The Distribution of Relief Seed and Fertilizer in Zimbabwe

Lessons Derived from the 2003/04 Season

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Executive Summary

Zimbabwe experiences severe drought every two to three years. In intervening years, parts of the country are periodically affected by floods. Correspondingly, the country frequently hosts drought or flood relief programs targeting the recovery of smallholder agriculture. The most common programs, involving the distribution of seed and fertilizer, have been implemented in one or another part of the country during at least ten of the 24 years since the country achieved its independence in 1980.

Zimbabwe experienced severe drought once again during both the 2001/02 and 2002/03 cropping seasons. Further, the impact of these recent droughts was measurably worsened by a rise in unemployment, high (100-500 percent) rates of inflation, a decline in gross domestic product, and an estimated 26 percent rate of HIV/AIDS incidence among adults. Further, maize import and price controls contributed to severe shortages of grain on both urban and rural markets. In past years, farm households have responded to drought by increasing their food purchases. In 2003, it was periodically difficult to find grain for purchase. Consequently, households were assumed to be more likely than usual to consume their limited seed stocks.

Despite the frequency of agricultural relief programs, little is know about their efficacy. Seed distribution is assumed to contribute to an expansion of cropped area. But it is difficult to find independent data measuring such gains. Fertilizer is assumed to increase production levels and productivity. But most relief programs simply assume these gains. Nonetheless, each year drought re-occurs, these programs are simply started afresh.

This study re-examines these assumptions. The analysis summarizes the results of three major farm surveys designed to assess the distribution of seed and fertilizer inputs following the 2002/03 season drought in Zimbabwe – during the 2003/04 cropping season. The analysis reveals that while the relief seed and fertilizer were generally well used, there remain substantial opportunities for improving the effectiveness and impact of these input distribution programs.

The targeting of households destined to receive relief needs improvement. While many of the non-governmental organizations (NGOs) distributing inputs identified explicit criteria for the selection of needy households, these lists were difficult to implement in practice. In consequence, there was little difference in the poverty levels of households that received relief inputs compared with those that did not receive these inputs. Many NGOs tried to target households affected by HIV/AIDS. Yet households with orphans, or female headed families were just as likely to have received relief inputs as male headed households or those without orphans.

Problems were also widely apparent in spatial targeting. Almost 15 percent of households received input packages from more than one non-governmental organization (NGO). In some districts, more than 25% of households received similar packages or relief inputs from multiple NGOs.

Targeting can be improved through better information sharing about the regional distribution of production losses and the spatial distribution 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 the ownership of cattle or donkeys for animal traction.

The distribution of seed does not appear to have contributed significantly to the expansion of cropped area. Instead, much of the relief seed appears to have replaced stocks available on local markets. This includes seed saved by many households from their previous harvest. Despite shortages of grain on the local market, and despite two consecutive years of drought, 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 season in more than two decades that relief agencies were allowed to distribute open pollinated maize varieties. While virtually all smallholders had adopted hybrid maize, the rising costs of this seed in recent years had led many to replant seed derived from their previous season's grain production. This was contributing to a decline in average maize yields. The delivery of open pollinated varieties offered farmers a cheaper, more sustainable, alternative. But unfortunately, most farmers receiving this seed had no idea whether they were getting hybrid or open pollinated varieties. Major investments are now required to teach farmers about the differences between alternative varieties.

The survey results also indicate that greater care needs to be taken to assure relief seed is of good quality. Much of the seed, especially for crops other than maize was of questionable origin. A significant share appeared simply to be grain cleaned to seed specification 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 was imported and distributed to farmers. This produced limited yields late in the production season (which fortunately was prolonged by late rains). In these cases, the recipients of relief seed would have been better off planting seed available on local markets. These problems were worsened by poor and incomplete seed labeling, and in some cases, wrong labeling.

The diagnosis of these problems has led to the drafting of a relief seed protocol calling for better labeling and the promotion of known varieties. These interventions alone, however, will not resolve the problem of shortages of important seed crops of limited interest to commercial seed companies. One additional solution is to encourage the establishment of seed security stocks for promising new varieties.

The study reveals that substantial gains in production and productivity were derived from the targeted application of small quantities of chemical fertilizer. More than 150,000 farmers received 25 kg of ammonium nitrate (AN), most with information about how to apply this in the form of micro-doses to a grain crop. Associated demonstration trials on more than 1400 fields highlighted an average yield gain of 30-50% derived from the application of only 10-20 kg N per hectare (about one-quarter the commonly recommended levels). Importantly, these gains appear consistent across regions and farmers. In effect, small doses of nitrogen-based fertilizer appear to offer much higher returns than the delivery of seed – particularly if this 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 draught power. Families owning cattle or donkeys planted 60 percent more land than those without. This is linked with an 80 percent average increase in grain harvests. These results suggest the need for introducing labor saving tillage systems, or special programs to resolve draught power constraints.

Larger gains can also be achieved by strengthening the technical assistance provided with these relief programs. Less than one-quarter of the recipients of relief inputs received any kind of extension advice. And the majority of these extension contacts occurred only once. Most farmers, correspondingly, could not identify what seed varieties they received – even if variety names were printed on the bags. An opportunity to educate farmers about new seed and production technologies was lost.

Finally, the study initiated an examination of the relative benefits of alternative distribution strategies, including a) direct input handouts to farmers, b) the distribution of seed and fertilizer using vouchers redeemable for designated input packages at rural retail outlets, and c) the distribution of vouchers redeemable at seed fairs. Direct handouts appear the easiest delivery method, but also the strategy most disruptive of rural markets. Rural retailers have little incentive to stock seed or fertilizer if they suspect an NGO will be handing out these inputs for free. The vouchers redeemable at local shops offered retailers a marginal payoff, but did not improve incentives to stock agricultural inputs because the redemption packages were pre-defined. In both cases, the predetermination of input packages was linked with the distribution of seed that was never planted. The seed fairs offered more choice, and generated income for local communities. A larger share of the seed derived from the fairs was planted. But the high seed prices offered in order to attract seed may have undermined the operation of traditional village markets. And questions remain about the quality of some of the seed flowing through these fairs. In general, more experimentation is warranted with voucher type schemes linked with the development of rural input markets.

Overall, the evidence strongly suggests that agricultural relief programs need to move away from an emphasis on handouts to encompass the pursuit of more explicit development goals. These programs may still target subsidized assistance to poorer households most severely affected by poor rains or socioeconomic constraints. Yet many of these households are likely to remain chronically poor unless they are more methodically assisted with improved varieties, better extension advice or strengthened markets. They will continue to need assistance during the next drought, and that following two years later. Larger, more sustained gains can be achieved by improving the quality of assistance, rather than concentrating, as most programs do today, on the numbers of households assisted, and the numbers of input packages delivered.

Contents

The 2003/04 Crop Input Distribution Program

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. National cereal grain harvests were estimated at 980,000 tons, approximately one-half the national requirement. The impacts of this production shortfall were worsened by foreign exchange shortages which limited the capacity of the government to import food grains. Severe shortages of maize, the country's main staple, led to sharp increases in local grain prices. The government sought to control grain price inflation by establishing price and grain movement controls over maize. But the combination of grain shortages and movement controls simply exacerbated the severity of food shortfalls in outlying rural areas.

The impacts of the 2002/03 drought were further complicated by several factors. First, this was a second consecutive year of drought. During the previous 2001/02 cropping season, rains had been even worse, leaving only 695,000 tons of grain harvest. Second, the decline in the national economy left an estimated 70% of the formal sector workforce unemployed. Third, approximately 26 percent of adults were believed to be infected with HIV/AIDS. This combined set of shocks reduced the capacity of households to cope with drought. Suggestions arose of the existence of a 'new variant famine' – whereby households facing multiple shocks are forced to sell more of their farming assets, reducing the capacity to recover farming operations 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 season drought, approximately US$19 million was spent on the provision of agricultural assistance to small-scale farmers. More than US$10.5 million of this was spent on the distribution of seed and fertilizer to 845,000 households (Table 1). Over 11,000 tons of seed and 8,000 tons of fertilizer were distributed free of charge by more than 30 different non-governmental organizations (NGOs). In addition, the government provided farmers access to maize seed on credit. Complementary programs assisted farmers with technical advice on crop production. And associated relief activities provided food aid, supplementary feeding, HIV/AIDS awareness training, borehole rehabilitation, and livestock support.

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

	Number of households	Number of people [a/]
Total population	2 382 507	10 432 131
Total number with cereal deficit	1 119 153	4 924 274
Total number receiving inputs	845 000	3 718 000

a/ These population estimates assume the average communal sector household has only 4.4 members, an estimated derived from the 2003 ZIMVAC surveys[1]. However, this estimate appears low. The 2004 ICRISAT Post-Planting Survey indicates an average household contains 6.7 members. If we only consider fulltime residents of the household, the mean number of members is 6.2 with a median of 6 members.

Source: FAO Emergency Coordination Unit, 2004.

The main objective of the seed and fertilizer relief programs being implemented by most NGOs was to help farmers re-establish their farming following the drought. As a

[1] Zimbabwe Vulnerability Assessment Committee. 2003. Zimbabwe: emergency food security and vulnerability assessment- April 2003. Harare: Zimbabwe Vulnerability Assessment Committee.

result of the two years of drought, many, if not most, farmers were assumed to have lost or consumed their seed supplies. Each family was correspondingly targeted with enough seed to plant at approximately a hectare of food crops. Fertilizer was provided to a sub-sect of farmers (as dictated by donor budget constraints) to improve production levels and productivity. Technical advice was funded to ensure these inputs were well used. Ideally, targeted farmers would be able to harvest enough grain to achieve self-sufficiency.

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

Monitoring Objectives

Approximately once every two to three years, Zimbabwe experiences severe drought over a significant part of the country. Drought is endemic to southern Africa. Correspondingly, Zimbabwe has hosted relief seed and fertilizer distribution programs during at least ten of the 24 years since the country gained independence – in 1980. And 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 tracks the distribution and receipt of inputs, and, if the timing permits, the level of production gains. Though donor and government investments in these "input relief programs" remain substantial, only rarely do these assessments ask how these programs can be improved.

The importance of more detailed assessments of input relief programs is highlighted by accumulating evidence that the quantities of seed lost in the event of drought are often over-estimated (Friis-Hansen and Rohrbach, 1993[1]; Rohrbach and Kiala, 2000[2]). Efforts are being made to better target households most in need. However, much uncertainty underlies questions about how best to identify which households are most in need of what sorts of agricultural 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 the distribution of free seed appears to undermine the development of retail markets for these inputs. While some NGOs are starting to experiment with alternative input delivery strategies, such as seed fairs and vouchers redeemable at retail shops, there are no comparisons of these efforts.

Finally, uncertainty persists regarding payoffs to the collateral distribution of chemical fertiliser and crop management advice. Small quantities of seed are easy to distribute to large numbers of farmers. Yet larger and more sustainable gains in food security may be obtained through the promotion of improved crop and livestock management technologies.

This study examines several of these questions with the aim of highlighting opportunities for improving the distribution of agricultural inputs under drought relief programs in the future. First, the analysis assesses the practices NGOs commonly use to target households in need of relief inputs such as seed and fertilizer. This asks the question, how might targeting be improved?

Next, the study examines the relative contributions of relief seed to improving household production levels and food security. This includes consideration of the severity of seed quality problems, as well as the issue of how much seed is really needed.

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[1] Friis-Hansen, Esbern and Rohrbach, David. 1993. Impact assessment of the SADC/ICRISAT drought relief emergency production of sorghum and pearl millet seed. ICRISAT Southern and Eastern Africa Program Working Paper Number 1. Bulawayo: ICRISAT.

[2] Rohrbach, David D. and Kiala, David. 2000. Development options for local seed systems in Mozambique. SEPP Working Paper No. 5, Hyderabad, ICRISAT.

The analysis then considers the relative contributions of chemical fertilizer to improving production and food security during the 2003/04 cropping season. This highlights the trade-off between supplying seed and fertilizer.

Finally, lessons are drawn for input distribution under drought relief programs in the future. These are relevant both in Zimbabwe and in neighbouring countries.

Sample Frame and Data Collection Plan

Three major farm surveys were employed to collect data necessary for this assessment of agricultural input distribution programs implemented in the context of humanitarian relief initiatives.

Post-Planting Survey 1 - An initial post-planting survey was implemented in January-February 2004. This collected information on what agricultural inputs were received through the relief programs, and how these were used. A sample frame was established from a listing of all districts in the country wherein at least 50% of the population experienced a cereal grain deficit in 2003[1]. These districts were then divided into three groups with significant programs of a) free, direct input distribution, b) seed fairs, and c) input distribution through retail traders. Four districts were then randomly chosen from each grouping. One additional district was chosen to broaden the sample of households receiving seed through direct distribution – the most commonly employed method of input dissemination.

The second sampling stage involved selection of the wards. Three wards were randomly selected in each district – two wards served by NGO programs, and one ward that had received no relief inputs. In order to enhance the diversity of the sample, the two recipient wards were chosen on the basis of having received assistance from different NGOs.

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 from the village list. In each village, 28 households were randomly selected from a listing of families receiving agricultural relief inputs, and 12 households were randomly selected from a listing of families that had not received relief inputs. Thus, 40 households were sampled in each selected village.

This survey ultimately targeted a national sample of 1 560 households distributed across 13 districts in the country. However, the disaggregation of wards and households between recipients and non-recipients proved difficult to implement. In many cases district authorities did not have accurate information about the distribution of NGO activity in their areas. Ward councilors and village headmen also did not have accurate information about which villages and households received assistance. The difficulty identifying recipients and non-recipients was worsened because several NGOs shifted their targeting during the course of input distribution – depending on the number of input packages received, and evolving information about the activity of 'competing' NGOs. In consequence, 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 distributed across 6 additional districts allowing a firmer basis for generalization of the survey results.. The survey collected most of the same information as *Post-Planting Survey 1*, and added initial estimates of crop harvest levels.

Given the difficulties encountered in the identification of wards, villages and households in the first post-planting survey, a simpler sampling procedure was employed. 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, 28 households were randomly selected from village lists of households receiving inputs, and 12 households were randomly selected from village lists of

[1] Zimbabwe Vulnerability Assessment Committee. 2003.

households that did not receive inputs. Again, village lists were not always accurate and this targeting proved approximate.

Post-Harvest Survey - A post-harvest survey collected information on the crop harvest, and the impacts of the relief programs on household food security. This was carried out in June-July 2004, after virtually all of the main crop harvest had been completed. This 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.

These formal surveys were reinforced by periodic reconnaissance surveys conducted before and during the agricultural season, as well as semi-structured discussions with informed observers.

The distribution of this sample frame is outlined in Figure 1.

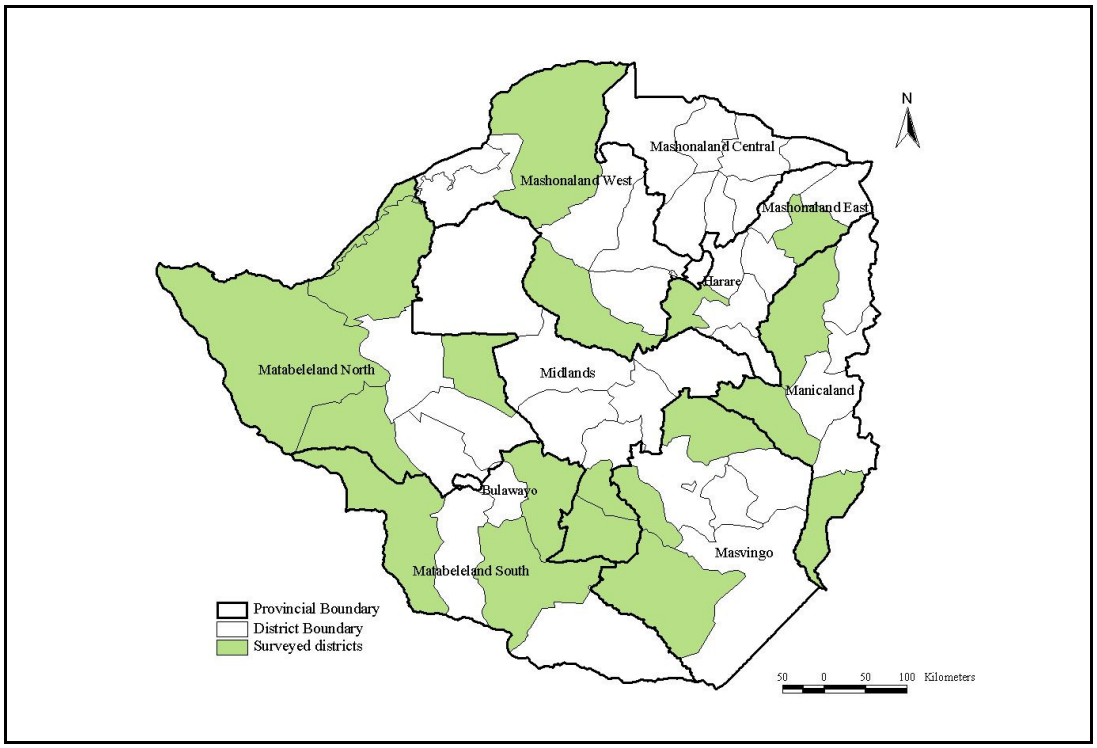

Figure 1. Distribution of sample frame for monitoring surveys of agricultural input relief programs, 2004.

The total sample frame is summarized in Table 2.

Table 2. Targeted Sample Frame for Relief Input Surveys, 2004

Free direct input distribution	Input distribution through seed fairs	Input distribution through retail shops	No seed distribution
Post-Planting Survey 1 (n=1 560)			
Hurungwe (2 wards) Seke (2 wards) Mutoko (1 ward) Makoni (1 ward) Chipinge (2 wards) Chivi (1 ward) Mwenezi (1 ward) Mberengwa (1 ward) Zvishavane (1 ward) Gwanda (2 wards) Bulilimamangwe (2 wards) Insiza (1 ward) Tsholotsho (1 ward) 720 households	Mutoko (1 ward) Makoni (1 ward) Insiza (1 ward) Tsholotsho (1 ward) 160 households	Chivi (1 ward) Mwenezi (1 ward) Mberengwa (1 ward) Zvishavane (1 ward) 160 households	Hurungwe (1 ward) Seke (1 ward) Mutoko (1 ward) Makoni (1 ward) Chipinge (1 ward) Chivi (1 ward) Mwenezi (1 ward) Mberengwa (1 ward) Zvishavane (1 ward) Gwanda (1 ward) Bulilimamangwe (1 ward) Insiza (1 ward) Tsholotsho (1 ward) 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) Mberengwa (1 ward) Zvishavane (1 ward) Gwanda (2 wards) Bulilimamangwe (2 wards) Insiza (1 ward) Tsholotsho (1 ward) 360 households	Insiza (1 ward) Tsholotsho (1 ward) 80 households	Mwenezi (1 ward) Mberengwa (1 ward) Zvishavane (1 ward) 120 households	Mwenezi (1 ward) Mberengwa (1 ward) Zvishavane (1 ward) Gwanda (1 ward) Bulilimamangwe (1 ward) Insiza (1 ward) Tsholotsho (1 ward) 280 households

Ultimately, 2 040 different households were targeted in the two post-planting surveys, and 2 073 households were interviewed (Table 3). Eight hundred and forty households were targeted for re-interview in the post-harvest survey, however only 752 of these farmers could be found. Many of these respondents had traveled to other parts of the country to visit friends and family members immediately after the harvest.

Table 3. Actual distribution of sample households

	Households receiving free inputs from NGOs	Households not receiving relief inputs
Targeted Post-Planting	1 120	920
Actual Post-Planting	1 320	753
Targeted Post-Harvest	392	448
Actual Post-Harvest	476	276

The original sample plan called for a distribution of approximately 55% recipients and 45% non-recipients in order to have a strong basis for comparison allowing

assessment of the impacts of the relief inputs. In practice, both the post-planting and post-harvest samples encompassed approximately 64% recipients.

Issues of Interpretation and Bias

The surveys and underlying sample frames were explicitly designed to assess opportunities for improving the distribution of seed and fertilizer by NGOs under the relief programs during the 2003/04 planting season. Correspondingly, this was *not* a random sample of all households receiving input relief. Districts and wards were selected to include households who had received relief from different NGOs under different distribution procedures. The sample also targeted areas of the country where the effects of the 2002/03 season drought had been relatively more significant.

Strictly speaking, the sample frame does not allow generalization across all smallholder households. However, the sample is large and diverse enough 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.

Since the post-harvest survey was restricted to the southern districts of the country, the harvest results, and associated statements of program impacts represent these sub-populations only.

Nonetheless, these results are probably more indicative of the impacts of the input relief programs than the evaluation efforts conducted by individual NGOs. This is because the surveys were conducted by field personnel with no vested interest in the result. And the assessment of efforts of many different NGOs allowed a broader evaluation of impacts accounting for the variability of distribution strategies. Importantly, the inclusion of a complementary sample of households that did not receive relief inputs 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 results of neighboring households who did and who did not receive assistance.

Any survey of the impacts of relief programs inevitably faces biases associated with the expectation of free handouts. Farmers may overstate the size of their production deficits or underestimate the size of their harvest in order to avoid being excluded from future relief programs. Fears of retribution could also have led to an underestimate of the quantities of relief seed left unplanted or amounts consumed. 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 also obtained seed from neighbors or the local market. Many recipients of relief inputs 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 households in most need of relief, a strict comparison with households that did not receive relief inputs is difficult. Farmers who did not receive inputs 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 inconsistently applied.

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

Identification of Relief Seed Recipients

According to records maintained by the office of the FAO Emergency Unit for Zimbabwe, 984 825 known packets of relief seed were distributed by NGOs in Zimbabwe during the 2003/04 planting season. These were targeted to assist a similar number of small-scale farmers – approximately 40% of the country's 2.4 million smallholder farm households[1]. Almost all of these households were situated in the country's communal farming areas. Few inputs were distributed by outside agencies into the nation's newly resettled farming areas.

Most NGOs claimed they were targeting assistance to districts and wards with the largest number or proportion of farmers experiencing food production deficits as defined by the Zimbabwe Vulnerability Assessment Survey (ZIMVAC). In practice, however, many NGOs first targeted areas of the country where they had been working on 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 took an active involvement in these decisions. However, in many areas, local authorities were either by-passed or they 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 the extension or reallocation of assistance to areas of the country that appeared to be under-supported relative to need. However, the success of this enterprise critically depended on the timeliness and accuracy of information about district and ward targeting provided by NGOs. This tracking of the distribution of assistance undoubtedly helped extend coverage to under-supported regions of the country. But the information provided by many NGOs was commonly either late or inaccurate. This is because decisions about input, particularly within districts, were commonly still being made during the course of the distribution effort.

NGOs pursued several different strategies to identify the farmers they targeted for the distribution of relief inputs. Most aimed to assist poorer, small-scale farmers whose harvest had failed the previous season. In many communities, these were families being assisted through food aid programs. In addition, NGOs also commonly cited a list of proxy variables for the identification of poorer households. These included:

- female-headed farm households
- child-headed farm households
- farmers with no cattle or limited access to draught 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 agricultural inputs being provided. If a household had no access to draught power, how could it be expected to plant the relief seed. Some argued that different sorts of assistance were required for households with severe labor constraints, including some affected by HIV/AIDS. Rather than providing inputs for field operations, these farmers might be assisted with small-scale irrigation packages for nutrition gardens. But it was more likely these households would receive both the relief seed and the assistance with micro-irrigation equipment.

[1] or 57% of 1.7 million households assuming an average household size of 6 members

Ultimately, the targeting of needy districts in the country appeared good. This is largely because FAO targeted the distribution of its own inputs to areas experiencing gaps in coverage.

However, the targeting of poorer households appears to have been less accurate. Female-headed households were just as likely to have received relief inputs as not (Table 4). Similarly, households with and without cattle were equally likely to have received relief inputs. Farm households with access to off-farm income were equally likely to have received inputs as those without. Both relief recipients and neighbors who did not receive relief had similar dependency ratios. While there was much talk of targeting households affected by HIV/AIDS, many households with orphans did not receive assistance.

Table 4. Evidence of targeting of input relief to poorer farm households, Zimbabwe, 2003/04

	Farmers receiving relief inputs	**Farmers not receiving relief inputs**
Female-headed households (%)	53.5	49.9
Child-headed households (%)	0.5	0.0
Households with no cattle (%)	45.8	42.7
Households with no off-farm income (%)	52.7	52.9
Dependency ratio	1.12	1.03
Households with orphans (%)	14.8	9.1

Source: ICRISAT Monitoring Surveys for 2003/04 Input Relief Programs

The reasons for this result are varied. In some communities, local leaders argued that inputs were wasted if provided to the poorest of the poor. They claimed that inputs should be provided to better households capable of increasing the total quantity of food harvested in the village. Poorer households would then be assisted by these better endowed households. One NGO did provide a small subset of inputs to these 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 working in areas of the country where they were not familiar. As a result, the strength of linkages with some local communities was limited.

Further, NGO field staff complained about the difficulties encountered implementing complicated targeting schemes. Farmers and village leaders expressed unhappiness about the need multiple meetings simply to identify and verify which households should receive assistance – e.g. a meeting to announce the program, a meeting to review criteria for the selection of targeted households and collect lists of qualifying households, and a meeting to verify the lists of qualifying households. If these meetings had to be held in tens or even hundreds of villages, less dialogue was

feasible. In this context, questions about the ultimate criteria used in targeting commonly arose.

The difficulties of targeting both regions and households within regions contributed to the distribution of multiple input packages to individual households. Over 13 percent of the recipients of input relief received seed from more than one NGO (Figure 2). Almost 2% received input packages from 3 different NGOs. In some districts the overlap of household coverage was limited. But in others, there was much more substantial overlap (Table 5).

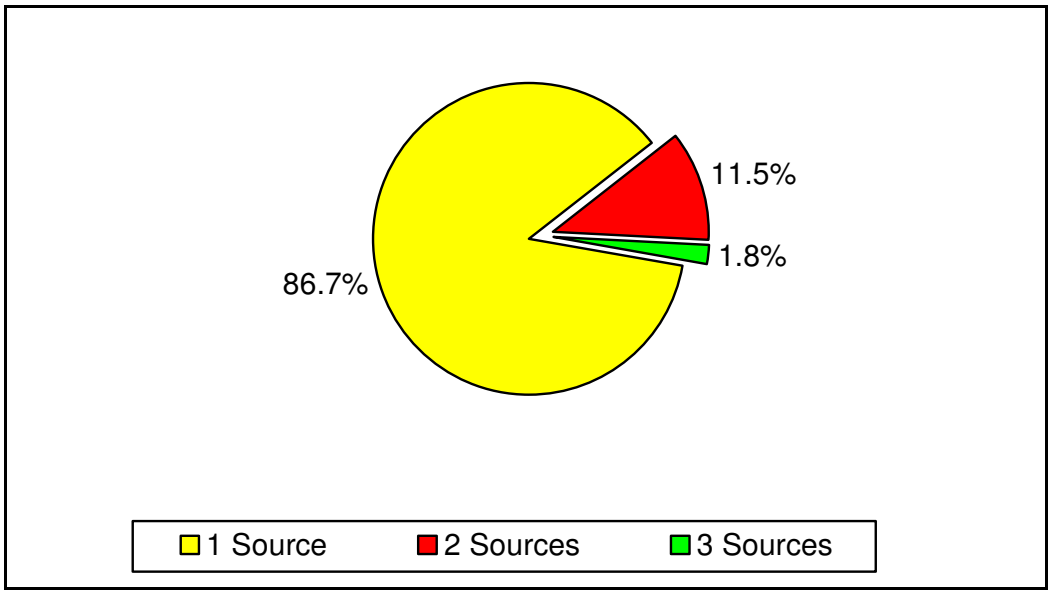

Figure 2. Proportion of recipients receiving relief seed from more than one source in Zimbabwe, 2003/04 season.
Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

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

District	**Proportion 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 for 2003/04 Input Relief Programs

Distribution of Relief Seed

The seed packages provided by different NGOs varied depending on the resources available for seed purchase and distribution, the quantities of seed available in the market, and the interest of the NGO 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. Though in some cases seed packages were divided into smaller units during the process of distribution in order to serve more households. Most seed packs included maize seed, because this is the main national staple. However, some NGOs sought to promote the distribution of sorghum and pearl millet instead of maize, because these are more drought tolerant crops. Most NGOs also sought to include a legume in their package. But shortages of legume seed, and the high cost of these seeds, limited the quantities of groundnut and cowpea distributed. At least one NGO also distributed sugar bean.

Ultimately, all recipients received seed of at least one type of cereal grain, and the majority received seed of two different grain crops – most commonly both maize and either sorghum or pearl millet (Table 6). Approximately 70% of the recipients received seed of a legume crop – most commonly cowpea. This includes the seed farmers purchased during seed fairs.

Table 6. Proportion of farmers receiving relief seed and mean quantity received in 2003/04 (n=1235)

	Proportion of recipients receiving seed of each crop (%)	**Mean quantity received by recipients of each seed crop (kg)**	**Mean quantity received by all recipients of relief seed (kg)**
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 for 2003/04 Input Relief Programs

The stocks of maize seed available on the market were generally adequate. NGOs could readily obtain hybrid maize seed, though supplies of open pollinated maize seed were limited. This is because prior to 2003 it was illegal to sell open pollinated maize seed on the Zimbabwe market. Seed companies preferred to sell hybrids, and the national government believed that hybrids offered farmers higher productivity. Most farmers agreed and readily adopted hybrid maize seed during the 1970s and 1980s. However, the rising prices of hybrid maize seed during the past 2 years has stimulated a growing interest in open pollinated varieties.

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 was made up of grain purchased for re-sale as seed.

Seed Quality Assessment

One of the main problems with relief seed programs is there is generally not enough high quality seed available for distribution. Seed companies and buyers then face two options. Either they import seed that may or may not be adapted to local

environments, or they purchase locally produced grain for distribution as seed. In either case the risks of providing poor quality seed to farmers are high.

The seed relief distribution programs in Zimbabwe have been no exception. In 2002/03, over 150 t of seed of a late maturing, forage type of sorghum was mis-labeled and distributed under the name of an early maturing white grained sorghum called Macia. This seed was imported from South Africa, and distributed by several different seed companies. One South African company claimed it originated in Mozambique. The seed ultimately provided little grain harvest. In previous years, poorly adapted sorghum and pearl millet seed had been imported from India and Egypt.

Recognizing these risks, ICRISAT/FAO initiated an assessment of the quality of seed being distributed under the 2003/04 season relief programs. NGOs were asked to provide samples from all of the seed lots they were distributing. After repeated requests, most major NGOs provided seed samples, however, 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.

A total of 373 seed samples were received from NGOs. All samples were tested for germination at an ICRISAT laboratory. In addition, 240 samples were sent for germination and purity tests, and 212 samples were sent for seed health testing, at the national Seed Services laboratory in Harare. A total of 225 samples were tested for varietal purity in grow outs. Entries selected for grow outs had to have adequate seed quantities for planting, adequate number of samples to warrant a grow out, and variety names for which some standard check was available.

The results of the germination tests for the major seed crops distributed are summarized in Table 7. A unexpectedly high proportion of the seed being distributed did not meet minimum national standards. This included 22 percent of the maize samples provided by companies – though most of these samples were only marginally under the minimum acceptable level. In general, the seed of legumes performed more poorly than the grains. Also, surprisingly, the germination efficiency of some of the seed provided by commercial seed companies was worse than that provided by samples received from farmers.

Table 7. ICRISAT laboratory germination results for seed obtained from farmers and seed companies, Zimbabwe, 2004.

Crop	**No. of samples tested**	***Min. acceptable germination (%)**	**Germination range (%)**		**Proportion of samples below min. standard germination (%)**	
			Farmers	Seed companies	Farmers	Seed companies
Cowpeas	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
Sugar beans	20	70	30-94	54-94	30	30

*AREX Seed Services department
Source: FAO/ICRISAT Seed Quality Assessment, 2004.

Similar concerns about seed quality were raised by the tests of the physical purity of the seed stocks. While the physical purity of the large seeded maize was excellent, seed stocks of most other crops were more contaminated than expected (Table 8). The contaminants included sand, dirt, chaff, and dead seed. Again, the physical quality of the seed obtained from companies was not necessarily better than that obtained from farmers in the context of seed fairs.

Table 8. AREX purity results for seed obtained from farmers and seed companies, Zimbabwe, 2004.

Crop	Total no. of samples tested	Purity range (%)		*Min. acceptable purity (%)	Proportion of samples below min. purity (%)	
		Farmers	Seed companies		Farmers	Seed companies
Cowpeas	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
Source: FAO/ICRISAT Seed Quality Assessment, 2004.

Finally, ICRISAT conducted grow-outs to provide an approximate check of the genetic purity of the relief seed. Unexpectedly, the seed obtained through companies was more variable than that obtained from farmers (Table 9). The pearl millet seed from both farmers (provided in the seed fairs) and companies was most variable. The variability of the cowpea coincided with the complaints received from farmers about the very late maturity of a portion of this seed stock. The most serious error occurred in sorghum. While most of the seed of the Macia variety was pure, approximately 150 t of seed were found to be wrongly labeled. Once again, one seed company sold seed labeled as Macia that turned out to be a later maturing forage type sorghum crop. This again provided little or no harvest to most recipients. After a lengthy investigation, this seed company paid compensation for its mistake.

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 encountered. Farmers had added extra grain to their seed deliveries in order to take advantage of the higher seed price. Since the demand from relief programs for this seed was high, the trader faced an incentive to purchase more seed than usual. While the seed crop had been inspected in the field, it was difficult to control what stocks were finally delivered. In effect, mixed grain and seed crops were sold to NGOs and delivered to farmers. Unfortunately, this sort of supply strategy is too common for seed crops of limited commercial interest to the larger companies.

The combination of these factors led to the drafting of a relief seed protocol listing a set of obligations for both seed companies and donors or NGOs purchasing seed. This called on seed buyers to prioritize the distribution of pure seed of well adapted varieties, even if this means the seed will be more expensive. The delivery of smaller quantities of higher quality seed is better than the distribution of large quantities of

poor quality seed stocks. By implication, tender awards should not **necessarily** be offered for the cheapest seed.

Table 9. Level of genetic contamination of seed samples received from farmers and seed companies for cowpeas, pearl millet, sorghum and sugarbean, Zimbabwe, 2004.

Crop	No. of samples tested		Percent of contaminated samples		Observed offtypes
	Farmers	Seed companies	Farmers	Seed companies	
Cowpeas	13	11	15.4	36.4	Grain colour of 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 grey grain for PMV-3. Distinct differences in plant height and head sizes and flowering
Sorghum	58	28	8.6	25	Plant colour, head shape, flowering and plant height
Sugar bean	8	8	12.5	0	Grain colour

Source: ICRISAT/FAO Seed Quality Assessment, 2004.

The protocol also calls for stricter labeling requirements for relief seed. This helps both NGOs and farmers better understand what sorts of seed they are receiving. Better labeling also allows easier traceability of poor quality seed. Seed companies commonly refuse to accept liability for poor seed unless this 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 access to new varieties. This is particularly the case in outlying rural areas where market access is limited, or for seed crops with limited commercial sales. Unfortunately, most farmers could not identify most of the seed varieties they received in 2003/04.

In the district of Hwange, tracked early in the season, none of the 143 randomly selected recipients correctly identified the maize variety they received (Table 10). To make matters worse, most of these farmers thought they were receiving hybrid seed, when in fact they were receiving open pollinated varieties. Many had sought open pollinated varieties, because hybrid seed had become too expensive. But prior to 2003, the commercial sale of open pollinated maize varieties had been illegal. Now these were available for the first time in more than 25 years. Yet no farmer even recognized the opportunity being provided.

The problems of seed identification in Hwange were severe, but not unusual. In the larger national sample, three-quarters of all farmers could not identify the maize varieties they received (Table 11). Even if the seed included labels with the variety name, this information was missed by most farmers. Again, many farmers failed to realize that they were receiving open pollinated seed varieties. 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 covey information about what they were distributing. In some cases, these NGO staff themselves probably did not understand what they were distributing.

Table 10. Farmer knowledge of maize variety obtained under relief programs in Hwange District, 2003/04 season.

Maize variety provided	**Maize variety farmers claim they received**
Kalahari Early Pearl (OPV)	SC 201 (hybrid) SC 401 (hybrid) SC 501 (hybrid) Monkey (hybrid) Short season Ibhalshadla Unknown

Source: FAO/ICRISAT Monitoring Surveys for 2003/04 Input Relief Programs

Table 11. Proportion of households who could *not* correctly identify the variety of relief seed being planted, 2003/04

Crop	**Proportion of farmers unable to identify what varieties they received (%)**
Maize	75.8
White sorghum	58.4
Groundnut	88.8
Cowpea	90.5

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

The problems recognizing what varieties were received were reinforced by two additional factors. First, the labeling of the seed was poor. In some cases, no labeling was provided. In others, seed labels failed to specify variety names. And even if names were provided, the labels did not specify whether the seed was open pollinated or hybrid.

The second explanatory factor was that much of the seed distributed was in fact standard or common grade of mixed or unknown varieties. Unfortunately, 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

Not all of the seed provided through the relief programs was planted. The proportion of seed sown depended on several factors including the severity of a household's seed supply constraint, interest in the seed crop provided, past experience with relief seed[1] and the availability of resources to plant a crop.

[1] the distribution of poor quality sorghum seed in 2002/03 likely discouraged some farmers from planting this seed in 2003/04.

The survey results indicate that almost 90 percent of the maize seed received was in fact planted (Table 12). However, 35 percent of the pearl millet seed distributed was never planted, and one-third of the red sorghum seed distributed was not planted. The main reason for these lower percentages is probably because these seeds were distributed to farmers who do not normally plant these crops. While NGOs were concerned to promote the production of more 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.

Table 12. Proportion and quantities of relief seed planted, and estimated area planted per recipient household, 2003/04

	Proportion of relief seed planted (%)	**Mean quantity of relief seed planted per recipient (kg)**	**Approximate area planted by recipients (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: FAO/ICRISAT Monitoring Surveys for 2003/04 Input Relief Programs

Another reason commonly hypothesized for the failure to plant all seed received is that this arrived late. The surveys revealed that a small number of NGOs were still distributing grains seed as late as January 2004 (Table 13). However, 72 percent of the relief seed for basic food crops (not including vegetables) was distributed by the end of November and over 90 percent by the end of December. While farmers sometimes complain that they want to receive the relief seed earlier, this is most likely a strategy to support the avoidance of seed purchases. Most planting occurs between late November and mid-January.

Table 13. Timing of relief seed distribution by crop, 2003/04

Month	**Percent distributed**	**Cumulative percent distributed**
August-September	4.5	4.5
October	30.8	35.3
November	36.2	71.5
December	21.4	92.9
January	4.2	97.1
February	2.9	100

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

While rumors that farmers ate some of their seed are common, the survey revealed little evidence of this practice. Most of the seed left unplanted 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 of the relief seed available to them was because most of them had alternative sources of seed. Almost half of the relief

recipients planting pearl millet seed also obtained seed stocks of this crop from sources within the village (Table 14). If stocks were not available from a farmer's previous harvest, he or she could probably obtain this from other farmers in the village. This seed might be borrowed from neighbors or relatives, or purchased from local grain markets. Two-thirds of the recipients of relief groundnut seed also obtained groundnut seed stocks from either their own previous harvests or local markets. More than half of the farmers receiving maize seed from relief programs also obtained this seed either from their previous harvests (implying the recycling of hybrid maize seed) or from local retail markets.

Table 14. Proportion of farmers (among those growing each crop) with seed from alternative sources in Zimbabwe, 2003/04 season (%)

Crop	Relief seed recipients			Other Farmers		
	Own Stock	Neighbours & relatives	Retail Market[a/]	Own Stock	Neighbours & relatives	Retail Market [a/]
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

[a/] includes seed purchased from local grain markets and retail outlets, but not seed obtained from the Grain Marketing Board credit program

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

A comparison of the seed sources of the recipients of relief seed with the seed sources of non-recipients indicates that the relief seed substituted for stocks that would otherwise have been obtained from the farmer's own previous harvest, from neighbours or from local markets. As noted above, the characteristics of the recipients of seed relief were similar to the non-recipients. The targeting of poorer and more food insecure households was inconsistent. Therefore, we can infer where the relief recipients would have obtained their seed by examining what non-recipients did. The survey data in Table 14 suggest non-recipients made more use of their own seed stocks. When these supplies were limited, they commonly sought seed in local markets.

Table 15 highlights the fact that most farmers who received relief seed also planted seed of the same crops obtained from alternative sources. Only in the case of cowpea did the majority of relief seed recipients depend entirely on this external seed source. This may reflect the relatively high probability of insect damage in cowpea seed stocks retained in the local community. But it should also be noted that if the relief seed had not been available, the majority of these households would likely have obtained seed from neighbouring households or from the local grain market.

Table 15. Proportion of households receiving relief seed relying entirely on this seed source for each crop, 2003/04 season

Crop	Proportion of recipients of relief seed for each crop who relied entirely on this seed source (%)
Maize	38.2
Sorghum	22.7
Pearl Millet	44.7
Groundnut	16.1
Cowpea	52.5

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

Contribution of Relief Seed to Area Planted

Relief seed is commonly distributed to farmers affected by drought in order to help re-establish farming operations. Donors and NGOs generally assume that drought leads farmers to consume much of their seed stocks. Stories appear of farmers showing visitors their empty granaries.

If this is true, then the external provision of new seed should allow these food insecure farmers to expand the area they plant. Assuming the two populations are relatively equal, farmers who receive relief seed should plant more land than farmers who do not receive this input.

Yet the data summarized above highlights the fact that many farmers do not consume their planting seed. Even if some farmers in a community obtain little or no harvest, most can obtain replacement seed from neighbouring households or the local grain market. These farmers remain pleased to accept seed from external NGOs. Indeed, the provision of such seed helps offset the need to obtain this input from other sources. Access to relief seed also offers the possibility of obtaining new, higher yielding varieties.

The survey data similarly confirm that households receiving relief seed planted similar areas of major food crops compared with those that did not receive such seed (Table 16). Relief recipients plant marginally less maize area, but about the same area of white sorghum, groundnut and cowpea as farmers who did not receive relief seed. Despite the fact that 35% of the pearl millet seed distributed under relief programs was left unplanted, this distribution does appear to have contributed to an increase in area planted for this crop. Overall, the relief seed probably contributed only marginally to any expansion of area planted.

Table 16. Mean area planted by households receiving relief seed and those not receiving relief seed, 2003/04 season

	Area planted by recipients of relief seed (ha)	**Area planted by farmers who did not receive relief seed (ha)**
Maize	.87	1.10
White sorghum	.40	.35
Pearl millet	.35	.18
Groundnut	.05	.07
Cowpea	.05	.04
Total	1.72	1.74

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

The Contribution of Seed Versus the Availability of Draught Power

Until recently, virtually all smallholder farmers in Zimbabwe employed animal traction to till their land. In wetter areas this involved the use of two or more cattle. In drier areas, two or more donkeys were used. In each case, four animals were preferred to two. Households without animals would readily borrow or rent draught power from their neighbours.

However a series of droughts, economic problems and the incidence of HIV/AIDS, have led to a decline in the proportion of smallholders who own draught teams. Table

17 highlights the fact that 35 to 66 percent of the households in the sampled districts did not own at least two draught animals. This has led to increasing delays in planting relative to rainfall events. And more fields are being prepared by hand.

Table 17. Proportion of households who do not own draught power resources, 2004.

District	Proportion of households without draught power (%)
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
Bililimamangwe	50.4
Tsholotsho	47.1
Binga	55.3
Hwange	44.2

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

Farmers owning draught resources are at a clear advantage relative to non-owners, because they can plant their fields on a more timely basis relative to rains. But in addition, these households generally plant a larger aggregate area. This is particularly important in the context of a low input cropping system. More planted area translates into higher levels of total production.

These relationships are apparent in the survey data. The surveys indicate that the main determinant of the size of area planted to key crops was not access to relief seed, but rather the ownership of draught power. Farmers owning two or more draught animals planted almost twice as much maize area as those who did not (Table 18). These farmers planted three times as much groundnut area and twice as much cowpea area. Draught power owners planted 60% more land to basic food crops compared with non-owners.

Table 18. Area planted (ha) by farmers with and without draught resources, 2003/04 season.

	Owned 2 or more draught animals	Owned less that 2 draught 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 for 2003/04 Input Relief Programs

A key inference to be drawn from these data is that efforts to expand area planted following a drought should concentrate less on distributing seed and more on improving , access to draught 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 the stability and productivity of production on a smaller area.

Distribution of Relief Fertilizer

The distribution of fertilizer is commonly limited in agricultural relief programs due to this input's expense and bulkiness. Fertilizer is also viewed to be of uncertain value in drought prone regions. Farmers are not accustomed to applying this input and stories appear of farmers selling fertilizer to neighbours during past programs. In practice these experiences are unusual, but this does not prevent the stories from being repeated as if such sales are common.

During the 2003/04 cropping season, NGOs distributed an estimated 1 553 tons of various compound fertilizers for basal applications and 6 184 tons of top dressing, mostly ammonium nitrate. A small quantity of organic fertilizer was also distributed. This input was allocated to more than 200 000 small-scale farmers.

Proportion of Farmers Receiving Fertilizer

The post-planting survey results indicate that the relief programs were the only source of fertilizer for the majority of farmers applying this input. Approximately 11% of small-scale farmers in the total sample applied basal fertilizer, and just over one-half of these farmers received this from relief programs (Table 19). Most of the remainder obtained their basal fertilizer through loan programs linked with cotton production. Almost 17% of farmers used AN, two-thirds obtaining this through the relief programs.

Table 19. Proportion of households obtaining chemical fertilizer, 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 for 2003/04 Input Relief Programs

Overall, just under 10% of the recipients of relief seed also received basal fertilizer and 16% received AN. However, based on the data on total fertilizer supply collected by the FAO Emergency Unit, the survey appears to have undercounted the proportion of farmers receiving fertilizer top dressing. This may be because these nutrients were still being distributed at the time of the post-planting survey when these data were being collected. Farmers who received fertilizer through relief programs did not obtain supplementary supplies from other sources.

Three-quarters of the fertilizer users applied this to maize, even in the driest parts of the country. Another 7 percent applied this to watermelon, a small-scale cash crop in many areas. Only about 4 percent applied this to white sorghum, groundnut and cowpea. Application to pearl millet was rare.

Due to the small-quantities being distributed, the rates of application were generally smaller than commonly recommended levels. Recipients of relief fertilizer received a mean level of 22 kg of basal dressing and 18 kg of top dressing. These were generally distributed as 5 kg, 10 kg, 25 kg and 50 kg allocations. 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 one-half the recommended rates nationally promoted by the Department of

Agricultural Research and Extension Services (AREX) (Table 20). Recipients applying AN as a top dressing similarly concentrated this, applying 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.

Table 20. Mean level of fertilizer application on maize by relief recipients receiving this input, 2003/04 season

	Mean quantity of fertilizer used	**Mean rate of application per ha**
Basal	22.3 kg total	76.5 kg/ha
Top dress	17.8 kg total	62.1 kg/ha

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

An effort had been made by ICRISAT to encourage farmers to spread their limited fertilizer stocks on 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.

A flyer with fertilizer application instructions was provided with the 25 kg of AN distributed to 160 000 farmers under a program funded by the Department for International Development (DFID). This suggested that farmers spread this limited quantity of fertilizer broadly to cover one hectare of any cereal grain – implying an application rate less than one-quarter of officially recommended levels. Most farmers receiving the 25 kg bags of AN received this flyer, and two-thirds described this as useful. However, the actual levels of application tended to be higher than the rates suggested in the pamphlet possibly due to the ease of application over a smaller area.

Technical Crop Management Advice

Many NGOs indicated that they would work with AREX to provide technical advice to the recipients of relief seed and fertilizer to help improve production levels and productivity (production per unit of input such as land or labor). In practice, however, these programs appear to have reached only a small proportion of farmers. Only 4 percent of the 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 21). Less than one-quarter of all of the recipients of relief inputs received technical advice from any source. This helps explain why so few farmers understood what varieties of seed they were receiving. This also reduced the returns to fertilizer use.

Table 21. Proportion of farmers who received technical advice from AREX or from NGOs involved in distributing relief inputs, 2003/04 season

	Proportion of recipients of relief inputs (%)
Received crop management advice from NGOs	4.0
Received crop management advice from AREX	17.9
Received crop management advice from any source	22.7

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

Fertilizer Impacts

Despite the variability of rainfall, the contribution of the chemical fertilizer to the improvement of maize yields was substantial. 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 offered an average 60 percent yield gain to maize, and almost doubled average, though much lower, white sorghum grain yields (Table 22). Almost every farmer who applied this input received a positive yield response.

Table 22. Mean grain yields of farmers using chemical fertilizer, 2003/04 season

	Mean yield of plots without chemical fertilizer (kg/ha)	**Mean yield of plots receiving chemical fertilizer (kg/ha)**	**Percentage grain yield gain (%)**
Maize	710	1 127	59
White sorghum	184	364	98

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

ICRISAT worked with three NGOs to conduct more than 1 200 on-farm demonstrations of the value of small doses of fertilizer. These involved the marking out of approximately one acre plots with the agreement that the farmer would apply about 10 kg of AN fertilizer on one-half of the designated area. Participating farmers simply had to agree not to apply fertilizer to the other one-half of the field. The farmer could select a field with any grain crop, though in the majority of cases the fertilizer was applied to maize. He/she could apply any management practice encompassing such decisions as time of planting, time and number of weedings, and thinning. But the same practices had to be applied to both sides of the selected field. Harvest data were collected from each half of the field separately.

Despite the fact that fields were managed in widely varying ways, the results of these demonstrations were consistent. The mean gains on grain yields resulting from the application of these small doses of AN ranged from 25 to 78% depending on the area (Table 23). More than 90 percent of all participating farmers achieved yield gains.

Table 23. Mean maize yields of farmers using small doses (approximately 25 kg/ha) of AN, 2003/04 season

District	**Mean yield of plots without chemical fertilizer (kg/ha)**	**Mean yield of plots receiving chemical fertilizer (kg/ha)**	**Percentage grain yield gain (%)**
Mberengwa	665	1 181	78
Bikita	690	959	39
Zaka	323	606	88
Hwange	604	754	25
Matobo	739	1 062	44

Source: ICRISAT-led farmer managed demonstration plots for small doses of chemical fertilizer, 2004.

One inference drawn from these results is that the distribution of chemical fertilizer was much more profitable for most farmers than the distribution of seed. The 25 kg of AN fertilizer commonly distributed through the relief programs cost approximately

Z$1500/kg[1] to deliver. This includes the estimated costs of labor used in applying this input. This compares with a post-harvest farmgate price for maize grain of approximately Z$750 per kg (Z$750 000 per t). In order to obtain a profit, farmers would have to obtain only 2 kg of grain for every kg of fertilizer applied. In fact, farmers more commonly obtained 6 to 12 kg of grain per kg of fertilizer input.

Grain Yields

The mean grain yields and harvest levels achieved by beneficiaries of the NGO agricultural relief program during the 2003/04 cropping season were highly variable depending on one's location in the country and the respective land management. Some regions had relatively high and consistent rainfall and other areas appear to have again experienced drought. A summary of this picture is outlined in the yield data shown in Table 24. This reveals maize yields ranging from 400 to 1 000 kg per ha, as would be expected under the variable rainfall conditions characteristic of Zimbabwe. What was not expected was the consistently lower mean yields observed for both white sorghum and pearl millet. The white sorghum yields range from 200 to 600 kg per ha and the pearl millet yields range from as little as 37 kg per ha to 450 kg per ha.

Table 24. Mean yields for major grain crops in a cross-section of smallholder farming regions who were recipients of the NGO agricultural relief program, 2004 harvest.

	Maize	**White sorghum**	**Pearl millet**
Post-Harvest Estimates			
Mberengwa	1 021	220	174
Zvishavane	1 066	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 for 2003/04 Input Relief Programs

Since sorghum and pearl millet are physiologically more drought tolerant than maize, one would expect to see these crops offering higher mean yields than maize in the relatively more drought affected areas. This does not seem to have happened. No clear explanation is immediately available for this anomaly. However, these data are not unique. ICRISAT collected yields data in southern Zimbabwe after the drought-affected 2003 harvest as part of a variety adoption survey. This also indicated that average maize yields were higher than those for sorghum or pearl millet – despite the severity of the drought.

There are several likely explanations for these results that merit further investigation. There is obvious evidence indicating that fertilizer is more likely to be applied to maize

[1] Approximately US$2.8/kg at current exchange rates

than to sorghum or pearl millet. And this input promotes substantial improvements in mean yields. Yet less than 7% of the maize plots received this input.

We also know, from past experience, that small-scale farmers are more likely to plant their maize on a timely basis relative to the incidence of rainfall. This is not simply a matter of planting early in the season. 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.

And perhaps most importantly, maize may be more likely to be weeded on a timely basis relative to the levels of weed growth. Again, this is not simply a measure of the number of weedings received by the crop, but also the timeliness of this weeding relative to the level of weed growth. These sorts of relationships are difficult to measure in the context of cross-sectional surveys encompassing large numbers of households.

Finally, the better performance of maize may be related to the higher quality of this crop's seed available through relief programs and on the retail market. While approximately one-third of the surveyed farmers recycled their maize seed, most fields were planted with certified seed. This is not the case with sorghum or pearl millet.

Food Security Impacts

The relative contribution of the relief program to household food security can be measured in terms of the total harvest level per household. An average household of 6.5 members required approximately one ton of grains to meet its requirements for a year – including all direct consumption, seed, losses and waste. The survey results suggest this limit was achieved in only two of the 13 areas with harvest estimates available (Table 25). Two additional areas have mediocre aggregate harvests between 700 and 900 kg per household. This leaves nine areas that appear to have experienced seriously production shortfalls.

Table 25. Mean total grain harvest per household in a cross-section of smallholder farming regions, 2004 harvest.

	Mean total grain harvest (kg per household)
Post-Harvest Estimates	
Mberengwa	1 727
Zvishavane	1 638
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 for 2003/04 Input Relief Programs

A high mean level of harvest implies the district as a whole may have adequate amounts of food. However, there will always be households remaining in short supply of grain within surplus districts either because of poor rainfall, poor crop management or the limited availability of farming assets. According to the post-harvest survey results, approximately one-quarter of the households in the grain surplus areas of Mberengwa and Zvishavane still experienced severe grain deficits (Table 26). These were generally poorer households with limited farming assets – particularly, limited draught power. They would normally be classified as the chronic poor – households likely to face food security constraints even under favorable rainfall conditions. In most cases, these food shortages will be resolved by working for neighbouring households with grain surpluses.

Table 26. Proportion of households experiencing harvests less than 500 kg of grain based on post-harvest estimates 2004 harvest.

	Proportion 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 for 2003/04 Input Relief Programs

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

These results coincide with the estimates from farmers of how long their grain supplies are expected to last. In general, a one ton harvest should last at least until the beginning of the next season's green maize harvest – around February. An eight month supply would last the family until, at least, March 2005. In correspondence with the production data displayed above, two of the seven areas for which post-harvest data are available appear to have reasonable grain stocks. One area, Insiza, appears extremely short of grain. The other four areas have intermediate grain stocks.

Table 27. Mean number of months after June 2004 that grain supplies are expected to last.

	Number 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 for 2003/04 Input Relief Programs

Alternative Distribution Methods

The easiest and most common way to distribute agricultural inputs to needy households under relief programs is free, direct distribution. The problem is, this undermines commercial input markets. Seed companies, in particular, find it more profitable to sell seed to donors and NGOs than to invest in the development of wholesale and retail market chains. They may target sales in Zimbabwe this year, in Mozambique the next, and in Angola the following year. The consistency of these programs over the past ten years has encouraged the development of several companies deriving virtually all of their sales from emergency distributions. Unfortunately, when the free seed distribution ends, at least temporarily, seed is unavailable on the rural market.

This study established a sample of districts and households 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. Each of these alternative strategies 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 timing of funding commitments, and quality of field staff, than on the chosen method.

Direct distribution

The main advantage of direct, free seed distribution was that this involved 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 alternative 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 process of distribution. Though there is no statistical relationship between the method of distribution and the timeliness.

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

Another problem with direct distribution is placed farmers at the disadvantage of having simply to accept whatever seed was offered. In some cases, farmers received seed they did not want, or would never plant. In some districts, up to 50% of the seed being distributed of some crops was never planted.

Seed Fairs

Seed fairs were developed in eastern Africa as a means to cope with the lack of quality seed available on commercial markets. Paradoxically, these work best when there are ample quantities of seed available on local markets. Yet if such seed is available, questions arise about the need for relief seed in the first place.

Seed fairs were first implemented in the context of relief programs in Zimbabwe during the 2002/03 planting season. Donor interest in this alternative approach encouraged more NGOs to try this method the during the 2003/04 planting season. As might be expected, this led to greater variation in implementation practice. Some NGOs

restricted the access of commercial traders to the fair; others promoted company access to assure the distribution of maize seed. Some set seed prices while others allowed farmers and traders to negotiate their own price.

Virtually all of these fairs involved the distribution of vouchers to needy households that could be exchanged for seed. This allowed farmers greater choice in what seed was obtained. As a result, a larger share of the seed obtained through seed fairs was finally planted by farmers.

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 they would face favorable sales opportunities. Correspondingly, the largest share of seed traded through community seed fairs was commercial, generally hybrid, maize seed.

A second advantage of seed fairs is these provide income to local seed sellers – income that remains within the rural community. This is believed to create an incentive for households to produce seed for their neighbors. Seed of a more varied 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 the largest share of income left these rural communities. 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. These local seed markets have long provided a means for households experiencing production deficits to obtain seed from their neighbors. Traditionally, most such transactions are free of charge. Farmers reason that a gift of seed to a neighbor in one year may translate into an obligation to provide seed in return if the giver 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. Thus, the price of a kilogram of sorghum seed on the day before the fair may be only 50% of the price during the fair. NGOs justify the higher price as necessary to attract traders to being seed 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 impacts 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, early traders will let in until an approximate quota of seed targeted for sale was 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 the shops at which inputs were provided. This was believed to promote retail trade of seed and encourage farmers to look for seed in these shops after rains returned.

In practice, this program operated little differently than the direct seed distribution. The NGO purchased all the inputs and took responsibility for their transport 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, these 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 they put into the program. But it seems unlikely this will encourage many to stock agricultural inputs after the program is completed.

Comparison of Approaches

The initial analysis of survey data suggest there was no significant difference in the three approaches in the timeliness of input delivery, nor the quantity of inputs delivered per household. Only the seed fairs offered the advantage that a higher proportion of inputs distributed were actually used. Nonetheless, there is no statistical difference in the average yields obtained with the inputs from the three types of distribution 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. This is a difficult decision for input manufacturers, and particularly seed companies who face the choice of selling seed in bulk to donors or NGOs versus selling smaller quantities through many retailers. There is little question but that bulk sales to relief programs can be highly profitable to input suppliers. And no seed company wants to be caught trying to retail inputs in communities where NGO programs are distributing inputs for free. Consequently, it seems likely that the pursuit of a more market oriented voucher program will require a transparent and common effort on the part of both donors and NGOs to move away from free handouts.

Seed fairs appear to offer a viable option for more isolated communities without the prospect of retail sales. Though 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 production of a range of different seed crops of limited interest to commercial companies. One problem with this approach, however, is that community seed production can undermine efforts to promote commercial company 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 one-half the price of the commercially produced seed. The company is considering whether to abandon its commercial production efforts.

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 the transition away from free seed ‘dumps’ is serious. Many will await the larger 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. Rather than simply distributing seed through retail outlets, vouchers need to be exchangeable for a choice of agricultural inputs. This changes the role of the NGO from a distributor of inputs to a facilitator of market development.

Estimating Program Impacts

The effort to estimate program impacts is complicated because of the difficulty estimating what the farmers who received relief inputs would have done if they had received nothing. An approximation of this is provided by the comparison of the performance of farmers who received relief inputs with the performance of those who did not receive seed or fertilizer. Since these two populations 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 the relief seed to household production and food security can be derived from available estimates of the area planted to relief seed, and mean yields obtained (Table 28). This assumes that the recipients of relief seed would not have obtained any seed from alternative sources. Instead, they would simply have planted less land, or no land at all if they truly had no seed stocks. According to this calculation, the average household achieved an additional Z$450 000 of production or about US$85 at the exchange rates prevailing at the time of the harvest. Most of this gain is derived from the harvest of about 475 kg of grain.

Table 28. Upper limit of the mean value of relief seed assuming farmers would not have obtained this seed from alternative sources, 2004 harvest.

	Additional ha planted with relief seed	Mean yield (kg/ha) gain achieved	Additional grain obtained (kg)	Value of additional grain (Z$)
Maize	0.44	641	282	211500
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 for 2003/04 Input Relief Programs

However, this is clearly an over-estimate of the actual level of production gain derived from the relief programs. The survey data outlined above suggests that much of the relief seed simply substituted for own seed stocks, or seed that would otherwise have been obtained through local seed markets. This does not appear to have significantly contributed to an expansion of cropped area. By corollary, a minimum estimate of the contribution of the relief seed to household food security or income levels would be the value of the seed replaced. This is estimated to be approximately Z$70,255 or US$13.25 per participant (Table 29).

Table 29. Lower limit of the mean value of relief seed assuming farmers simply used this to replace seed stocks otherwise available through own supplies or purchases on the local market, 2004 harvest.

	Mean quantity of seed received through relief programs (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 for 2003/04 Input Relief Programs

If we assume that 20 percent of all households are so chronically poor that they would not have been able to replace the seed obtained through relief distributions, this allows an intermediate estimate of gain from the seed distribution of approximately US$20 per recipient. This gain would have been higher if more, higher quality seed had been distributed, and if more farmers understood what varieties they were receiving.

Seed Saved for 2004/05 Planting

Another indicator of the value of the seed to households is the availability of seed for the next year's planting season. Despite the drought, the majority of households claim they have been able to retain seed stocks (Table 30). This includes, unexpectedly, almost 60 percent of the growers of maize. The 60 to 70 percent of growers saving seed of white sorghum and pearl millet are more or less expected. The one-half to two-thirds of farmers saving seed of groundnut and cowpea are marginally higher than expected. These seed crops are more prone to insect damage and breakage.

Table 30. Proportion of growers saving seed of each crop for planting during the 2004/05 cropping season (%)

	Proportion 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 for 2003/04 Input Relief Programs

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

Table 31 indicates, that 80 percent 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 as well as a promotion campaign to more widely distribute the seed of open pollinated maize varieties.

Table 31. Types of maize seed being saved from the 2004 harvest for replanting the next cropping season as identified by farmers.

Variety	**Proportion of farmers claiming to save seed of each type (%)**
Named hybrids	81.4
Kalahari Early Pearl	5.2
Unknown varieties	30.0

NB. Proportion adds to more than 100% because some farmers have chosen to save more than one variety.

Source: ICRISAT/FAO Monitoring Surveys for 2003/04 Input Relief Programs

Fertilizer Impacts

The FAO Emergency Unit estimates of the total quantity of chemical fertilizer distributed, and survey estimates of the mean quantities of fertilizer obtained per household, suggest that upwards to 300 000 households received small quantities of basal and/or top dress fertilizer. Here, there is stronger evidence that these supplies would not have been replaced by fertilizer purchases. Fertilizer was more difficult to obtain on the rural market and expensive. Most of the fertilizer used by non-relief 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 grain yield gains derived from the fertilizer can be primarily attributable to the relief programs. The average recipient of fertilizer obtained 334 kg of additional grain valued at Z$235,500 or US$44 (table 32). The cost of supplying this fertilizer was approximately Z$72 000 per recipient, implying a net economic gain of Z$163 500 (US$30).

Table 32. Mean value of fertilizer distributed through the relief programs and applied to grain crops, 2004 harvest.

	Mean area to which fertilizer applied (ha)	**Additional grain yield resulting (kg/ha)**	**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 for 2003/04 Input Relief Programs

These gains could be higher if more consistent technical support was provided with the fertilizer. These farmers are effectively being introduced to a new technology offering higher marginal returns to lower than officially recommended application rates. Overtime, the promotion of this technology could markedly improve average crop yields as well as household food security.

Lessons Derived

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 funding permits, these are supplemented with the distribution of chemical fertilizer. Efforts to monitor the impacts of these programs concentrate on checking whether these 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 these efforts can be improved.

This study initiated the implementation of a more rigorous monitoring and assessment program. The analysis indicates that there is little question but that the 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 recommendations offer a preliminary set of advice for improving these payoffs. As the analysis of the 2003/04 season survey data continues, these may be extended.

1. Distribute less seed to the most needy households

Smallholder communities are generally better at maintaining seed stocks, even in the face of frequent drought, than they are commonly credited for. Most households maintain 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 data indicate no difference between the areas planted by households who received relief seed compared with those that did not receive relief seed. The surveys similarly indicate little difference in the production levels between these two groups of farmers.

One contribution of the relief seed programs was to provide access to new, improved crop varieties – if these were available. The problem is that seed stocks of most new varieties are limited. NGOs face a trade-off between giving larger quantities of low quality seed, or smaller quantities of high quality seed of new varieties. Evidence of the capacity of farmers to retain seed and make use of local seed markets suggests the value of promoting quality rather than quantity.

Another contribution of the relief programs is to improve seed access to chronically poor households with limited capacity to purchase seed from their neighbors. The relief seed allows a farmer to avoid the expense of having to purchase seed on the local market, or the embarrassment of having to beg for seed from neighbors. Relief seed may give a farmer the option to replant should one or more of his/her crops fail during the course of the season. Many sought to renew their stocks with higher quality seed originating from commercial companies.

This implies the value of targeting relief seed to the small proportion of farmers who are chronically poor, including those who are relatively more 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 have no small stock such as goats and chickens. Households with more tenuous community ties may include female-headed households, and poorer households

affected by HIV/AIDS. [Though NGOs should also note that many female-headed households and households with orphans are not chronically poor.]

1a. Distribute smaller quantities of higher quality seed to a smaller sub-set of poorer farmers most in need. These can be identified, in the first instance, as farmers without draught resources. The poorest of these are likely also to have no small stock.

2. Assure better quality seed is distributed

One of the highlights of the 2003/04 season was the distribution of at least 120 tons of poorly adapted white sorghum seed. This seed was labeled as a high quality, early maturing sorghum variety, but turned out to be a late maturing forage type sorghum. The distribution of this seed was particularly disappointing because the same variety had mistakenly been distributed the previous 2002/03 season. NGOs and seed companies had been warned about this mistake. Yet this 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 trying, in the process, to undermine Zimbabwean agriculture. Many farmers had gained a distrust of the value of what, in fact, is a high quality grain sorghum variety. They had also gained a distrust of relief seed.

The distribution of this seed was clearly a mistake. Seed companies paid compensation in 2003, and again in 2004. But the justifications of this mistake merit closer examination.

Seed companies maintain commercial stocks of varieties they believe they can readily sell on the local market. By corollary, the supply of maize seed was, and continues to be ample, relative to national requirements. Since most other seed crops are viewed to be commercially unprofitable, except in the context of sales through relief and recovery programs, the stocks of these seeds tend to be more limited. When tenders are offered for seed of these secondary crops, some companies purchase grain, clean this, check the germination, and then sell this as standard or common grade seed. The origins of this seed become blurred as companies trade stocks between one another. Donors and NGOs are commonly left with the option of purchasing uncertified, standard grade seed (cleaned grain) or nothing for crops such as sorghum, pearl millet, groundnut, cowpea and sugar bean. And sales of poor quality seed are reinforced by decisions to pursue the cheapest tenders.

These problems could be controlled through stricter regulation of seed supplies. However, the strict application of national regulations would likely eliminate most seed stocks for crops other than maize from the market. During periods of emergencies, regulators relax their standards in order to facilitate the flow of seed of 'adequate quality' to the market. The key problem is how to assure farmers receive seed of 'adequate' quality as opposed to poorly adapted varieties. In many cases, the supply of seed derived from locally produced grain, may be better than the supply of no inputs. What most hurts farmers is the supply of poorly adapted varieties derived from imports.

Strict regulation of the quality of all relief seed may too severely reduce seed stocks available for distribution. But the identity of seed imports ought to be strictly controlled given the higher likelihood of obtaining poorly adapted varieties from this source. Further, regulatory authorities ought to promote stricter labeling to help assure NGOs and farmers of what types and varieties of seed they are getting. The implementation

of these efforts can be facilitated by closer monitoring of the quality of relief seed stocks being distributed.

Finally, the best way to assure that high quality stocks of seed of well-adapted varieties are available may be to finance the establishment of seed security stocks. Zimbabwe is highly prone to drought, and likely to experience a demand for relief seed at least once every three years. Insofar as new varieties offer the prospect of higher productivity, there is a high payoff to investing in the multiplication and distribution of these seeds. If the subsidies underlying agricultural relief programs can be applied to the dissemination of these new varieties, even higher returns can be achieved.

2a. More strictly control imports of seed of untested varieties.

2b. Establish stricter seed labeling requirements to assure donors, NGOs and farmers know what types and varieties of seed they are receiving.

2c. Monitor the quality of seed being distributed through relief programs through sampling and testing of germination, physical purity and genetic purity.

2d. Establish seed security stocks of well adapted varieties of crops of limited commercial interest.

3. Assure farmers understand whether they are receiving hybrid or open pollinated maize seed.

Most smallholder farmers in Zimbabwe have been growing hybrid maize seed for the past two decades. In fact, sales of open pollinated seed were illegal, until 2003. But purchases of maize were declining due to the high cost of this seed, relative to grain, in the context of the nation's 200-500% annual rates of inflation. Many farmers started recycling their hybrid maize seed - collecting grain from their harvest for replanting.

The 2003/04 input relief program provided a new opportunity for NGOs to distribute open pollinated varieties to small-scale farmers. Three varieties were distributed on a significant scale. Unfortunately, most farmers did not know this. The recipients of relief seed assumed they were still receiving hybrids, or simply did not know what they were receiving. This was a lost opportunity.

Two major problems need to be quickly resolved to maintain the productivity of Zimbabwe's staple food grain. If farmers continue to replant recycled hybrid maize seed, average grain yields will quickly decline. These farmers immediately need training to help them identify the risks of recycling their hybrid seed, and access to seed offering a clear choice of both hybrid and open pollinated varieties.

In addition, farmers interested in growing and maintaining open pollinated maize seed, because they do not want to purchase fresh hybrid seed each year, should be trained how to maintain relatively pure seed stocks when their neighbors are growing hybrids or alternative open pollinated varieties. This may involve as simple a technique as selecting seed from the center of a field.

3a. Help extension workers provide farmers training explaining the difference between hybrid and open pollinated maize varieties currently available on the market.

3b. Improve the access of farmers to a choice of hybrid and open pollinated maize seed.

3c. Help extension workers teach farmers how to maintain genetically pure open pollinated maize seed stocks.

4. Use relief subsidies to target the distribution of new, more productive seed varieties through local markets

Relief programs in southern Africa have provided a principal means to distribute new varieties of seed crops of limited interest to commercial seed companies. Most of the adoption of improved varieties of sorghum and pearl millet, for example, has resulted from the distribution of this seed through relief efforts. In Mozambique, most of the adoption of new varieties of maize can be directly linked with relief distributions. But these gains have occurred only because a new variety happened to be available. As such, these are *ad hoc* and temporary gains. Once the relief program ends, these varieties are no longer broadly available on national markets.

The opportunity to build national (and regional) seed markets is lost if this seed is simply distributed freely and directly to farmers. Retailers have limited incentive to stock seed if this is likely to be handed out for free by a neighboring NGO. Seed companies have little incentive to build wholesale and retail linkages if they can sell most of their stocks through larger tenders with 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. In one, vouchers were provided to targeted farmers for redemption for specified input packages at pre-determined retail outlets. In the second, vouchers were redeemable at village seed fairs wherein any trader could provide seed.

Insofar as the objective of relief programs is to improve food security, there is good justification for allocating at least part of the underlying subsidy toward improving access to better varieties through local retail markets. This sort of strategy is particularly appropriate for the many households that retain the capacity to purchase seed, but have limited access to high quality stocks 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 (e.g. free vouchers) following seasons of drought, while their relatively wealthier neighbours may receive only limited subsidies (e.g. vouchers with 20% discounts). Following seasons with good harvests, voucher subsidies may be at least temporarily eliminated.

4a. Promote the distribution of high quality stocks of suitable, new varieties through voucher relief programs.

4b. Test and develop alternative strategies for linking the use of vouchers with efforts to promote the expansion of retail seed markets.

5. Strengthen technical support backstopping the distribution of relief inputs

Though many NGOs claimed to provide technical support to backstop the distribution of relief seed and fertilizer, few farmers had access to such assistance during the 2003/04 cropping season. This is partly because NGO staff expected national extension workers to provide most of this assistance, with little additional resource. But also, NGO staff found themselves so occupied with the logistical demands of food and input distribution that they had little time to train farmers. And in some cases, NGO staff were simply unqualified to provide such training.

One blatant example of this constraint was the fact that most farmers did not even understand what seed variety they received. They did not know variety names or characteristics, and many who received open pollinated 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 assure the flyers were understood.

Ultimately, this is an opportunity lost. There is little doubt but that the returns to the distribution of relief inputs can be improved with better technical support. But larger investments are required to assure this assistance is provided to more farmers, and to assure that the underlying advice is relevant.

5a. Assure all inputs are well labeled with information understandable to farmers. Seed packets, in particular, should include variety names and characteristics.

5b. Coordinate stronger and more broadly focused crop management training programs with local**,** district and regional AREX staff. *These should emphasize training relating to the correct application of the relief inputs.*

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

Relief programs have tended to emphasize the distribution of seed because this input is readily divisible into small units that can be easily distributed to hundreds of thousands of households. The pursuit of this strategy is reinforced by the assumption that the poorest of households tend to consume their seed. These farmers are then least able to recover from climatic shocks. The provision of new seed allows, at least, the re-establishment of a basic cropping enterprise.

Yet a growing array of evidence indicates that most farmers do not consume their seed, even following the most severe seasons of drought. In addition, farmers short of seed are commonly able to obtain stocks through the local market.

In addition, a growing range of evidence indicates high and consistent payoffs to the application of even small quantities of nitrogen fertilizer. Importantly, these payoffs extend to 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 the addition of nitrogen than the additional supply of water. These results are supported both in the 2003/04 season survey data and in the data collected from on-farm demonstration trials distributed across large parts of the country.

The survey results also reveal that the factor most limiting the area of land planted by poorer households is not the availability of seed, but access to draught power. Farmers owning 2 or more draught animals plant, on average, 80% more maize area and three times as much groundnut area as farmers without this draught resource. In the low input systems now characteristic of smallholder agriculture in Zimbabwe, this translates into a 68% increase in grain harvests. Unfortunately, partly as a result of repeated droughts, approximately 50% of small-scale farmers in Zimbabwe no longer own the two or more cattle or donkeys necessary for draught power. These households are forced to rent or borrow draught resources from their neighbours. As a consequence, their fields are more likely to be smaller and planted late.

A key development question is how to efficiently provide ploughing services to this 50% of farmers now in need. One option is to encourage the use of limited or no-till

systems of land preparation. Another may be to develop tillage systems, in parts of the country with lighter soils that require less animal power. Another may be to encourage more sharing of draught resources, possibly through the provision of vouchers redeemable for draught power.

6a. In much of Zimbabwe, the lack of soil nitrogen appears more limiting that the lack of water, even in years of severe drought[1]. Correspondingly, the provision of small packs of chemical fertilizer offers higher economic and food security gains than the provision of seed.

6b. Extend crop management training to include concepts of conservation farming encompassing the application of low or no tillage systems and related water conservation techniques, micro-dosing fertilizer application and greater manure application.

6c. The provision of draught power can contribute more to the expansion of area planted, and household food production, than the provision of seed. However, new strategies are needed to provide this assistance efficiently to large numbers of farmers.

6d. Households without access to draught power may alternatively be assisted with low or no tillage technologies such as planting basins. However, these technologies need to be carefully tested for their performance and acceptability.

7. Targeting of households in need should be improved

The targeting strategies being applied by NGOs were variable. Many aimed to assist the poorest and most food insecure, applying an approximate set of proxy indicators (e.g. female-headed households, households with orphans, households with no off-farm income, etc) chosen without analytical justification. Some simply sought to assist farmers they had been previously working with on development projects. At least one provided inputs to better than average farmers on the assumption that these could obtain the highest levels of production and thus 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 selection criteria need to be simple to implement.

The complicated set of proxy variables cited by many NGOs proved difficult to implement in practice. The use of multiple criteria also appears to have led to the identification of larger numbers of vulnerable households since different farmers qualified under different measures. Ultimately, the underlying logic of targeting was compromised.

The survey results indicated little relationship between production and harvest levels and several of the most commonly cited targeting variables used by NGOs. These include such variables as access to off-farm income, dependency ratios and the existence of orphans in the household. Female-headed households do tend to plant and harvest less, however, this relationship appears to result from the fact that many female-headed households do not own cattle. Yet some female-headed households are relatively wealthy, because of their access to off-farm income.

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

The survey results clearly indicate that household food security (and poverty) are closely related to the ownership of draught animals. Families with 2 or more cattle or donkeys plant 60 percent more land, and harvest 68 percent more grain than households without this resource. These families are more likely to run out of grain earlier after the harvest.

A second indicator of poverty is the lack of small stock such as goats and sheep. A third indicator of extreme poverty is the lack of chickens, though this proxy is complicated by the variable incidence of flock losses due to Newcastles disease.

The use of only two variables, cattle ownership and goat ownership, seems likely to cover most of the poor. The lack of cattle could be expected to cover approximately 50 percent of the poorer members of most communities. The lack of both cattle and goats offers an indication of the poorest of the poor.

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

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

7a. 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.

7b. Two simple variables for poverty and food insecurity appear robust in the data analysis. These are i) ownership of draught power (cattle and/or donkeys) and b) ownership of goats. The former is essential for the expansion of cropped area; the latter is a supplementary indicator of wealth.

7c. Dialogue with district and village authorities helps allay concerns about the politicization of relief targeting, particularly if this is linked with the application of a few strictly defined selection criteria (such as draught power ownership).

8. External monitoring of relief programs can help identify opportunities for their improvement

Much monitoring of agricultural relief programs simply concentrates on measuring the level and timing of input delivery. Many (though not all) NGOs seek to prove they have delivered more inputs to more households on a timely basis. Estimates of impacts assume that all inputs are used. Some estimates similarly presume 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 opportunities for improved monitoring. The continuing involvement of external agencies in the monitoring of relief programs 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.

Insofar 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 assure the continuation of efforts to improve these experiences.

8a. Provide advisory assistance to NGOs to help improve the quality of their monitoring and evaluation efforts.

8b. Continue support for external monitoring targeting the identification of opportunities for improve agricultural relief programs.