity to educate farmers about new technologies was lost.

The study also examined the relative benefits of three alternative distribution strategies:

- Free inputs distributed directly to farmers
- Distribution of seed and fertilizer using vouchers redeemable for designated input packages at rural retail outlets
- Distribution of vouchers redeemable at seed fairs.

Direct handouts are the easiest delivery method – but also the most disruptive of rural markets, because free distribution competes directly with rural retailers. The second strategy, vouchers redeemable at local shops, offered a marginal payoff. But in effect, it was simply direct distribution carried out through retail shops. The third strategy, seed fairs, offered more choice, and generated income for local communities. But the high prices offered by relief agencies in order to attract seed traders, may have undermined traditional markets; and seed quality at some fairs was unsatisfactory. In general, however, voucher-type schemes linked with the development of rural input markets, are promising and merit further experimentation.

Overall, the evidence strongly suggests that agricultural relief programs need to move away from the current emphasis on handouts, and instead pursue more explicit development goals. Programs may still target subsidies or other assistance to poorer households most severely affected by drought or poverty. But many of these households are likely to remain chronically poor unless they receive more comprehensive, methodically planned support – improved varieties, better extension advice, and better market access. Without this, they will still need assistance during the next drought, and the next. Larger, more sustained gains can be achieved by improving the quality of assistance, rather than concentrating, as most programs do today, on the number of households assisted, or number of input packages delivered.

Introduction, Objectives, and Methodology

Input Distribution Program 2003/04

After the 2003 harvest, over one million small-scale farmers in Zimbabwe's communal areas were said to be in need of food and agricultural inputs as a result of drought. The national cereal grain harvest was estimated at 980 000 tons, approximately half the amount required. The impacts of this shortfall were worsened by foreign exchange shortages that limited the government's capacity to import grain. Severe shortages of maize, the main staple, led to sharp increases in grain prices. The government sought to control this by establishing price and grain movement controls over maize; but the combination of grain shortages and movement controls only increased the severity of food shortfalls in outlying rural areas.

The impacts of the drought were further complicated by several factors. First, this was a second consecutive drought. During the previous cropping season, rains had been even worse, with a grain harvest of only 695 000 tons. Second, the decline in the national economy left an estimated 70% of the formal sector workforce unemployed. Third, approximately 26% of adults were believed to be infected with HIV/AIDS. This combination of shocks reduced the capacity of households to cope with drought. Suggestions arose that a 'new variant famine' now existed, where households facing multiple shocks are forced to sell more of their farming assets, reducing the capacity to operate normally when favorable rains return. A growing proportion of households, particularly those affected by HIV/AIDS, may be caught in a poverty trap.

In response to the 2002/03 drought, approximately US$19 million was spent on providing agricultural assistance to small-scale farmers, of which over US$10.5 million was spent on distributing seed and fertilizer to 845 000 households (Table 1). Over 11 000 tons of seed and 8000 tons of fertilizer were distributed free by more than 30 NGOs. In addition, the government provided farmers with maize seed on credit. Complementary programs provided, variously, technical advice on crop production, food aid, supplementary feeding, HIV/AIDS awareness training, borehole rehabilitation, and livestock support.

Table 1. Communal sector farm population receiving assistance, 2003/04

	No. of households	No. of people*
Total population	2 382 507	10 432 131
Total no. with cereal deficit	1 119 153	4 924 274
Total no. receiving inputs	845 000	3 718 000

*ZIMVAC 2003 estimates the average communal household has 4.4 members. ICRISAT survey 2004 estimates average 6.7 members. If we consider only full-time residents, mean household size 6.2, median 6

Source: FAO Emergency Coordination Unit

The main objective of NGO seed and fertilizer relief programs was to help farmers re-establish themselves after the drought. After two consecutive droughts, it was assumed that many (or most) farmers had lost or consumed their seed stocks. Each family was therefore provided enough seed to plant approximately 1 ha of food crops. Fertilizer was provided to a subset of farmers (depending on funds available) to improve production levels and productivity. Technical advice was funded to ensure that the inputs were properly used. Ideally, the beneficiaries would be able to harvest enough grain to achieve self-sufficiency.

Most of the families receiving agricultural inputs also qualified for food aid under other relief programs. Such assistance was also commonly linked with education programs about HIV/AIDS.

Monitoring Objectives

Drought is endemic to southern Africa. Approximately once every two to three years, severe drought occurs over a significant part of Zimbabwe. Correspondingly, relief seed and fertilizer have been distributed in the country during at least ten of the 24 years since independence. Similar programs have been repeatedly implemented in many neighboring countries including Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, and Zambia.

Few of these programs have been critically evaluated. Most monitoring efforts track the distribution and receipt of inputs and, if time permits, the level of production gains. Although donors and governments have made – and continue to make – substantial investments in relief programs, only rarely do these assessments ask how these programs can be improved.

There is growing evidence that seed losses caused by drought are often over-estimated.[1,2] Efforts are being made to better target the neediest households – but there is considerable uncertainty about how best to identify which households are most in need of what sorts of assistance. In addition, recent experience indicates that the sudden demand for large quantities of emergency seed leads to imports of seed of poor quality or questionable performance. And free seed distribution appears to undermine the development of retail markets for inputs. While some NGOs are starting to experiment with alternative strategies such as seed fairs and vouchers redeemable at retail shops, there have been few attempts to compare results. Finally, uncertainty persists about the payoffs to distributing chemical fertilizer and providing crop management advice, in complement to seed distribution. Small quantities of seed can easily be distributed to large numbers of farmers. Yet larger and more sustainable improvements in food security may be achieved by promoting improved crop and livestock management technologies.

This study examines these questions in order to find ways to improve the distribution of agricultural inputs under drought relief programs in the future. First, we assess the practices NGOs commonly use to identify households in need. How might targeting be improved? Next, we examine seed quality problems, and the issue of how much seed is really needed. We then consider the relative contributions of relief seed and chemical fertilizer to improving production and food security, and highlight the trade-off between supplying seed and supplying fertilizer. Finally, we draw lessons for input distribution for future relief programs. These are relevant both in Zimbabwe and in neighboring countries.

Sample Frame and Data Collection Plan

Three major farm surveys were conducted, to collect the data necessary to assess input distribution programs.

Post-Planting Survey 1. The survey was implemented in Jan-Feb 2004 and collected information on what agricultural inputs were distributed, and how they were used. A sample frame was established from a list of all districts in the country where at least 50% of the population experienced a cereal grain deficit in 2003.[3] These districts were then divided into three groups with significant programs of (i) free, direct input distribution, (ii) seed fairs, (iii) input distribution through retail traders. Four districts were randomly chosen from each group. One additional district was chosen to broaden the sample of households receiving seed through direct distribution, the most common method.

In each district thus identified, three wards were randomly selected – two wards served by NGO programs, and one that had received no relief inputs. In order to enhance the diversity of the sample, we chose recipient wards that had received assistance from different NGOs.

1. Friis-Hansen E and Rohrbach D. 1993. Impact assessment of the SADC/ICRISAT drought relief emergency production of sorghum and pearl millet seed. ICRISAT Southern and Eastern Africa Region Working Paper no. 1. PO Box 776, Bulawayo, Zimbabwe: ICRISAT.
2. Rohrbach DD and Kiala D. 2000. Development options for local seed systems in Mozambique. Socioeconomics and Policy Working Paper No. 5. PO Box 776, Bulawayo, Zimbabwe: ICRISAT.
3. ZIMVAC (Zimbabwe Vulnerability Assessment Committee). 2003. Emergency food security and vulnerability assessment, April 2003. Harare, Zimbabwe: ZIMVAC.

Finally, a list of all the villages in each selected ward was obtained from the respective ward councilors. One village was then randomly selected for the survey. Forty households were sampled in each survey village: 28 households randomly selected from a list of families receiving agricultural relief inputs, and 12 households randomly selected from a list of non-beneficiary families.

The survey ultimately aimed to sample 1560 households distributed across 13 districts. However, it proved difficult to disaggregate wards and households between recipients and non-recipients. In many cases district authorities did not have accurate information about the distribution of NGO activity in their areas. Ward councilors and village headmen lacked accurate information about which villages and households received assistance. The difficulty of identifying recipients and non-recipients was worsened because several NGOs shifted their targeting during the course of input distribution, depending on quantity of inputs received and evolving information about the activities of 'competing' NGOs. In some areas it proved difficult to find wards and households that had not received relief inputs.

Post-Planting Survey 2. A supplementary post-planting survey was implemented in March-April 2004. This extended the initial sample with 480 more households in 6 additional districts, allowing a firmer basis for generalizing the results. The survey collected most of the same information as *Post-Planting Survey 1*, plus harvest estimates.

Given the difficulties encountered in identifying wards, villages, and households in the first post-planting survey, a simpler sampling procedure was used. Two sample wards, known to have received relief inputs, were selected in each district. One village receiving inputs was randomly selected from each ward. In each village, using village lists, 28 beneficiary households and 12 non-beneficiary households were randomly selected. Since village lists are not always accurate, this targeting was only approximate.

Post-Harvest Survey. This survey collected information on the crop harvest, and the impacts of relief programs on household food security. It was carried out in June-July 2004, after virtually all the main crop had been harvested; and covered 840 of the households interviewed in the *Post-Planting Survey 1*. Seven of the original 13 districts were covered, all situated in the more drought-prone southern parts of the country.

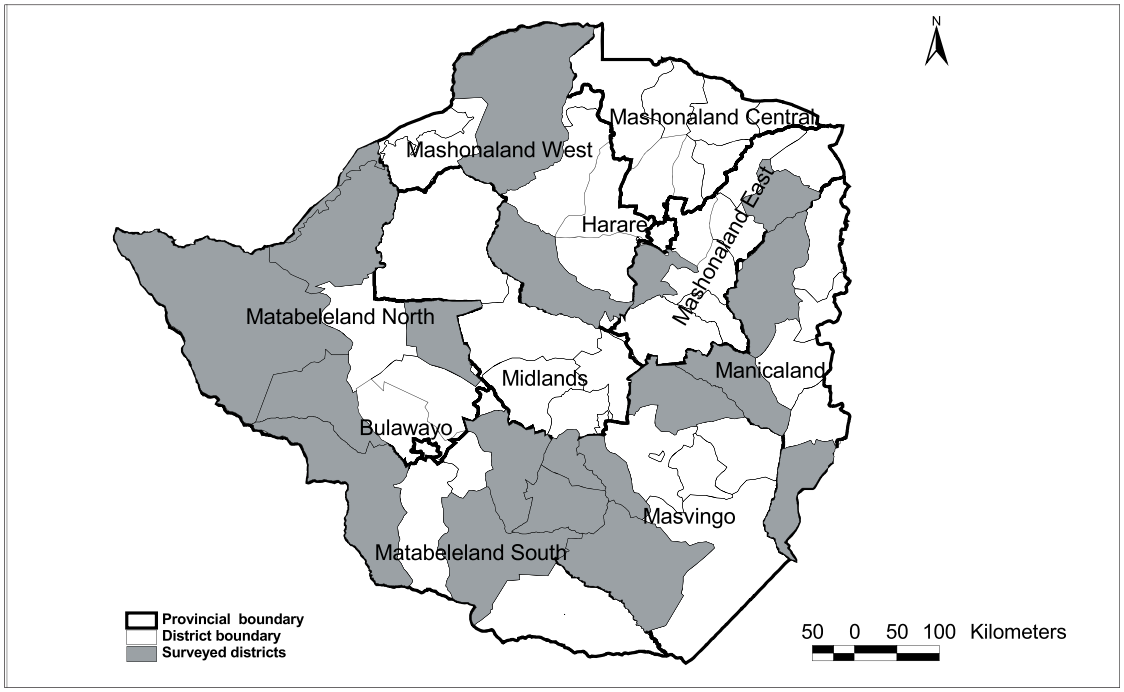

Figure 1. Distribution of sample frame for monitoring surveys of input relief programs, 2004

These formal surveys were supplemented by periodic reconnaissance surveys conducted before and during the agricultural season, as well as semi-structured discussions with informed observers. Figure 1 and Table 2 show the distribution of the sample frame for the surveys.

Ultimately, 2040 households were targeted in the two post-planting surveys, and 2073 households were interviewed (Table 3). 840 of these households were targeted for re-interview in the post-harvest survey, but only 752 could be found, because many had traveled to other parts of the country to visit friends and relatives immediately after the harvest.

Table 2. Targeted sample frame for relief input surveys, 2004

Free direct distribution	Distribution through seed fairs	Distribution through retail shops	No seed distribution
Post-planting survey 1 (n=1560)			
Hurungwe (2 wards)	Mutoko (1 ward)	Chivi (1 ward)	Hurungwe (1 ward)
Seke (2 wards)	Makoni (1 ward)	Mwenezi (1 ward)	Seke (1 ward)
Mutoko (1 ward)	Insiza (1 ward)	Mberengwa (1 ward)	Mutoko (1 ward)
Makoni (1 ward)	Tsholotsho (1 ward)	Zvishavane (1 ward)	Makoni (1 ward)
Chipinge (2 wards)	160 households	160 households	Chipinge (1 ward)
Chivi (1 ward)			Chivi (1 ward)
Mwenezi (1 ward)			Mwenezi (1 ward)
Mberengwa (1 ward)			Mberengwa (1 ward)
Zvishavane (1 ward)			Zvishavane (1 ward)
Gwanda (2 wards)			Gwanda (1 ward)
Bulilimamangwe (2 wards)			Bulilimamangwe (1 ward)
Insiza (1 ward)			Insiza (1 ward)
Tsholotsho (1 ward)			Tsholotsho (1 ward)
720 households			520 households
Post-planting survey 2 (n=480)			
Kadoma (2 wards)			
Nkayi (2 wards)			
Gutu (2 wards)			
Binga (2 wards)			
Buhera (2 wards)			
Hwange (5 wards)			
480 households			
Post-harvest survey (n=840)			
Mwenezi (1 ward)	Insiza (1 ward)	Mwenezi (1 ward)	Mwenezi (1 ward)
Mberengwa (1 ward)	Tsholotsho (1 ward)	Mberengwa (1 ward)	Mberengwa (1 ward)
Zvishavane (1 ward)	80 households	Zvishavane (1 ward)	Zvishavane (1 ward)
Gwanda (2 wards)		120 households	Gwanda (1 ward)
Bulilimamangwe (2 wards)			Bulilimamangwe (1 ward)
Insiza (1 ward)			Insiza (1 ward)
Tsholotsho (1 ward)			Tsholotsho (1 ward)
360 households			280 households

Table 3. Planned vs actual distribution of sample households

	Households receiving free inputs from NGOs	Households not receiving inputs
Targeted post-planting	1120	920
Actual post-planting	1320	753
Targeted post-harvest	392	448
Actual post-harvest	476	276

The planned sample comprised approximately 55% recipients and 45% non-recipients in order to have a strong basis for assessing impact. In practice, both the post-planting and post-harvest samples included approximately 64% recipients.

Issues of Interpretation and Bias

The surveys and sample frames were explicitly designed to assess opportunities for improving the distribution of relief seed and fertilizer by NGOs during the 2003/04 planting season. Correspondingly, this was *not* a random sample of all beneficiary households. Districts and wards were selected to include households who had received inputs from different NGOs under different distribution procedures. Also, the sample targeted areas more severely affected by the 2002/03 drought.

Strictly speaking, the sample frame does not allow generalization across all smallholder households. However, the sample is sufficiently large and diverse to allow generalization about the impact of input relief on planting practices across most farmers receiving assistance from the major NGO-led programs funded by ECHO, DFID, and OFDA.[4]

Since the post-harvest survey was restricted to the southern districts of Zimbabwe, the harvest results and conclusions on program impacts are for these areas only.

Nonetheless, the results are probably a more accurate impact assessment than the efforts of individual NGOs, for several reasons. The surveys were conducted by field staff with no vested interest in the result. We assessed the efforts of many different NGOs, allowing a broader evaluation of impacts accounting for the variability of distribution strategies. And importantly, sampling non-beneficiary households allowed a stricter assessment of the contributions of relief seed and fertilizer *per se* to area planted and harvest levels. In effect, we could compare the production decisions and the results of neighboring (beneficiary and non-beneficiary) households.

Any survey of the impacts of relief programs has inevitable biases, caused by respondents' expectation of free handouts. Farmers may overstate their production deficits or underestimate their harvest in order to avoid being excluded from future relief programs. They may underestimate the quantities of relief seed left unplanted or the amounts consumed, fearing retribution. However, a series of cross-checks within the survey reduce the probabilities and estimated levels of bias.

The survey was also complicated by the multiple sources of agricultural inputs. Most farmers had retained some seed, and many obtained additional seed from neighbors or the local market. Many relief recipients had only a limited idea of who was providing their seed or fertilizer. In order to distinguish the impacts of relief inputs *per se*, it was necessary to collect plot-level data. This considerably increased the complexity of the exercise.

Finally, the sample frame itself was problematic. Insofar as NGOs successfully targeted poorer, needier households, a strict comparison of recipients vs non-recipients was difficult. Non-recipients would be wealthier and more successful than average. In practice, however, the distinction between recipients and non-recipients proved limited. Efforts to target poorer and more food-insecure households were not consistently applied.

In sum, these surveys provide the most complete, independent view available, of the impacts of input relief programs in Zimbabwe. The findings mirror related, though more narrowly reported, results of surveys elsewhere in southern Africa.

4. The European Commission's Humanitarian Aid Office; Department for International Development, UK; and the USAID Office for Disaster Assistance, respectively.

Identification of Relief Seed Recipients

According to records maintained by the FAO Emergency Unit for Zimbabwe, NGOs distributed 984 825 packets of relief seed during the 2003/04 planting season. The aim was to assist these many small-scale farmers – approximately 40% of the country's 2.4 million smallholder households.[5] Almost all beneficiaries were situated in the communal farming areas. Few inputs were distributed by outside agencies into the newly resettled farming areas.

Most NGOs claimed they were targeting assistance to districts and wards with the largest number/proportion of farmers experiencing food production deficits, identified by the Zimbabwe Vulnerability Assessment Survey. In practice, however, many NGOs first targeted areas where they had been implementing development programs prior to the drought.

NGOs were expected to consult with district authorities to identify wards and villages most in need. In some districts, local authorities were actively involved in these decisions. But in many areas local authorities were either by-passed or were reluctant to turn away offers of additional assistance.

The FAO Emergency Unit sought to monitor the distribution of relief inputs in order to encourage provision or reallocation of assistance to areas that were under-supported relative to need. However, this required timely and accurate information from NGOs, about district and ward targeting. Tracking the distribution of assistance undoubtedly helped extend coverage to under-supported areas. But the information provided by many NGOs was often either late or inaccurate, because decisions about input distribution, particularly within districts, were commonly still being made even while distribution was in progress.

NGOs pursued several different strategies to identify beneficiaries. Most aimed to assist poorer small-scale farmers whose previous harvest had failed. In many communities, these were families already being assisted through food aid programs. In addition, NGOs commonly cited a list of proxy variables to identify poorer households. These included:

- female-headed farm households
- child-headed farm households
- farmers with no cattle or limited access to draft power
- farmers with limited cash income
- farmers with no access to off-farm employment
- families with high dependency ratios.

Debates arose about the need for a minimum level of farming resources necessary to make effective use of the inputs being provided. If a household had no access to draft power, how could it be expected to plant the relief seed? Some argued that households with severe labor constraints (eg AIDS-affected households) needed different sorts of assistance. Rather than inputs, they might be better off receiving irrigation packages to establish small-scale vegetable gardens. But it was more likely that these households would receive relief seed as well as micro-irrigation equipment.

Ultimately, the needy districts appeared to be well targeted – largely because FAO targeted the distribution of its own inputs to areas experiencing gaps in coverage. But targeting of poorer households within an area was less accurate. Female-headed households were just as likely to have received relief inputs as not (Table 4). Similarly, households with and without cattle, or with and without off-farm income, were equally likely to have received inputs. Recipients and non-recipients had similar dependency ratios. While there was much talk of targeting households affected by HIV/AIDS, many households with orphans did not receive assistance.

5. Alternatively, 57% of 1.7 million households, assuming an average household size of 6 members.

Table 4. Targeting input relief to poorer households, 2003/04 cropping season

	Households receiving relief inputs	Households not receiving inputs
Female-headed households (%)	53.5	49.9
Child-headed households (%)	0.5	0.0
Households without cattle (%)	45.8	42.7
Households without off-farm income (%)	52.7	52.9
Dependency ratio	1.12	1.03
Households with orphans (%)	14.8	9.1

Source: ICRISAT/FAO monitoring surveys 2004

There are several reasons for this apparent lack of targeting. In some communities, local leaders argued that inputs were wasted if provided to the poorest of the poor. They preferred that they be given to better-off households capable of increasing the total quantity of food harvested by the village. Poorer households would then be assisted by better-endowed neighbors. One NGO did provide a small subset of inputs to the relatively wealthier households, but this practice was not common. Several NGOs provided assistance to households with whom they had previously worked, regardless of their socio-economic status. More broadly focused agricultural development programs were supplemented, or temporarily replaced, with the distribution of free seed and fertilizer.

Another explanation is that NGO staff concentrated more on the logistics of distributing food aid and inputs, than on the selection of needy households. Many of these staff had to be newly trained. Most were relative newcomers to the area, and had not developed strong linkages with the local community.

Further, NGO field staff complained about the difficulties of implementing complicated targeting schemes. Farmers and village leaders were unhappy about the need for multiple meetings simply to identify and verify beneficiaries. For example, a meeting to announce the program, another meeting to review criteria for selecting beneficiaries, another to verify the list of beneficiaries selected. If these meetings had to be held in tens or even hundreds of villages, detailed dialog with the community was not practicable – and lack of dialog often led to objections about the criteria used.

The difficulties of targeting regions and then households within a region, contributed to a situation where individual households received multiple relief packages. Over 13% of relief recipients received seed from more than one NGO (Fig 2). Overlap of household coverage was limited in some districts, but substantial in others (Table 5).

Table 5. Households receiving relief inputs from two or more NGOs, 2003/04 cropping season

District	% of households receiving multiple seed packs
Hurungwe	4.1
Seke	0.0
Mutoko	1.5
Makoni	2.6
Chipinge	28.8
Mberengwa	21.3
Zvishavane	10.9
Mwenezi	17.7
Chivi	18.9
Gwanda	17.6
Insiza	9.9
Bulilimamangwe	11.4
Tsholotsho	24.7

Source: ICRISAT/FAO monitoring surveys 2004

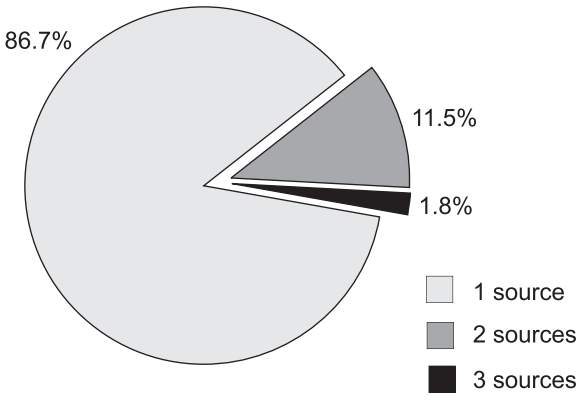

Figure 2. Proportion of recipients receiving relief seed from more than one source, 2003/04 season. Source: ICRISAT/FAO monitoring surveys 2004

Distribution of Relief Seed

The seed packages provided by different NGOs varied depending on the funds available, the quantities of seed available in the market, and the NGO's interest in promoting the production of one crop or another. Most NGOs sought to provide enough seed to plant at least one acre of food crops, although seed packages were sometimes divided into smaller units during the process of distribution in order to serve more households. Most seed packs included maize, because this is the main staple; but some NGOs sought to promote sorghum and pearl millet, which are more drought-tolerant. Most NGOs also sought to include a legume in their package, but shortages and high cost of seed limited the quantities of groundnut and cowpea distributed. At least one NGO also distributed sugarbean.

Ultimately, all recipients received seed of at least one cereal, and the majority received seed of two – maize and either sorghum or pearl millet (Table 6). About 70% of recipients, including those who purchased at seed fairs, received seed of a legume crop, most commonly cowpea.

Table 6. Relief seed distribution of different crops, 2003/04 (n=1235)

	% of recipients receiving each crop	Mean quantity received (kg), recipients of respective crop	Mean quantity received (kg), all recipients
Maize	88	10.8	9.5
White sorghum	70	4.8	3.4
Red sorghum	5	2.8	0.2
Pearl millet	51	2.6	1.3
Groundnut	21	2.6	0.5
Cowpea	51	2.9	1.5

Source: ICRISAT/FAO monitoring surveys 2004

The stocks of maize seed available on the market were generally adequate. NGOs could readily obtain hybrid maize seed, though supplies of OPV maize were limited. This is because prior to 2003 it was illegal to sell OPV maize seed in Zimbabwe. Seed companies preferred to sell hybrids, and the government believed hybrids offered higher productivity. Most farmers agreed, and readily adopted hybrids during the 1970s and 1980s; but price increases during the past 2 years have stimulated a growing interest in OPVs.

Available stocks of sorghum, pearl millet, groundnut, and cowpea seed were much more limited. As a result, most of the seed being sold was classified as standard grade. An unknown proportion consisted of grain purchased for re-sale as seed.

Seed Quality Assessment

One major problem for relief programs is there is generally not enough high quality seed available. They have two options: import seed that may or may not be adapted to local environments, or purchase locally produced grain for distribution as seed. In either case the risks of distributing poor quality seed are high.

Relief programs in Zimbabwe have the same problem. In 2002/03, over 150 tons of seed of a late-maturing, forage type of sorghum was mislabeled and distributed under the name of an early-maturing white-grained sorghum called Macia. It produced little or no grain. This seed was imported from South Africa, and distributed by several seed companies. One South African company claimed it originated in Mozambique. In previous years, poorly adapted sorghum and pearl millet seed had been imported from India and Egypt.

Recognizing these risks, ICRISAT and FAO studied the quality of relief seed being distributed in the 2003/04 season. NGOs were asked to provide samples from each seed lot. After repeated requests, most major NGOs provided samples, but these were not representative of the full range of seeds being distributed. In addition, ICRISAT and FAO collected samples from a cross-section of seed fairs.

NGOs provided a total of 373 seed samples, which were tested for germination at ICRISAT's laboratory in Zimbabwe. 240 samples were also sent for germination and purity tests, and 212 samples for seed health testing, at the national Seed Services laboratory in Harare. 225 samples were tested for varietal purity in ICRISAT grow-outs. These latter varieties had to have enough seed available for planting, adequate number of samples to warrant a grow-out, and variety names for which some standard check was available.

The results of germination tests are summarized in Table 7. An unexpectedly high proportion of the seed being distributed did not meet Zimbabwean standards. This included 22% of the maize samples provided by companies – though most of these samples were only marginally below standard. In general, legume seed was of poorer quality than cereals. Also, surprisingly, germination in some of the company samples was worse than that of samples provided by farmers.

Similarly, there were problems with physical purity of seed stocks. While the physical purity of maize was excellent, most other crops were more contaminated than expected (Table 8). The contaminants included sand, dirt, chaff, and dead seed. Again, the physical quality of company samples was not necessarily better than that of seed purchased by farmers at seed fairs.

Finally, ICRISAT conducted grow-outs to provide an approximate check on the genetic purity of relief seed. Unexpectedly, the seed obtained from companies was more variable than that obtained from farmers (Table 9). Variability was highest in pearl millet seed, whether from farmers (purchased at seed fairs) or from companies. There was variability in cowpea seed; farmers also complained that some of the seed they received was very late-maturing. The most serious error occurred in sorghum. While most seed of the Macia variety was pure, approximately 150 tons were wrongly labeled. Once again, one seed company sold seed labeled as Macia that turned out to be a late-maturing forage-type sorghum, and yielded little or no grain. After a lengthy investigation, they agreed to pay compensation.

Field assessments also revealed that a significant additional quantity of white sorghum labeled as Macia was, in fact, a mixture of varieties. One company had provided a disclaimer stating that its seed might not be pure. However, it did not expect the level of admixture we found. Farmers had added

Table 7. Germination tests on seed samples obtained from farmers and seed companies. Tested at ICRISAT laboratory, 2004

	No. of samples tested	Min. acceptable germination %*	Germination range %		% of samples below standard	
			Farmers	Seed companies	Farmers	Seed companies
Cowpea	69	75	21-99	64-92	29.6	40
Groundnut	40	60	50-100	41-91	3.0	14.3
Maize	18	90	64-100	88-100	77.8	22.2
Pearl millet	37	70	48-100	77-100	4.3	0
Roundnut**	10	75	20-82		80	
Sorghum	119	70	70-100	74-100	0	0
Sugarbean	20	70	30-94	54-94	30	30

*AREX Seed Services department

**Companies did not submit samples of roundnut

Source: ICRISAT/FAO seed quality assessment 2004

Table 8. Physical purity of relief seed samples obtained from farmers and seed companies. Tested by AREX, 2004

	No. of samples tested	Purity (%)		Minimum acceptable purity (%)*	% of samples below standard	
		Farmers	Seed companies		Farmers	Seed companies
Cowpea	31	90-99	97-100	98	40.0	8.2
Groundnut	5	99	94-99	98	0	33.3
Maize	8	99	99	99	0	0
Pearl millet	33	96-99	95-99	98	31.6	57.1
Roundnut**	6	92-100		98	16.7	
Sorghum	113	91-99	95	98	35.3	14.3

*AREX Seed Services department
** Companies did not submit samples of roundnut
Source: ICRISAT/FAO seed quality assessment 2004

Table 9. Genetic contamination in seed samples received from farmers and seed companies, 2004

	No. of samples tested		% of contaminated samples		
	Farmers	Seed companies	Farmers	Seed companies	Observed off-types
Cowpea	13	11	15.4	36.4	Grain color: mixtures of creamy brown, red, purple, and black speckles. Horizontal growth habit whereas IT18 has an upright, bunch type growth habit
Pearl millet	6	14	50	50	Mixtures of creamy white and gray grain for PMV3. Distinct differences in plant height, head size, and flowering
Sorghum	58	28	8.6	25	Plant color, head shape, flowering, plant height
Sugarbean	8	8	12.5	0	Grain color

Source: ICRISAT/FAO seed quality assessment 2004

grain to their seed deliveries to inflate quantities, and the trader had the incentive to purchase more seed than usual because of high demand from relief programs. The seed crop had been inspected in the field, but it was difficult to control what stocks were finally delivered. In effect, mixtures of grain and seed were sold to NGOs and ultimately distributed to farmers. Unfortunately, this practice is common for crops of limited interest to the larger companies.

The combination of these factors led to the drafting of a relief seed protocol for seed companies, donors, and relief NGOs. The protocol urges buyers to emphasize pure seed of well adapted varieties, even if it is more expensive. It is better to distribute smaller quantities of high-quality seed rather than large quantities of poor seed. By implication, tenders should not *necessarily* be awarded to the lowest bidder.

The protocol also calls for stricter labeling requirements for relief seed. This will help both NGOs and farmers better understand what type of seed they are receiving; and allow easier traceability of poor quality seed. Seed companies commonly refuse to accept liability for poor seed unless it can be traced to specific seed lots. However, if labeling fails to clearly state lot numbers, then even the opportunity to establish liability is compromised. Most labeling provided during the 2003/04 season was poor.

Farmer Knowledge of Seed Varieties Received

Farmers commonly look to relief programs as a source of new varieties, particularly in outlying rural areas with poor markets, or for non-commercial crops. Unfortunately, most farmers could not identify most of the seed varieties they received in 2003/04. In Hwange district, tracked early in the season, none of the 143 randomly selected recipients correctly identified the maize variety they received. They received an open-pollinated variety, Kalahari Early Pearl. It was variously identified as SC 201, SC 401, SC 501 (all hybrids), Monkey (hybrid), Short season (OPV), Bhabhadla (OPV), or unknown.

The problem in Hwange was severe, but not unusual. In the larger national sample, three-quarters of all farmers could not identify the maize varieties they received (Table 10). Even if labels gave the variety name, most farmers missed this information. Many failed to realize they were receiving OPVs. Virtually no farmers recognized what groundnut variety or what cowpea variety they were receiving. It appears that virtually none of the NGO staff distributing the seed sought to convey such information. In some cases, the NGO staff themselves probably did not know.

Table 10. Farmers' ability to identify the variety of relief seed being planted, 2003/04

	% of farmers unable to identify variety
Maize	75.8
White sorghum	58.4
Groundnut	88.8
Cowpea	90.5

Source: ICRISAT/FAO monitoring surveys 2004

The problems of variety recognition were compounded by two additional factors. Firstly, the seed was poorly labeled. In some cases, no labeling was provided. In others, labels did not specify the variety name – and if names were provided, the labels did not specify whether the variety was an OPV or a hybrid.

Secondly, much of the seed was in fact standard or common grade of mixed or unknown varieties. Most NGOs did not seem to understand this. In one case, a major purchase of sorghum seed was dropped because of questions about varietal purity, and replaced with a purchase of pearl millet seed that was probably grain cleaned to seed specification for germination and physical purity.

Quantities of Seed Planted

Farmers did not plant all the relief seed they received. The proportion planted depended on several factors including the severity of a household's seed shortage, interest in the crop provided, past experience with relief seed,[6] and availability of resources for planting.

Almost 90% of the maize seed received was planted; but one-third of the pearl millet and red sorghum seed was not planted (Table 11). This was probably because seed was distributed to farmers who do not normally grow these crops. While NGOs sought to promote drought-tolerant crops such as sorghum and pearl millet, many farmers preferred to accept the risks of growing maize. The grain yield data discussed below suggests these farmers were correct.

6. Distribution of poor quality sorghum seed in 2002/03 probably discouraged some farmers from planting in 2003/04.

Table 11. Planting of relief seed by recipient households, 2003/04

	% of relief seed planted	Mean quantity planted per recipient (kg)	Approx area planted per recipient (ha)
Maize	89.8	9.7	0.5
White sorghum	81.2	3.9	0.5
Red sorghum	67.9	2.9	0.4
Pearl millet	65.4	1.7	0.3
Groundnut	82.4	2.1	0.05
Cowpea	75.0	2.2	0.05

Source: ICRISAT/FAO monitoring surveys 2004

Another explanation is often given for the failure to plant relief seed: the seed arrived late. Most planting occurs between late Nov and mid Jan. The surveys revealed that a small number of NGOs were still distributing seed as late as Jan 2004 (Table 12). However, 72% of the relief seed for basic food crops (excluding vegetables) was distributed by the end of Nov, and over 90% by the end of Dec 2003. Farmers sometimes complain that they want to receive the seed earlier, but this is most likely because with early deliveries, they will not need to purchase seed.

Table 12. Timing of relief seed distribution (all crops), 2003/04

	% distributed	Cumulative % distributed
Aug-Sep	4.5	4.5
Oct	30.8	35.3
Nov	36.2	71.5
Dec	21.4	92.9
Jan	4.2	97.1
Feb	2.9	100.0

Source: ICRISAT/FAO monitoring surveys 2004

Rumors that farmers ate some of their seed are common, but the survey revealed little evidence of this practice. Most of the unplanted seed appears to have remained in stock. A small quantity was sold to neighboring households.

Alternative Sources of Seed

Another reason why farmers did not plant all the relief seed was because most of them had alternative sources of seed. Almost half of the relief recipients planting pearl millet, and two-thirds of groundnut recipients, also obtained seed from sources within the village (Table 13). If the household's own stocks

Table 13. Percentage of farmers (among those growing each crop) with seed from alternative sources, 2003/04 season

	Relief recipients			Other farmers		
	Own stock	Neighbors, relatives	Retail market*	Own stock	Neighbors, relatives	Retail market*
Maize	32.9	1.0	20.8	47.9	16.7	48.4
Sorghum	11.1	9.8	2.0	33.9	49.2	24.2
Pearl millet	29.1	14.2	2.6	47.4	37.8	16.3
Groundnut	38.7	22.4	13.6	47.0	28.9	24.4
Cowpea	18.7	11.3	2.8	36.4	44.4	12.1

*includes seed purchased from local grain markets and retail outlets, but not seed obtained from the government's Grain Marketing Board credit program

Source: ICRISAT/FAO monitoring surveys 2004

were exhausted, it could probably obtain seed from others in the village: borrow from neighbors or relatives, or purchase from the local grain market. More than half the farmers receiving relief maize seed also obtained seed either from their own stocks (implying that they recycle hybrid maize seed) or from local retail markets.

A comparison of seed sources among relief recipients and non-recipients indicates that relief seed substituted for seed that would otherwise have been obtained from the farmer's own stocks (saved from previous harvest), from neighbors, or from local markets. As noted above, the characteristics of recipients and non-recipients were similar – poorer and more food-insecure households were not consistently targeted. Therefore, we can infer where the relief recipients would have obtained their seed by examining what non-recipients did. The survey data in Table 13 suggest non-recipients made more use of their own stocks. When these were limited, they commonly sought seed in local markets.

Table 14 shows that for each crop, most recipients planted seed obtained from various sources. Only for cowpea did the majority of recipients depend entirely on relief seed. This may reflect the fact that stored cowpea (and hence local seed stocks) is susceptible to insect damage. But again, if relief seed had not been available, the majority of these households would probably have obtained seed from other sources.

Table 14. Reliance exclusively on relief seed, 2003/04 season

	% of recipients who relied entirely on relief seed
Maize	38.2
Sorghum	22.7
Pearl millet	44.7
Groundnut	16.1
Cowpea	52.5

Source: ICRISAT/FAO monitoring surveys 2004

Table 15. Mean area planted by recipients and non-recipients of relief seed, 2003/04 season

	Recipients (ha)	Non-recipients (ha)
Maize	0.87	1.10
White sorghum	0.40	0.35
Pearl millet	0.35	0.18
Groundnut	0.05	0.07
Cowpea	0.05	0.04
Total	1.72	1.74

Source: ICRISAT/FAO monitoring surveys 2004

Contribution of Relief Seed to Increasing Area Planted

Relief seed is commonly distributed to help drought-affected farmers re-establish themselves. Donors and NGOs generally assume that drought forces farmers to consume their seed stocks; and farmers often show visitors their empty granaries.

If this were true, then seed distribution should allow these farmers to expand the area they plant. Assuming the two populations are roughly equal, recipients of relief seed should plant more land than non-recipients. Yet the survey data show clearly that many farmers do not consume their planting seed. Even if some farmers in a community harvest little or nothing, they can usually obtain seed from neighbors or the local grain market. These farmers are pleased to receive seed from NGOs. Indeed, this seed reduces the need to look for alternative sources, and offers the possibility of obtaining new, higher-yielding varieties.

The survey data also show that recipients and non-recipients planted similar areas of major food crops (Table 15). Despite the fact that 35% of the pearl millet seed distributed under relief programs was left unplanted, it does appear to have contributed to an increase in millet area. But overall, relief seed probably contributed only marginally to any expansion of area.

Relative Contributions of Seed and Draft Power

Until recently, virtually all smallholder farmers in Zimbabwe employed animal traction to till their land, using two or more cattle in the wetter regions, and two or more donkeys in drier areas. In each case, four animals were preferred to two. Households without animals could readily borrow or rent draft power from their neighbors. However a series of droughts, economic problems, and HIV/AIDS have led to a decline in draft animal ownership. As Table 16 shows, 35 to 66% of households in the sampled districts own less than two draft animals, insufficient for a team. This has caused increasing delays in planting. More fields are being prepared by hand.

Table 16. Ownership of draft animals, 2004

District	% of households with less than 2 draft animals (ie, no draft team)
Hurungwe	61.4
Seke	66.3
Mutoko	58.5
Makoni	66.4
Chipinge	58.7
Mberengwa	35.6
Zvishavane	44.5
Mwenezi	62.1
Chivi	60.0
Gutu	58.8
Gwanda	49.2
Bulilimamangwe	50.4
Tsholotsho	47.1
Binga	55.3
Hwange	44.2

Source: ICRISAT/FAO monitoring surveys 2004

Farmers owning draft resources are at a clear advantage relative to non-owners, because they can plant their fields on a more timely basis. In addition, they generally plant larger areas – particularly important in a low-input cropping system – and thus obtain higher production. These relationships are apparent in the survey data. The main determinant of area planted to key crops was not access to relief seed, but ownership of draft power. Farmers owning two or more draft animals, compared to those who did not, planted almost twice the maize area, and overall, 60% more land to basic food crops (Table 17).

Table 17. Area planted (ha) by farmers with and without draft resources, 2003/04 season

	Owned ≥ 2 draft animals	Owned < 2 draft animals
Maize	1.19	0.66
White sorghum	0.41	0.37
Pearl millet	0.23	0.13
Groundnut	0.09	0.03
Cowpea	0.06	0.03
Total	1.83	1.16

Source: ICRISAT/FAO monitoring surveys 2004

By inference, efforts to expand area planted following a drought should concentrate less on distributing seed and more on improving access to draft power. NGOs could provide vouchers encouraging the sharing of available animals, perhaps in exchange for supplementary feed and veterinary care. Alternatively, relief programs should concentrate more effort on improving yield and yield stability (eg through better management) on a smaller area.

Distribution of Relief Fertilizer

Relief programs generally distribute only limited amounts of fertilizer, because it is expensive and bulky; and is considered to be of uncertain value in drought-prone regions. Farmers are not accustomed to applying fertilizer. There are reports of beneficiaries selling their fertilizer to neighbors, although such cases are uncommon.

During the 2003/04 cropping season, NGOs distributed an estimated 1553 tons of various compound fertilizers for basal applications and 6184 tons of top-dressing, mostly ammonium nitrate (AN). This was distributed among nearly 200 000 small-scale farmers. A small quantity of organic fertilizer was also distributed.

Proportion of Farmers Receiving Fertilizer

The post-planting survey results indicate that relief programs were the only source of fertilizer for the majority of users. Approximately 11% of small-scale farmers in the total sample applied basal fertilizer, and just over half of them received it from relief programs (Table 18). Most of the remainder obtained their basal fertilizer through loan programs linked with cotton production. Almost 17% of farmers used AN, two-thirds obtaining it through relief programs.

Table 18. Sources of chemical fertilizer (proportion of households), 2003/04 season

	From NGOs	From other sources	Overall
Basal	6.4% (9.2% of relief recipients)	5.0%	11.4%
Top dress	11.3% (16.1% of relief recipients)	5.5%	16.6%

Source: ICRISAT/FAO monitoring surveys 2004

Overall, almost 10% of the recipients of relief seed also received basal fertilizer and 16% received AN. However, based on the data collected by the FAO Emergency Unit, the survey appears to have undercounted the proportion of farmers receiving fertilizer top dressing; possibly because it was still being distributed at the time of the survey. Farmers who received relief fertilizer did not obtain additional supplies from other sources.

Three-quarters of the fertilizer users applied it to maize, even in the driest parts of the country. Another 7% applied it to watermelon, a small-scale cash crop in many areas. Only 4% applied it to white sorghum, groundnut, and cowpea; and very few to pearl millet.

Due to the small quantities being distributed, application rates were generally lower than commonly recommended. Recipients received an average of 22 kg of basal dressing and 18 kg of top dressing, in packages of 5, 10, 25, or 50 kg. Rarely did recipients receive more than 50 kg of chemical fertilizer.

Recipients applying basal fertilizer concentrated this on a small part of their maize at about half the rates recommended by the Department of Agricultural Research and Extension (AREX) (Table 19). AN top dressing was similarly concentrated,

Table 19. Application of relief fertilizer on maize, 2003/04 season

	Mean quantity used	Mean application rate
Basal	22.3 kg	76.5 kg/ha
Top dress	17.8 kg	62.1 kg/ha

Source: ICRISAT/FAO monitoring surveys 2004

and applied at about 60% of the AREX recommended rate. However, most farmers received either basal fertilizer or AN. Therefore, the levels of nitrogen being applied were generally less than 50% of AREX recommended levels.

ICRISAT attempted to encourage farmers to target their limited fertilizer stocks more effectively to plants, and thus achieve yield gains over a larger area. Recent on-farm trials had confirmed that farmers may be better off applying smaller quantities of nitrogen (in the form of AN) to each plant, rather than larger quantities to the full field.

Under a DFID-funded program, 25 kg of AN was distributed to each of 160 000 farmers, together with a pamphlet (in the local language) containing instructions on fertilizer application. It advised farmers to spread this AN to cover 1 ha of any cereal crop – an application rate less than one-fourth of officially recommended levels. Two-thirds of farmers described the pamphlet as useful. However, they tended to apply AN at higher rates than suggested in the pamphlet, possibly due to the ease of application over a small area.

Technical Crop Management Advice

Many NGOs indicated they would work with AREX to provide technical advice to the recipients of relief seed and fertilizer, to help improve production and productivity per unit of land or labor. In practice, however, these programs reached only a small proportion of farmers. Only 4% of recipients of relief inputs received advice from NGOs, despite the fact that many of the people handing out relief inputs were former extension officers (Table 20). Less than one-quarter of recipients received technical advice from any source. This helps explain why so few farmers understood what varieties of seed they were receiving. Lack of advice reduced the returns to fertilizer use.

Table 20. Farmers receiving technical advice on crop management, 2003/04 season

	% of relief recipients
Received advice from NGOs	4.0
Received advice from AREX	17.9
Received advice from any source	22.7

Source: ICRISAT/FAO monitoring surveys 2004

Fertilizer Impacts

Despite the variability of rainfall, chemical fertilizer made a substantial contribution to the improvement of maize yields. This gain was measured both through the farm surveys, and through more detailed measurements taken from on-farm demonstration plots run by farmers themselves. According to the surveys, fertilizer gave an average yield gain of 60% in maize and almost 100% in white sorghum (Table 21). Almost every farmer who applied fertilizer obtained increases.

ICRISAT worked with three NGOs to conduct more than 1200 on-farm demonstrations of the value of small doses of fertilizer. Approximately 1 acre plots were marked out, with the agreement that the farmer would apply about 10 kg of AN fertilizer on half the plot, and no fertilizer to the other half. The farmer could select a field with any crop, though the fertilizer was usually applied

Table 21. Mean grain yields (kg ha^{-1}) of farmers using chemical fertilizer, 2003/04 season

	Plots without fertilizer	Plots with fertilizer
Maize	710	1127
White sorghum	184	364

Source: ICRISAT/FAO monitoring surveys 2004

to maize. He/she could apply any management practice (planting date, weeding etc), but the same practices had to be applied to both sections. Harvest data were collected from each half of the field separately.

Despite the fact that fields were managed in widely varying ways, the results were consistent. Application of these small doses of AN increased grain yields by 25 to 78% in different districts (Table 22). More than 90% of participating farmers achieved yield gains.

Table 22. Mean maize yields (kg ha^{-1}) of farmers using small doses (approx 25 kg ha^{-1}) of AN, 2003/04 season

District	Plots without AN	Plots with AN	% yield gain
Mberengwa	665	1181	78
Bikita	690	959	39
Zaka	323	606	88
Hwange	604	754	25
Matobo	739	1062	44

Source: ICRISAT-led, farmer-managed demonstration plots 2004

These results show that for most farmers, relief fertilizer was much more profitable than relief seed. The 25 kg of AN commonly distributed, cost approximately Z$1500 kg^{-1}, including purchase cost, transport, as well as farm labor for applying it.[7] The post-harvest farmgate price for maize grain was approximately Z$750 kg^{-1}. In order to obtain a profit, farmers would have to obtain only 2 kg of extra grain for every kg of fertilizer applied. In fact, they often obtained 6-12 kg of extra grain per kg of fertilizer.

Grain Yields

The grain yields and harvest levels achieved by relief beneficiaries during the 2003/04 season were highly variable (Table 23), depending on location and crop management practices used. Some regions had relatively high and consistent rainfall while others suffered drought. The variability in maize yields, from 400 to 1000 kg ha^{-1}, was expected, give the variable rainfall. What was not expected was the consistently lower yields of both white sorghum and pearl millet.

Table 23. Mean yields (kg ha^{-1}) for major grain crops obtained by relief recipients, 2004 harvest

District	Maize	White sorghum	Pearl millet
Post-harvest estimates			
Mberengwa	1021	220	174
Zvishavane	1066	345	np
Mwenezi	421	191	171
Gwanda	637	216	110
Insiza	414	146	37
Bulilimamangwe	569	341	308
Tsholotsho	918	616	459
Pre-harvest estimates			
Kadoma	581	233	82
Buhera	483	234	115
Gutu	493	np	np
Binga	397	298	189
Nkayi	744	335	np
Hwange	597	291	162

np = not planted or inadequate number of observations
Source: ICRISAT/FAO monitoring surveys 2004

7. Total cost approximately US 28 cents at the exchange rate then prevailing.

Since sorghum and pearl millet are physiologically more drought-tolerant than maize, one would expect to see these crops outyielding maize in the more drought-affected areas. This did not happen, and no clear explanation is available. Moreover, these data are not unique. ICRISAT collected yield data in southern Zimbabwe after the drought-affected 2003 harvest as part of a variety adoption survey; and found that average maize yields were higher than those for sorghum or pearl millet – despite the severity of the drought.

There are several likely explanations that merit further investigation. Fertilizer is generally applied to maize rather than sorghum or pearl millet. This can substantially improve yields. Yet less than 7% of the maize plots received fertilizer. We also know from past experience that small-scale farmers plant maize on a timely basis. This is not simply a matter of planting early. It is even more important to plant within a few days of a major rainfall event, than to plant earlier in the season but well after the rainfall event.

Perhaps most importantly, weed control is likely to be better in maize. Again, this is not simply the number of weedings but also the timeliness of weeding relative to the level of weed growth. These sorts of relationships are difficult to measure during cross-sectional surveys covering large numbers of households.

Finally, the better performance of maize may be related to the higher-quality seed available through relief programs and on the retail market. One-third of the surveyed farmers recycled their maize seed, but they used both recycled and certified seed – most fields were planted with the latter. In contrast, sorghum and pearl millet are grown almost entirely from recycled seed.

Food Security Impacts

The contribution of relief programs to household food security can be measured in terms of the harvest per household. An average household of 6.5 members required approximately 1 ton of grain to meet its requirements for a year – consumption, seed, losses, and waste. This was achieved in only two of the 13 areas where harvest estimates were available (Table 24). Two additional areas had harvests of 700-900 kg per household. The remaining nine areas experienced serious production shortfalls.

Table 24. Grain harvest by smallholder households, 2004 harvest

	Mean grain harvest, kg per household
Post-harvest estimates	
Mberengwa	1727
Zvishavane	1638
Mwenezi	447
Gwanda	569
Insiza	478
Bulilimamangwe	463
Tsholotsho	871
Pre-harvest estimates	
Kadoma	733
Buhera	436
Gutu	490
Binga	637
Nkayi	574
Hwange	536

Source: ICRISAT/FAO monitoring surveys 2004

A high mean harvest implies the district as a whole may have adequate food. However, there will always be food-deficient households even in surplus districts because of poor rainfall, poor crop management, or lack of farming assets. The post-harvest survey results show that approximately one-quarter of households in the grain-surplus areas of Mberengwa and Zvishavane had severe deficits (Table 25). These were generally poorer households with limited farming assets – particularly draft power. They would normally be classified as chronically poor: likely to face food security constraints even under favorable rainfall conditions. In most cases, these food shortages will be resolved by working for neighboring households with grain surpluses.

Table 25. Households harvesting less than 500 kg of grain, based on post-harvest survey estimates, 2004

	% of households
Mberengwa	22.2
Zvishavane	29.2
Mwenezi	65.2
Gwanda	61.0
Insiza	76.2
Bulilimamangwe	71.8
Tsholotsho	36.8

Source: ICRISAT/FAO monitoring surveys 2004

Table 26. Mean number of months after June 2004 that grain supplies are expected to last – farmers' estimates

	No. of months
Mberengwa	8.0
Zvishavane	7.3
Mwenezi	4.1
Gwanda	4.9
Insiza	2.5
Bulilimamangwe	4.7
Tsholotsho	5.9

Source: ICRISAT/FAO monitoring surveys 2004

In the four districts that were most affected by the 2003/04 drought, two-thirds to three-quarters of all households faced severe food deficits. Since these districts are short of grain as a whole, food supplies must be imported. In most years these imports would be provided through normal market operations – movement of grain from surplus to deficit regions, or sale of commercially processed maize meal in local retail shops.

The survey results correspond with farmers' estimates of how long their grain supplies are expected to last (Table 26). In general, a 1 ton harvest should last at least until the beginning of the next season's green maize harvest, around February. An 8-month supply would last the family until, at least, March 2005. Thus, two of the seven areas for which post-harvest data are available appear to have reasonable grain stocks. Four areas have smaller stocks while one area, Insiza, appears extremely short of grain.

Distribution Methods

The easiest and most common way to distribute relief inputs is free, direct distribution. Unfortunately, this undermines commercial input markets. Seed companies, in particular, find it more profitable to sell seed to donors and NGOs than to invest in developing wholesale and retail market chains. They may sell (in bulk) in Zimbabwe this year, Mozambique the next, Angola the following year. Because relief programs have been consistently implemented over the past ten years, several companies have emerged that sell almost exclusively to NGOs. When the free seed distribution ends, at least temporarily, seed is unavailable on the rural market.

The sample of districts and households in this study were defined to test the relative impacts of alternative seed distribution strategies. The largest sample was of households receiving seed directly and free of charge. However, semi-purposive samples were also established of households receiving seed through vouchers redeemable at seed fairs, and through vouchers redeemable at retail shops, ie, it involved at least an implicit market transaction.

In practice, however, it was difficult to compare these three strategies because each was implemented differently by different NGOs. In some cases, implementation strategies seemed to depend more on the level and timeliness of funds available, and on the quality of field staff, than on the method *per se*.

Direct Distribution

The main advantage of direct, free seed distribution was that it was essentially the same process as food aid distribution. Field teams involved in food distribution needed little or no additional training to hand out seed, or fertilizer, on other days. Farmers similarly had little adjustment to make. This week they collected their food allotment, and next week their seed or fertilizer allotment. This probably speeded the distribution process, although there was no statistical relationship between the method of distribution and its timeliness.

As noted above, however, free seed undermined the development of seed markets. Few retailers stocked seed – especially if they expected an NGO might undertake free distribution nearby. Seed companies found it much more profitable to sell in bulk to relief programs, than to sell through wholesale and retail channels. Ultimately, retail seed trade was largely restricted to cities and larger business centers.

Another problem is that direct distribution is forces farmers to simply accept whatever seed is offered. In some cases, farmers received seed they did not want, or would never plant. In some districts, up to 50% of the relief seed of some crops was never planted.

Seed Fairs

Seed fairs were developed in East Africa as a means to cope with the lack of quality seed available on commercial markets. Paradoxically, seed fairs work best when ample seed is available on local markets – in which case relief seed may not be needed.

Seed fairs in Zimbabwe were first implemented under relief programs during the 2002/03 planting season. Donor interest encouraged more NGOs to try this method the following season. As might be expected, this led to considerable variation in implementation practice. Some NGOs restricted the access of commercial traders to the fair; others promoted company access to ensure the distribution of maize seed. Some set seed prices while others allowed farmers and traders to negotiate their own price.

In virtually all seed fairs, vouchers were distributed to needy households, who exchanged them for seed. This allowed farmers greater choice of what seed to 'buy'. As a result, a larger share of

the seed obtained through seed fairs, was planted. However, the degree of choice was sometimes limited. In a number of fairs farmers complained that they were being forced to purchase maize seed before they could obtain any other kind of seed. This left them with limited 'change' in vouchers with which to purchase seed of other crops. This practice seems to have been linked with promises made to commercial traders offering certified maize seed, that sales opportunities would be good. Correspondingly, the largest share of sales at seed fairs was commercial (generally hybrid) maize seed.

Another advantage is that seed fairs provide income to local seed sellers – income that remains within the community. This is believed to create an incentive for households to produce seed for their neighbors. Seed of a wider range of crops would be available for sale, increasing varietal and crop diversity. In fact, however, the large proportion of sales of commercial maize seed meant that much of the income went to external traders or companies. The impact on village seed production remains unknown.

While seed fairs are being encouraged as a means to promote the development of village seed markets, in practice they may be undermining these markets. Local markets have long provided a means for deficit households to obtain seed from their neighbors. Traditionally, most such transactions are free of charge. A neighbor donating seed this year may receive a donation next year when he/she falls short. More consistent transactions may involve barter exchanges of seed for labor. The seed fairs start to 'monetize' these transactions.

More problematically, NGOs tend to set prices at levels well above those prevailing in the informal market. The price of sorghum seed on the day before the fair may be only half of the price charged during the fair. NGOs justify the higher price as necessary to attract traders to the fair. Yet the higher price also encourages farmers with surplus seed to hold their stocks off the market, in the hope an NGO will intervene. At a minimum, the impact of seed fairs on traditional rural seed markets merits investigation.

Finally, though the training of seed fair organizers has highlighted the need to check seed quality, this is generally not done. In many fairs, virtually anyone with seed to sell is allowed to participate. In others, traders will be let in until the seed availability 'target' is reached. As a result, the quality of seed being traded was sometimes poor. Some seed samples were weeviled and diseased.

Vouchers Redeemable at Retail Shops

One NGO organized a system whereby needy households were provided vouchers redeemable at designated retail shops. Farm communities, in many cases, helped choose these shops. This was believed to promote retail seed trade and encourage farmers to look for seed in these shops even after the relief program ended.

In practice, this program operated little differently from direct distribution. The NGO purchased all the inputs and delivered them to each retail shop. Farmers received vouchers, but these were to be redeemed for pre-determined input packages. In some cases, in order to limit the possibility of vouchers being lost, they were handed out as farmers lined up to received their inputs.

Retailers were happy with the program because they earned a small fee for storing the inputs and facilitating the distribution. Some even stated they were over-rewarded for the limited effort. But it is unlikely this will encourage many retailers to stock agricultural inputs after the relief program ends.

Comparison of Approaches

The survey data suggest there was no significant difference between the three approaches in timeliness of input delivery, or quantity of inputs delivered per household. With seed fairs, a higher proportion of inputs distributed were actually used. There was no statistical difference in the average yields obtained with the inputs from the three types of programs.

The use of vouchers redeemable at retail shops offers the greatest potential contribution to input market development. However, this will not be realized until input suppliers and retailers each share some of the trading risk. Input manufacturers are reluctant – especially seed companies who would rather sell in bulk to donors or NGOs instead of selling smaller quantities through many retailers. For input suppliers, bulk sales to relief programs are clearly more profitable. And no company will try selling retail in communities where NGOs are distributing inputs for free. Market-oriented voucher programs probably cannot be implemented unless donors and NGOs make a transparent and common effort to move away from free handouts.

Seed fairs appear to offer a viable option for remote or isolated communities where retail sales are unlikely. (But there are few communities in Zimbabwe where hybrid maize seed and vegetable seed have not been previously sold.)

An alternative approach would be to link seed fairs with efforts to promote community seed production of crops of limited interest to commercial companies. One problem, however, is that community seed production can undermine efforts to promote commercial investment in new seed crops. In a recent case in Malawi, community seed production sponsored by NGOs was undermining the efforts of a commercial company to produce groundnut seed on a commercial scale. The community seed was of questionable purity and quality, but sold for half the price of the commercial seed. The company is considering whether to abandon production.

Most observers now accept the need to move away from free, direct seed distribution. It may take several years, however, to convince seed companies that donors are serious about this shift. Many will await NGO tenders in the hopes of earning more from less effort – if not in Zimbabwe, then through sales to neighboring countries. The Zimbabwean experience also suggests that further experimentation is needed with more market-oriented voucher programs. For example, vouchers should be exchangeable for a choice of agricultural inputs, not just seed. This changes the NGO's role from distributor of inputs to facilitator of market development.

Estimating Program Impacts

It is hard to estimate program impacts because of the difficulty estimating what the beneficiaries would have done if they had not received relief inputs. A rough answer is provided by comparing the performances of beneficiaries and non-beneficiaries. Since the two groups do not appear substantively different, despite partial NGO efforts at targeting, this comparison seems reasonable.

Seed Distribution Impacts

An upper estimate of the contribution of relief seed to production and food security is given by the area planted to relief seed, and mean yields obtained (Table 27). This assumes that recipients would not have obtained any seed from alternative sources – they would simply have planted less land, or none at all if they truly had no seed stocks. According to this calculation, the average household produced 500 kg of extra grain, valued at Z$450 000 or about US$85 at the exchange rates prevailing at harvest time. However, this clearly over-estimates the impacts. As discussed, the survey data suggest that much of the relief seed simply substituted for own seed stocks, or seed that would otherwise have been obtained through local seed markets; and relief seed did not significantly contribute to an expansion of cropped area.

Table 27. Benefits from relief seed, 2004 harvest – upper limit, assuming farmers had no alternative sources of seed

	Mean area planted with relief seed (ha)	Mean yield (kg ha^{-1})	Grain harvested (kg)	Value of harvest (Z$)
Maize	0.44	641	282	211 500
White sorghum	0.47	288	135	101 250
Pearl millet	0.33	173	57	42 750
Groundnut	0.01	439	4	6 600
Cowpea	0.08	405	32	85 300

Source: ICRISAT/FAO monitoring surveys 2004

A minimum estimate of the contribution of relief seed to household food security or income would be the value of the seed replaced. This is estimated at about Z$43 255 or US$8.16 per participant (Table 28).

If we assume that 20% of households are so chronically poor that they had no alternatives to relief seed, this allows a midway estimate: benefit of approximately US$20 per recipient. The benefit would have been greater if more, higher quality seed had been distributed, and if more farmers understood what varieties they were receiving.

Table 28. Benefits from relief seed, 2004 harvest – lower limit, assuming farmers used relief inputs to replace seed otherwise available through own stocks or purchases

	Mean quantity of relief seed received (kg)	Estimated replacement value of this seed (Z$)
Maize	9.5	25 175
White sorghum	3.4	5 400
Pearl millet	1.3	2 050
Groundnut	0.5	2 650
Cowpea	1.5	7 950

Source: ICRISAT/FAO monitoring surveys 2004

Seed Saved for 2004/05 Planting

Another indicator of the value of relief seed to households is the availability of seed for the next planting season. Despite the drought, the majority of households claim they have been able to retain seed stocks (Table 29). This includes almost 60% of maize growers (unexpected), 60-70% of white

Table 29. Farmers saving seed after 2003/04 season, for 2004/05 planting

	% of growers saving seed
Maize	57.6
White sorghum	61.3
Pearl millet	70.2
Groundnut	67.2
Cowpea	54.3

Source: ICRISAT/FAO monitoring surveys 2004

Table 30. Types of maize seed being saved from 2004 harvest for next planting, as reported by farmers

Variety	% of farmers saving seed
Named hybrids	81.4
Kalahari Early Pearl	5.2
Unknown varieties	30.0

Total >100% because some farmers saved multiple varieties
Source: ICRISAT/FAO monitoring surveys 2004

sorghum and pearl millet growers (more or less expected), and half to two-thirds of groundnut and cowpea farmers (marginally higher than expected, because these crops are more prone to insect damage and breakage).

The high proportion of farmers saving maize seed is a worry, because this is mostly hybrid seed being recycled. If hybrid seed is recycled for one generation, the yield loss will be small. However, recycling for two or more years can lead to large yield losses. Problematically, since most farmers did not know what maize varieties they received from relief programs in 2003/04, the identity of much of the seed being recycled is uncertain.

Table 30 shows that 80% of the farmers saving maize seed thought they were saving hybrids. This suggests the need for an education campaign about the risks of replanting hybrids, and a campaign to promote wider distribution of maize OPVs.

Fertilizer Impacts

The FAO Emergency Unit estimates, together with our survey data, suggest that nearly 300 000 households received small quantities of basal and/or top-dress fertilizer. Here, there is stronger evidence that relief supplies would not have been replaced by fertilizer purchases, because fertilizer is expensive and difficult to obtain on the rural market. Most of the fertilizer used by non-recipients was obtained through cash crop production schemes, particularly for cotton. The poorest households would generally not have participated in these schemes.

In view of this, one can be reasonably confident that the yield gains from fertilizer can be attributed largely to relief programs. The average fertilizer recipient obtained 334 kg of additional grain valued at Z$235 500 or US$44 (Table 31). The cost of supplying this fertilizer was approximately Z$60 150 per recipient, implying a net economic gain of Z$173 350 (US$33). The gains could be higher if more consistent technical support was provided along with the fertilizer. These farmers are effectively being introduced to a new technology offering higher marginal returns to lower-than-officially-recommended application rates. Over time, promotion of this technology could markedly improve crop yields and household food security in Zimbabwe.

Table 31. Mean value of relief fertilizer applied to grain crops, 2004 harvest

	Mean area to which fertilizer applied (ha)	Grain yield increase (kg ha^{-1})	Additional grain produced per recipient (kg)	Value of additional grain produced per recipient (Z$)
Basal	0.33	608	201	150 750
Top dressing	0.27	418	113	84 750

Source: ICRISAT/FAO monitoring surveys 2004

Lessons Learnt

Drought relief programs in Zimbabwe have evolved little over the past 20 years. Small packs of grain and legume seed are consistently being provided to as many farmers as possible. If funds permit, chemical fertilizer is also distributed. Efforts to monitor the impacts of these programs concentrate on checking whether inputs were delivered on a timely basis. In some programs, gross production estimates are used to infer improvements in household food security. But few efforts are made to calculate the true rate of return to these investments, or assess how the programs could be improved.

This study sought to make a more rigorous assessment. Without question, distribution of relief inputs generally contributes to improvements in smallholder welfare and food security. However, the magnitude of these improvements appears much smaller than what is possible. The following preliminary recommendations outline ways to improve these payoffs. As the analysis of the 2003/04 season survey data continues, these recommendations may be extended.

1. Distribute less seed, target the most needy households

Smallholder communities are generally better at maintaining seed stocks, even in the face of frequent drought, than is commonly believed. Most households have access to some seed. The common notion that farmers consume their seed in the event of drought is simply not true.

Local seed markets continue to operate to move seed from farmers with surpluses to those with deficits. These markets generally remain robust even after multiple years of drought. Correspondingly, the survey found little difference between recipients versus non-recipients of relief seed in area planted or in production levels.

Relief programs did provide access to new, improved crop varieties – if these were available. The problem is that seed stocks of most new varieties are limited. NGOs must choose between distributing large quantities of low-quality seed, or smaller quantities of high-quality seed of new varieties. Evidence of farmers' capacity to retain seed and make use of local seed markets suggests the value of promoting quality rather than quantity.

Another contribution of relief programs is to improve seed access to chronically poor households with limited capacity to purchase seed from their neighbors. Relief seed allows a farmer to avoid the expense of buying seed, or the embarrassment of having to beg for it from neighbors. It may give a farmer the option to replant if needed, following a drought spell. Many sought to renew their stocks with higher quality seed originating from commercial companies.

It is important to target relief seed to the small proportion of farmers who are chronically poor, and those who are relatively isolated within the community, and thus less able to borrow or purchase seed from neighbors. Poorer households can be readily identified as those with no cattle or donkeys. The poorest lack even small stock (goats, chickens). Households with weak community ties may include female-headed households, and poorer households affected by HIV/AIDS. [But NGOs should note that many female-headed households and households with orphans are not chronically poor.]

- Distribute smaller quantities of high-quality seed to a smaller subset of poorer farmers most in need. These can be identified, in the first instance, by their lack of draft animals. The poorest will lack even small stock.

2. Ensure that better quality seed is distributed

At least 120 tons of poorly adapted white sorghum seed were distributed during the 2003/04 season – labeled as a high-quality, early-maturing grain variety, but actually a late-maturing forage type.

The same variety had mistakenly been distributed the previous season. NGOs and seed companies had been warned, but the forage seed was imported nonetheless. By the time of the harvest, radio, television and newspaper reports were attacking NGOs for handing out bad seed and accusing them of trying to undermine Zimbabwean agriculture. Many farmers no longer trusted the value of what, in fact, is a high-quality variety. They had also become distrustful of relief seed. Seed companies paid compensation in 2003, and again in 2004. But the reasons for this mistake merit closer examination.

Seed companies maintain commercial stocks of varieties they believe they can readily sell. Maize seed was (and continues to be) amply available, relative to national requirements. Since most other seed crops are considered unprofitable, except for sales to relief programs, stocks are more limited. When tenders are offered for seed of these secondary crops, some companies purchase grain, clean it, check the germination, and then sell it as standard or common grade seed. The origins of this seed become blurred as companies trade stocks with each other. Donors and NGOs often are forced to choose between distributing this 'seed' or distributing nothing, for crops such as sorghum, pearl millet, groundnut, cowpea, and sugar bean. Sale of poor quality seed is reinforced by decisions to award tenders to the lowest bidder.

These problems could be controlled by stricter regulation. But strict application of national regulations would likely eliminate from the market, most seed stocks for crops other than maize. During emergencies, regulators relax their standards in order to facilitate the flow of seed. The problem is how to ensure farmers receive seed of 'adequate' quality as opposed to poorly adapted varieties. Supplying grain-sold-as-seed is usually better than supplying nothing at all. What most hurts farmers is distribution of imported, poorly adapted varieties.

Very strict regulation of all relief seed may be self-defeating – but seed imports ought to be strictly controlled, given the higher likelihood of poorly adapted varieties. Further, regulatory authorities ought to promote stricter labeling to ensure that NGOs and farmers know what seed they are getting. In parallel, the quality of relief seed being distributed must be monitored more closely.

The best way to ensure high-quality seed of well-adapted varieties is available, may be to establish seed security stocks. Zimbabwe is highly prone to drought, and relief seed will probably be required at least once every three years. Investments in multiplying and distributing new high-yielding varieties will have high payoffs. And the returns could be higher still, if subsidies for relief programs can be applied to dissemination of these varieties.

- Stricter control of seed imports of untested varieties.
- Stricter seed labeling requirements to ensure that donors, NGOs, and farmers know what seed they are receiving.
- Monitor the quality of relief seed being distributed, by testing samples for germination, physical purity, and genetic purity.
- Establish seed security stocks of well adapted varieties of crops of limited commercial interest.

3. Ensure farmers understand whether they are receiving hybrid or OPV maize seed

Most smallholder farmers in Zimbabwe have been growing hybrid maize for two decades – in fact sale of OPV seed was illegal until 2003. In recent years, high seed prices have led farmers to recycle hybrid maize seed. The 2003/04 input relief program provided a new opportunity for NGOs to distribute OPVs to small-scale farmers. Three varieties were widely distributed – but most recipients assumed they were receiving hybrids, or simply did not know what they were receiving. This was a lost opportunity.

Two major problems must be quickly resolved. If farmers continue to replant recycled hybrid maize seed, yields will quickly decline. Farmers need training on the risks of recycling, and access to seed – with a clear choice of both hybrids and OPVs. In addition, farmers interested in growing

and maintaining maize OPVs (and thus saving the cost of repurchasing hybrids each year) should be trained on how to maintain reasonably pure seed stocks when their neighbors are growing hybrids or alternative OPVs. The methods may be as simple as selecting seed from the center of a field.

- Help extension workers to provide farmer training, explaining the difference between the hybrid and open-pollinated maize varieties currently available.
- Improve farmers' access to a choice of hybrid and OPV maize seed.
- Help extension workers teach farmers how to maintain genetically pure seed stocks of OPV maize.

4. Use relief subsidies to distribute seed of improved varieties through local markets

Relief programs are a key channel for distributing seed of new varieties, for crops of limited interest to commercial seed companies. Most of the adoption of improved sorghum and pearl millet varieties in southern Africa, for example, was due to relief seed distribution. Similarly for maize varieties in Mozambique. But these gains are *ad hoc* and temporary – they occurred only because a new variety happened to be available. Once the relief program ends, these varieties are no longer easily available.

The opportunity to build national (and regional) seed markets is lost if seed is simply distributed free, directly to farmers. Retailers have no incentive to stock seed if a neighboring NGO will be distributing it free. Seed companies have little incentive to build wholesale and retail linkages if they can sell most of their stocks to a few donors or NGOs.

Recognition of the market distortions caused by relief seed distribution has led to growing interest in testing various sorts of voucher programs. Two such programs were implemented on a small scale in Zimbabwe during the 2003/04 season: (i) Vouchers were provided to targeted farmers, and could be redeemed for specified input packages at specified retail outlets. (ii) Vouchers could be redeemed at village seed fairs where any trader could offer seed.

The objective of relief programs is to improve food security; therefore there is justification for allocating at least part of relief-program subsidy to improve access to better varieties through local retail markets. This strategy is particularly appropriate for the many households that have the capacity to purchase seed, but lack access to high-quality seed or to new varieties. Once such retail linkages are established, subsidies can be varied depending on the level of need. Poorer households may receive higher subsidies (eg free vouchers) following seasons of drought, while their wealthier neighbors may receive only limited subsidies (eg vouchers with 20% discounts). Following a good season the subsidy could be eliminated, at least temporarily.

- Promote distribution of high-quality seed of suitable new varieties through voucher programs.
- Develop and test alternative strategies to link vouchers with efforts to expand retail seed markets.

5. Strengthen technical support and backstopping for input distribution

Though many NGOs claimed to provide technical support to backstop seed and fertilizer distribution, few farmers received such assistance during the 2003/04 cropping season. This is partly because NGOs expected national extension workers to provide most of this assistance, but did not provide sufficient additional resources. But also, NGO staff found themselves so occupied with the logistics of food and input distribution that they had little time to train farmers. And in some cases, NGO staff were simply not qualified to provide such training.

Most farmers did not even understand what variety they received. They did not know variety names or characteristics; many who received OPV maize seed for the first time thought they were receiving hybrids. Some NGOs provided technical advice in the form of pamphlets or flyers. But at least one of the flyers was so poorly translated as to be meaningless. In other cases, there was no follow-up to ensure the flyers were understood.

Ultimately, this is an opportunity lost. The returns to relief programs can be significantly improved with better technical support. But larger investments are required to provide this assistance to more farmers.

- Ensure all inputs have clear, easily understood labels. Seed packets should include variety name and characteristics.
- Coordinate stronger and more broadly focused crop management training programs with local, district, and regional AREX staff. Training should focus on how to correctly apply relief inputs.

6. Re-examine which sorts of inputs offer the highest payoffs

Relief programs emphasize seed distribution because (i) seed is conveniently divided into small units that can be easily distributed to hundreds of thousands of households, (ii) it is commonly assumed that the poorest households tend to consume their seed – thus it is expected that relief seed will help these farmers recover from climatic shocks, or at least to re-establish farming. Yet the evidence indicates that most farmers do not consume their seed, even following severe drought. In addition, farmers short of seed are commonly able to obtain stocks through the local market.

There is growing evidence of high and consistent payoffs to the application of even small quantities of nitrogen fertilizer, even in the driest and most drought-prone regions of the country. Biophysical simulations for Zimbabwe show that even in drought years nitrogen availability to plants is the main limiting factor, not water. By inference, plant growth will benefit more from adding nitrogen than from supplying water. These results are supported by survey data as well as data from on-farm demonstration trials conducted across the country.

The survey results also reveal that the key factor limiting the area of land planted by poorer households is not seed availability, but lack of draft power. Farmers owning 2 or more draft animals plant, on average, 80% more maize area and thrice as much groundnut area, compared to farmers without draft power. In the low-input systems now characteristic of smallholder agriculture in Zimbabwe, this translates to a 68% increase in grain harvests. Partly as a result of repeated droughts, approximately 50% of small-scale farmers no longer own the two or more cattle or donkeys necessary for a draft team. They are forced to rent or borrow draft resources from their neighbors; consequently their fields are usually smaller and planted late.

A key development question is how to efficiently provide plowing services to these farmers. One option is to encourage limited or no-till systems. Another (in areas with lighter soils) may be to develop tillage systems that require less animal power. Yet another option is to encourage more sharing of draft resources, perhaps by distributing vouchers that can be redeemed for draft power.

- In much of Zimbabwe, lack of soil nitrogen appears more limiting than lack of water, even in years of severe drought.[8] Distributing small packs of chemical fertilizer thus offers higher economic and food security gains than seed distribution.
- Extend crop management training to include conservation farming, low-till or no-till systems, water conservation techniques, micro-dose fertilizer application, manure treatment and application.

8. Similar results have been found in the Sahelian zone of West Africa. In some regions, however, soil phosphorus is more limiting than nitrogen.

- Provision of draft power can contribute more to the expansion of area planted, and household food production, than provision of seed. However, new strategies are needed to provide this assistance efficiently to large numbers of farmers.
- Households without access to draft power could also benefit from low-tillage technologies such as planting basins. However, these technologies must be carefully tested for performance and acceptability before they are promoted.

7. Improve targeting of households in need

NGOs applied various targeting strategies. Many aimed to assist the poorest and most food insecure, using proxy indicators (eg female-headed households, households with orphans, households without off-farm income, etc) chosen without analytical justification. Some simply assisted farmers they had been previously working with. At least one provided inputs to better-than-average farmers on the assumption that they could use the inputs most effectively to improve food security for the village as a whole.

The choice of targeting criteria depends on the objectives of the program. Regardless, to be effective, the criteria must be simple to implement. The complicated proxy variables cited by many NGOs proved difficult to implement in practice. The use of multiple criteria also appears to have increased the number of beneficiaries because different households qualified under different measures. Ultimately, the underlying logic of targeting was compromised.

The survey results indicated little relationship between production levels and many commonly used targeting variables – access to off-farm income, dependency ratio, presence of orphans in the household. Female-headed households do tend to plant and harvest less, but probably because many of these households do not own cattle. Yet some female-headed households are relatively wealthy, because of off-farm income.

The survey results clearly indicate that household food security (and poverty) are closely related to ownership of draft animals. Families with a draft team (2 or more cattle or donkeys) plant 60% more land and harvest 68% more grain than households without one; and are less likely to run out of grain in the months after the harvest. A second indicator of poverty is lack of small stock such as goats and sheep. A third indicator of extreme poverty is lack of chickens, though this proxy is complicated by the variable incidence of flock losses due to Newcastle disease. The use of only two variables – cattle ownership and goat ownership – seems likely to cover most of the poor. Non-cattle owners account for about half the poorer members of most communities. The poorest of the poor have neither cattle nor goats.

Whatever indicator is chosen should be openly discussed with local communities. During the 2002/03 planting season, many communities believed NGOs were linked with opposition political parties. This view was reinforced by uncertainty about how input recipients were chosen. This was less of a concern in 2003/04.

Interviews with key members of various smallholder farming communities suggest that local leaders want a greater say in the choice of recipients. If the selection criteria are well defined and understood, this participation can be positively directed.

- Complicated targeting criteria are difficult and expensive to implement, and may be less reliable than a few simple proxy variables for poverty and food security.
- Two simple variables for poverty and food insecurity appear robust: ownership of draft animals (cattle, donkeys) and ownership of goats. The former is essential for expanding cropped area; the latter is a supplementary indicator of wealth.
- Dialog with district and village authorities helps allay concerns about politicization of relief targeting, particularly if selection criteria are simple, transparent, and clearly defined.

8. External monitoring can help identify opportunities for improvement

Much monitoring of relief programs simply concentrates on measuring the level and timing of input delivery. Many (but not all) NGOs seek to prove they have delivered more inputs to more households on schedule. Impact estimates assume that all inputs are used – or that farmers would not have produced grain without relief assistance.

This report highlights some of the problems with these assumptions. In so doing, it exposes several constraints underlying existing performance monitoring systems. These observations need to be followed up in discussions with NGOs about better monitoring. The continuing involvement of external agencies in monitoring similarly offers a challenge to NGOs to improve their own measurement efforts. This is best pursued, however, as a learning process, not as an evaluation of NGO performance.

As relief programs continue to evolve, adding more complex objectives such as seed market development, crop management training, and capacity building, more complex monitoring systems will be required. This remains a challenge, but a necessary one to ensure the continuation of efforts to improve.

- Provide advisory assistance to NGOs to help improve their monitoring and evaluation efforts.
- Continue support for external monitoring aiming to identify opportunities for improving relief programs.

About ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political, international organization for science-based agricultural development. ICRISAT conducts research on sorghum, pearl millet, chickpea, pigeonpea and groundnut – crops that support the livelihoods of the poorest of the poor in the semi-arid tropics encompassing 48 countries. ICRISAT also shares information and knowledge through capacity building, publications and information and communication technologies (ICTs). Established in 1972, it is one of 15 Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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