
Titles in the Working Paper Series aim to disseminate information and stimulate feedback from the scientific community. A large number of similar informal publications have been distributed by ICRISAT’s Socioeconomics and Policy Program, under various titles: Progress Reports, Discussion Papers, and Occasional Papers.

Abstract

Seed systems in Kenya, Malawi, Zambia, and Zimbabwe were studied jointly by ODI, ICRISAT, and national researchers. The study examined various aspects - the nature of seed demand, particularly for new varieties; local-level seed provision and farmer-to-farmer diffusion; the commercial seed sector; community-level projects; emergency seed distribution programs; seed policy and regulatory framework; and the role of public-sector research.

The study also provides specific recommendations to develop the seed sector. For example, public research programs must invest more heavily in variety promotion and production of breeder and foundation seed. Seed certification should be made voluntary, and variety registration simplified. Emergency seed programs should pay greater attention to variety adaptation and seed quality; and should support local seed enterprises, not compete with them. Seed companies should strengthen their retail networks. NGO seed projects should consider marketing and sustainability issues more carefully. Donor-funded projects, which currently operate in isolation from each other, must be integrated into a coherent, long-term, nationally-directed seed strategy.

Résumé

Des systèmes semenciers au Kenya, au Malawi, en Zambie et au Zimbabwe ont fait l'object d’étude conjointe par l'ODI, l'ICRISAT et les chercheurs des programmes nationaux. Plusieurs aspects ont été examinés—la nature de la demande semencière, surtout pour des nouvelles variétés; l’approvisionnement locale des semences et la diffusion des semences du paysan au paysan; le secteur semencier commercial; des projets au niveau communautaire; des programmes d’urgence de distribution des semences; les politiques et les règlements gouvernementaux des semences.


This publication is a result of research project R6720(H) “Linking seed producers and consumers: diagnosing constraints in institutional performance” funded by the Department for International Development, UK
Strategies for Seed System Development in Sub-Saharan Africa:
A study of Kenya, Malawi, Zambia, and Zimbabwe

Robert Tripp

ICRISAT
International Crops Research Institute for the Semi-Arid Tropics
Matopos Research Station, PO Box 776, Bulawayo, Zimbabwe

ODI
Overseas Development Institute
Portland House, Stag Place, London SW1E 5DP, UK

2000
About the author

Robert Tripp is a Research Fellow with the Overseas Development Institute, specializing in agricultural research issues. He has carried out studies in Africa, Asia, and Latin America on seed policy, regulatory reform, seed enterprise development, and farmer seed management.
Contents

Acknowledgments ...................................................................................................... 1
Acronyms .................................................................................................................... 2
Executive summary ..................................................................................................... 3
Introduction ................................................................................................................ 5
Seed demand ............................................................................................................... 6
Farm-level seed provision ............................................................................................ 8
Opportunities for commercial seed provision ............................................................. 13
Local-level seed projects ............................................................................................. 19
Introducing varieties with small seed packs ................................................................. 24
Emergency seed programs ........................................................................................... 28
Seed regulation ........................................................................................................... 31
Public sector plant breeding ......................................................................................... 36
Summary and recommendations ................................................................................... 41
References ................................................................................................................... 48
Appendix .................................................................................................................... 51
Acknowledgments

This publication is a project “Linking seed producers and consumers: diagnosing constraints in synthesis of research results from the institutional performance”. The project was conducted jointly by the Overseas Development Institute (ODI), ICRISAT, and researchers in Kenya, Malawi, Zambia, and Zimbabwe.

The project involved the active collaboration of ICRISAT staff: it was developed and managed by David Rohrbach, who provided guidance and ideas throughout. In Kenya, Richard Jones and Patrick Audi provided invaluable support and organized several studies as part of the project. In Malawi, Duncan Boughton collaborated on research planning while he was working with ICRISAT, and Pala Subrahmanyam provided support and encouragement.

Most of the research was done by universities, agricultural research organizations, regulatory agencies, NGOs, and seed companies in the collaborating countries. Particular recognition should be given to the following people: Paul Omanga, Lydia Kimenye, Julius Ochuodho, Dalmas Sigunga, and Wilson Songa (Kenya); M A R Phiri, Allan Chiyembekeza, Jeffrey Luhanga, Rowland Chirwa, Patrick Kambewa, and Sophie Kandoole (Malawi); Ed Zulu, Francisco Miti, John Milimo, Bean Lyoba, Rollen Mukanda, Abiton Phiri, and Nicholas Mwansa (Zambia); Joseph Rusike, Bella Mpofu, Joseph Mushonga, Kizito Mazvimavi, Percy Malusalila, and Tichaona Gandanhamo (Zimbabwe).

Some of the research focused on NGO seed projects, and particular thanks are due to ActionAid (Malawi) and CARE (Zambia) staff for their support and collaboration. Kate Longley of ODI helped manage some of the work in Malawi. Mel Woodland prepared several drafts of the report.

The project was made possible by a grant from the UK Department for International Development (DFID) under the Competitive Research Facility (formerly known as the Holdback Fund), which supports collaborative work between international agricultural research centers, institutes in UK, and national research organizations. Their support is gratefully acknowledged. The views expressed in this paper are not necessarily those of DFID, ICRISAT, or ODI.
### Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMARC</td>
<td>Agricultural Development and Marketing Corporation (Malawi)</td>
</tr>
<tr>
<td>AOSCA</td>
<td>Association of Official Seed Certifying Agencies</td>
</tr>
<tr>
<td>CIAT</td>
<td>Centro Internacional de Agricultura Tropical</td>
</tr>
<tr>
<td>CIMMYT</td>
<td>Centro Internacional de Mejoramiento de Maíz y Trigo</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agricultural Organization of the United Nations</td>
</tr>
<tr>
<td>FSRT</td>
<td>Farming Systems Research Team (Zambia)</td>
</tr>
<tr>
<td>FSU</td>
<td>Foundation Seed Unit (Kenya)</td>
</tr>
<tr>
<td>GTZ</td>
<td>Deutsche Gesellschaft für Technische Zusammenarbeit (Germany)</td>
</tr>
<tr>
<td>ICRISAT</td>
<td>International Crops Research Institute for the Semi-Arid Tropics</td>
</tr>
<tr>
<td>KARI</td>
<td>Kenya Agricultural Research Institute</td>
</tr>
<tr>
<td>KSC</td>
<td>Kenya Seed Company</td>
</tr>
<tr>
<td>LFSP</td>
<td>Livingstone Food Security Project (Zambia)</td>
</tr>
<tr>
<td>MSSDP</td>
<td>Malawi Smallholder Seed Development Project</td>
</tr>
<tr>
<td>MV</td>
<td>modern variety</td>
</tr>
<tr>
<td>NARl</td>
<td>national agricultural research institute</td>
</tr>
<tr>
<td>NDFRC</td>
<td>National Dryland Farming Research Centre (Kenya)</td>
</tr>
<tr>
<td>NGO</td>
<td>nongovernmental organization</td>
</tr>
<tr>
<td>NSCM</td>
<td>National Seed Cotton and Milling (formerly National Seed Company of Malawi)</td>
</tr>
<tr>
<td>ODI</td>
<td>Overseas Development Institute</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OPV</td>
<td>open-pollinated variety</td>
</tr>
<tr>
<td>PAM</td>
<td>Program Against Malnutrition (Zambia)</td>
</tr>
<tr>
<td>PBR</td>
<td>plant breeders' rights</td>
</tr>
<tr>
<td>QDS</td>
<td>Quality Declared Seed</td>
</tr>
<tr>
<td>SACCAR</td>
<td>Southern African Centre for Co-operation in Agriculture Research and Training (Botswana)</td>
</tr>
<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
</tr>
<tr>
<td>SCCI</td>
<td>Seed Control and Certification Institute (Zambia)</td>
</tr>
<tr>
<td>SEMOC</td>
<td>Sementes de Moçambique</td>
</tr>
<tr>
<td>SPS</td>
<td>Starter Pack Scheme (Malawi)</td>
</tr>
<tr>
<td>UPOV</td>
<td>International Union for the Protection of New Varieties of Plants</td>
</tr>
</tbody>
</table>
Executive Summary

This report summarizes the results of a study of national seed systems in Kenya, Malawi, Zambia, and Zimbabwe, conducted jointly by ODI, ICRISAT, and national researchers. The study focuses on sorghum, pearl millet, groundnut, and pigeonpea in these four countries, but the results are relevant for most grains and grain legumes, and we believe the conclusions are applicable for seed policy reform in much of sub-Saharan Africa.

Section 1 of the report provides an introduction. Section 2 reviews the nature of seed demand, particularly for new crop varieties. There are several types of seed demand, requiring different responses – demand for new varieties; demand associated with emergencies such as drought or civil disorder; demand resulting from chronic poverty and low yields; and demand for fresh seed (rather than farm-saved seed) to maintain seed quality. Current seed systems are unable to satisfy demand for seed of new varieties, thus slowing down the process of diffusion.

Section 3 focuses on local-level seed provision. Demand for seed of new varieties is quite high, as evidenced from agricultural development projects, partly because these varieties offer significant advantages such as higher yield or earlier maturity. But there are limitations to this demand – farmers are usually interested in only a small number of new varieties, and adoption of a new crop (as opposed to a new variety of a traditional crop) is rare.

There is virtually no commercial seed supply for most grains and legumes in the study countries. Seed is obtained from other farmers or from grain markets, and occasionally from NGO projects. At least 20-25% of seed is acquired off-farm each season, commonly because the farmer’s own seed stocks are insufficient. Most of this seed is acquired from relatives or acquaintances. It may be purchased for cash – at the prevailing grain price – or obtained as a gift or a loan.

Section 4 discusses the commercial seed sector. Each country studied has one dominant (parastatal or private) seed company. These companies concentrate on hybrid maize and a few other high-value products. The few other commercial seed firms grow mainly for export under donor-sponsored emergency seed programs. The study examines the prospects for growth of the commercial seed sector. One problem is the choice of contract farmer for seed multiplication: smallholder outgrowers are associated with limited and/or variable output and high transport and assembly costs, while large commercial farmers (the traditional outgrowers for seed companies) would rather grow hybrid seed. Other problems are the inadequate retail network for seed, and barriers to regional seed trade.

Section 5 reviews the performance of local-level seed projects. Such projects are often successful in introducing and catalyzing diffusion of new varieties, but are not sustainable. Source seed is often not freely available, the scale of the project (especially relating to seed processing) is too small, and most important, farmers are unable to market the seed they produce.

Section 6 describes an innovative approach, where new varieties are introduced by marketing seed in small packs, through village retailers. Three examples are described, from Zimbabwe, Kenya, and Malawi. The feedback and sales figures are encouraging, and it is expected that these schemes will achieve financial viability. In any case, the small-pack strategy can help to introduce new varieties and, more important, stimulate interest in commercial seed purchases.

Section 7 deals with emergency seed provision. Seed distribution programs established in response to an emergency (e.g. drought, civil war) tend to become institutionalized. Further, these programs often distribute inappropriate varieties or poor quality seed, and do not use opportunities for introducing new varieties that are in demand. Although justified on welfare grounds, they effectively prevent the development of a sustainable seed system, and may encourage dependence on free supplies of seed.

Section 8 reviews seed regulatory frameworks. In all four countries, performance testing of foreign varieties is mandatory. Point-of-sale inspection is recognized as being important, but is poorly implemented due to budget constraints. In Kenya and Zambia, all seed of the target crops must be
certified. In Malawi and Zimbabwe, seed must pass official inspection for purity and germination. The study emphasizes the need to redistribute regulatory responsibilities among government, seed producers, and farmers. Current regulatory frameworks are acceptable to the dominant seed company in each country, but hamper competitors, whether from local-level seed initiatives or new commercial firms.

Section 9 discusses the role of public-sector research in developing the seed sector. Dissemination of information about new varieties, production and distribution of breeder/foundation seed, and linkages with other actors in the seed system are all poor. Consequently, so is diffusion of new varieties.

Section 10 summarizes results from the study and presents recommendations on various components of the seed system. Public research programs must invest more heavily in variety promotion and production of breeder and foundation seed. Research funding should be contingent on variety adoption. Regulatory agencies should simplify variety registration procedures. Seed certification should be made voluntary, but truthful labelling vigorously enforced. Emergency seed programs should pay greater attention to variety adaptation and seed quality; and should support local seed enterprises, not compete with them. Seed companies should strengthen their retail network, and experiment with innovations (e.g. small packs) to reach small-scale farmers. NGO and other seed projects should consider financing and sustainability issues more carefully. They can help accelerate variety diffusion by providing farmers with source seed and information, and improving their access to grain markets. Policymakers should pay more attention to seed issues, particularly to links between grain marketing and seed production, and to ensuring that all actors (not just government agencies) are represented on seed policy bodies. Donors need to improve project monitoring, and work with governments to integrate donor-funded seed projects into a long-term national seed strategy.
Introduction

The project

Formal seed systems in Africa have not been able to meet farmers’ needs. Parastatal seed enterprises do not provide seed of many of the crops that farmers grow, the commercial sector has shown little interest in non-hybrid crops, and efforts by NGOs and various local-level organizations are limited in scope. An effective solution will probably require a combination of public, commercial, and local-level participation, but the precise strategies need to be identified.

This project looked principally at the seed situation for four crops: sorghum, pearl millet, groundnut, and pigeonpea. However, the results are directly relevant to other grains and grain legumes such as open-pollinated maize, finger millet, beans, cowpea, soybean, and bambaranut. There are also lessons that may be applied to grains such as rice, barley, and wheat.

The research was conducted in four countries: Kenya, Malawi, Zambia, and Zimbabwe. However, the conclusions should be broadly applicable to most countries in sub-Saharan Africa.

Project activities

The project was initiated in Oct 1997. Initial discussions involved ODI and ICRISAT staff, as well as policymakers, researchers, NGOs, and others in the national seed systems. In early 1998 stakeholder meetings were conducted in the four countries, where issues relating to seed system development were prioritized, and research areas relevant to each country were identified. The objective was to examine as many experiences relating to seed provision as possible.

A total of 22 studies (see Appendix) were carried out by researchers from local universities and national agricultural research institutes (NARIs). The studies fall under six categories.
- Movement of seed and information relating to the introduction of new varieties in all four countries
- Performance and prospects of the private commercial seed sector in Kenya and Zimbabwe
- Producing and marketing small seed packs of new varieties in Kenya, Malawi, and Zimbabwe
- Seed regulation and regulatory framework in all four countries
- Breeder and foundation seed production in all four countries
- Emergency seed programs (although this was not a primary focus of the project) in Malawi and Zimbabwe.

The tentative conclusions were reviewed during national workshops in June 1999. This report summarizes the results of the studies and reflects the conclusions discussed in the final workshops.

Organization of the report

The report begins by briefly examining the nature of seed demand. This is followed by an examination of farm-level seed provision, based largely on field data collected during the project. The next four sections analyze the performance of current strategies for seed provision for the target crops. First, the status, limitations, and prospects for expansion of the commercial seed sector. Next, the performance of NGO and donor projects that support local-level seed production and attempt to encourage small-scale seed entrepreneurial activity. The study then looks at several experiments in delivering small packs of seed of new varieties through various commercial channels. Finally, the experience and limitations of emergency seed provision strategies are reviewed.

In the next two sections, the report examines two important elements of the public seed sector: current seed regulations and their effect on seed system development; and the status of public agricultural research and its potential role in reorienting variety diffusion and seed system development.

The final section of the report presents a summary of the results and a set of recommendations.
Seed Demand

Farmers are often able to save and use seed from a previous harvest. Only when there is a necessity or an incentive to acquire fresh seed does the possibility for a formal seed provision system emerge. There are different types of demand for seed, and different levels and frequencies of demand, each eliciting a different response (Table 1).

In the first category, emergency seed, demand is caused by environmental calamities or civil conflict, as a result of which harvests are insufficient to provide seed stocks for the next season. There is an acute need to provide seed rapidly, usually at low cost or as a donation. This may be done through government, donor, or NGO programs. This type of seed demand is, by definition, temporary – seed is provided to help people regain their normal livelihoods. If a program or project is providing seed year after year, then it is best seen as a response to chronic poverty (the second category in Table 1), rather than emergency aid.

In the second category, poverty, seed shortages are caused by a poor harvest, in turn due to various reasons – labor shortage, illness, shortage of land or other resources. Even with a reasonable harvest, the poorer households in a community may have to sell their seed stocks for cash or consume them as food. A significant proportion of seed demand in African farming communities is poverty-related.

Because this demand is associated with chronic poverty, rather than temporary misfortune, it implies a continuous requirement for some type of off-farm seed supply. In recent years, governments and NGOs have attempted to respond. Farmers in this category lack purchasing power, so it is unlikely that this demand can be addressed by commercial channels. In the long term, the solution is poverty reduction: improving productivity, output, and production stability, so that farmers become able to maintain seed stocks. Such changes will obviously require considerable time and investment. In the meantime, donations or loans of seed may prove useful in some cases, but in other cases they may only delay the search for a more stable and productive farming system.

The third category of seed demand relates to seed quality and is usually found in relatively stable, often commercial, crop production systems in which fresh seed is acquired frequently. The most familiar example is hybrids – because hybrid vigor declines in farm-saved seed, there is a strong incentive to buy seed each year. Other factors may also create demand for seed. The seed may be difficult to store (e.g. soybean) or difficult to extract (e.g. vegetables). Or market standards for grain quality may be high, encouraging the regular purchase of high quality seed. This type of demand increases as farmers become more commercially oriented, producing for the market. Because demand is continuous and is supported by purchasing power, it usually leads to the development of commercial seed provision.

Table 1. Types of seed demand

<table>
<thead>
<tr>
<th>Origin of demand</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency: seed shortage because of drought, flood, or civil disorder</td>
<td>Emergency seed programs</td>
</tr>
<tr>
<td>Poverty: seed shortage because of poor harvest and/or necessity to sell or consume all stocks</td>
<td>Seed from neighbors or grain markets; community level seed projects</td>
</tr>
<tr>
<td>Seed quality: hybrid seed use; convenience and quality of formal-sector seed; crops that are not usually stored or harvested for seed; market standards for grain require quality seed</td>
<td>Commercial seed provision</td>
</tr>
<tr>
<td>Variety change: seed as source of new variety</td>
<td>Not clear. May be addressed by established commercial seed system. Currently addressed by farmer-to-farmer seed movement and seed projects</td>
</tr>
</tbody>
</table>
The point at which farmers will turn to the commercial sector for seed is not well established. The interaction between supply and demand is dynamic; to a certain extent the availability of good quality commercial seed serves to develop demand. For most crops in sub-Saharan Africa, the emergence of this type of demand is constrained by inadequate supply and a very limited range of varieties.

The final category – demand for seed of new varieties – is the principal focus of this research project. Many seed projects make the justification that ‘Farmers do not have access to seed’, when they really mean that farmers do not have access to new varieties. The distinction is important, because demand for new varieties is different (e.g. less continuous) than other types of demand.

Farmers gain access to new varieties by acquiring seed from outside sources. If formal (government or private) seed enterprises are in place they may be an important source. If a new variety is particularly attractive, farmers may be willing to pay a premium for an initial quantity of seed. But this demand is rarely sufficient by itself to sustain a formal seed supply system. New varieties of a particular crop are usually released only once every few years. In addition, farmers can often acquire seed from their neighbors. For instance, the ‘green revolution’ wheat and rice varieties in Asia spread largely from farmer to farmer, not through the formal seed system.

There is some overlap among these four basic types of seed demand, but they are sufficiently distinct to illustrate that different types of demand require different responses.
Farm-Level Seed Provision

Demand for new varieties

What is the evidence of demand for new varieties? There are a number of examples of farmers adopting new varieties in the study countries. These varieties may be promoted by extension or by NGOs, but much of the learning and diffusion is from farmer to farmer. The project looked at four initiatives to promote the use of modern varieties (MVs). Two of these were managed by NGOs, one by a government adaptive research program, and one by a university. Adoption rates vary considerably (Table 2). New sorghum varieties promoted by the Livingstone Food Security Project (LFSP) in Zambia were widely adopted, partly because the project was initiated in response to a severe drought; farmers had either lost their seed stocks or felt their traditional varieties were no longer adequate. In the Malawi Smallholder Seed Development Project (MSSDP) a new groundnut variety was multiplied by small groups of farmers who were then responsible for its diffusion to neighbors; it is not surprising that adoption by direct participants was higher than by other farmers. In the other two examples - Farming Systems Research Team (FSRT), Zambia and University of Nairobi - diffusion took place from farmer to farmer after relatively modest research or extension efforts.

The literature provides further evidence of the demand for new varieties in the project countries. Zimbabwean farmers obtain new sorghum and pearl millet varieties mainly through emergency seed distribution. But farmers who acquire seed of these varieties value their early maturity and continue to plant them (Rohrbach et al. 1997). In Zambia, 27% of sorghum area in small-scale farmers' fields (and an even higher proportion for larger farmers) was planted with MVs by 1995 (Chisi et al. 1997). A study in Malawi showed that 77% of farmers who were provided with a small quantity of seed of a new bean variety continued to grow it three seasons later (Jere, undated).

Farmers seek MVs for specific reasons such as superior yield or disease resistance, and particularly early maturity. The spread of new sorghum varieties in Zambia and of sorghum and pearl millet varieties in Zimbabwe is largely because they mature earlier than most local varieties and are thus especially useful in drought-prone areas. New groundnut varieties in Zambia and Malawi also mature early, and in

Table 2. Adoption of recommended varieties in project research areas

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Crop</th>
<th>Varieties</th>
<th>Adoption rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livingstone Food Security Project, Southern Province, Zambia (CARE)</td>
<td>Sorghum</td>
<td>Sima, Kuyuma</td>
<td>67% of farmers</td>
</tr>
<tr>
<td>Farming Systems Research Team, Western Province, Zambia</td>
<td>Sorghum</td>
<td>Sima, Kuyuma</td>
<td>31% of farmers</td>
</tr>
<tr>
<td>M alawi Smallholder Seed Development Project (MSSDP), Mzuzu, M alawi (ActionAid)</td>
<td>Groundnut</td>
<td>Kadononga, JL 24</td>
<td>32% of farmers</td>
</tr>
<tr>
<td>MSSDP, Blantyre, Malawi</td>
<td>Groundnut</td>
<td>CG 7</td>
<td>46% of project participants' area, 2% of neighboring farmers' area</td>
</tr>
<tr>
<td>University of Nairobi, Eastern Province, Kenya</td>
<td>Pigeonpea</td>
<td>N PP 670</td>
<td>74% of project participants' area, 25% of neighboring farmers' area</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>38% of area</td>
</tr>
</tbody>
</table>

1. This section is based on the following case studies: Audi et al., Lyoba and Tripp, Phiri et al. (Malawi, MSSDP), Milimo and Tripp (see Appendix).
addition are easier to harvest than many of the traditional varieties currently grown. In parts of Eastern Province, Kenya adoption of a new pigeonpea variety was partly because early maturity enabled farmers to get their crop to market earlier, and get a better price. This variety tends to be adopted by farmers who have sufficient land and labor for commercially-oriented production, and who have sandy soils in which the variety performs particularly well.

Adoption of a new variety always depends on farmers recognizing one or more characteristics that justify its inclusion in their portfolio of varieties, or its displacement of another variety. This process of variety refinement and selection is continually taking place. Farmers continue to plant both local varieties and MVs. In Malawi, the MSSDP provided foundation seed of a new groundnut variety to farmer seed multiplication groups. The new variety was adopted by all the group members and by many neighboring farmers, but most adopters continued to grow at least one of their previous varieties as well. Table 3 shows the range of varieties used by farmers in the four study areas.

We can conclude that many farmers have experience with MVs and that there is evidence of demand for MV seed. However, we must temper our conclusions – several factors govern the extent to which demand for MVs might be translated into some type of formal seed provision response.

Firstly, as many seed projects have discovered, demand for MVs is restricted to a limited range of crops and only a few varieties in each crop. In Zambia, LFSP offered farmers access to seed or planting material of a range of crops after a severe drought (Mitti 1997). However, uptake in each project area was usually limited to one or two crops, and a limited number of MVs. FSRT have also reported a concentration on one or two crop varieties after initial exposure to a wider range (Lof and Nchemba 1994). Similarly, in Malawi the MSSDP provided farmer groups the opportunity to multiply seed of a number of crops and varieties. After several years of nationwide operation, one groundnut variety accounts for about two-thirds of project seed multiplication (Msimuko 1997). Current limitations on grain marketing also restrict farmers' interest in new varieties. Efficient grain markets often elicit demand for varieties with particular consumer qualities, but there are few current examples from the region.

Demand for MVs is also limited by farmers' knowledge of these varieties. Farmers sometimes have difficulty providing a precise name for the variety (whether local or MV) they are planting (see Table 3). Variety recognition is not a problem because individual farmers generally plant only 2-3 varieties of a crop, and can readily distinguish between them. But if researchers hope to offer farmers a range of new varieties, more investment is needed to disseminate information about these varieties. Currently, farmers depend mostly on other farmers for information about new varieties (Table 4).

Variety recognition will likely become a critical issue in the 'second generation' MVs currently being developed. In many cases, the first MVs captured farmers' attention because of some highly distinctive characteristic, such as early maturity or short stature. The MVs now being considered for release are often more difficult to distinguish; for instance, a new variety may be similar in other characteristics but

<table>
<thead>
<tr>
<th>Project</th>
<th>Crop</th>
<th>Variety identification*</th>
<th>Local variety</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSP, Southern Province, Zambia</td>
<td>Sorghum</td>
<td>67%</td>
<td>24%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Cowpea</td>
<td>0%</td>
<td>28%</td>
<td>17%</td>
</tr>
<tr>
<td>FSRT, Western Province, Zambia</td>
<td>Sorghum</td>
<td>31%</td>
<td>22%</td>
<td>48%</td>
</tr>
<tr>
<td>MSSDP, Muzu, Malawi</td>
<td>Groundnut</td>
<td>89%</td>
<td>-</td>
<td>11%</td>
</tr>
<tr>
<td>MSSDP, Blantyre, Malawi</td>
<td>Groundnut</td>
<td>97%</td>
<td>-</td>
<td>3%</td>
</tr>
<tr>
<td>University of Nairobi, Eastern</td>
<td>Pigeonpea</td>
<td>38%</td>
<td>-</td>
<td>62%</td>
</tr>
</tbody>
</table>

*Percentage of farmers for LFSP and FSRT, percentage of area for MSSDP and University of Nairobi

Table 3. Variety use in project area
show better disease resistance. Unless the enhanced disease resistance is immediately obvious, information about the new variety’s advantages may not spread effectively, and demand for seed will be modest.

**Demand for seed from local sources**

Despite the lack of formal sources of seed for our target crops, there is a significant degree of off-farm seed acquisition (Table 5). These high figures may be somewhat atypical, because several of these areas were recovering from drought. But Table 6, which is drawn from other published literature, also shows high values. Off-farm acquisition will depend on the crop and the farming conditions. Poverty or drought will increase the figure. Certain crops (e.g., sorghum and pearl millet) are easier to maintain as seed than a crop like groundnut, which has a high seeding rate and can be consumed without processing. In summary, a significant demand does exist – in any given year at least 20-25% of seed will be acquired off-farm in most African farming communities.

In several of our project studies we asked farmers why they had acquired seed off-farm. In many cases they wanted to obtain seed of a new variety, especially in areas where it had been recently introduced. In other cases farmers simply had no seed available – sometimes because they had not even planted the crop the previous year. In a minority of cases, farmers seek seed because they wish to renew seed purity or quality. This happens more frequently for MVs than for the local varieties (Table 7).

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>Source of information A farmer</th>
<th>Extension or research</th>
<th>NGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Province, Zambia</td>
<td>Sorghum</td>
<td>78%</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td>Southern Province, Zambia</td>
<td>Cowpea</td>
<td>89%</td>
<td>9%</td>
<td>2%</td>
</tr>
<tr>
<td>Western Province, Zambia</td>
<td>Groundnut</td>
<td>84%</td>
<td>12%</td>
<td>5%</td>
</tr>
<tr>
<td>Western Province, Zambia</td>
<td>Sorghum</td>
<td>60%</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>Mzuzu, M alawi</td>
<td>Groundnut</td>
<td>57%</td>
<td>42%</td>
<td>-</td>
</tr>
<tr>
<td>Blantyre, M alawi</td>
<td>Groundnut</td>
<td>61%</td>
<td>18%</td>
<td>-</td>
</tr>
<tr>
<td>Eastern Province, Kenya</td>
<td>Pigeonpea</td>
<td>84%</td>
<td>16%</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 4. Sources of information about new varieties**

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>Source obtained off-farm in 1997-98</th>
<th>Original source of seed A other farmer</th>
<th>Extension or NGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Province, Zambia</td>
<td>Sorghum</td>
<td>62%</td>
<td>68%</td>
<td>16%</td>
</tr>
<tr>
<td>Southern Province, Zambia</td>
<td>Cowpea</td>
<td>54%</td>
<td>71%</td>
<td>16%</td>
</tr>
<tr>
<td>Western Province, Zambia</td>
<td>Groundnut</td>
<td>37%</td>
<td>78%</td>
<td>9%</td>
</tr>
<tr>
<td>Western Province, Zambia</td>
<td>Sorghum</td>
<td>38%</td>
<td>48%</td>
<td>-</td>
</tr>
<tr>
<td>Mzuzu, M alawi</td>
<td>Groundnut</td>
<td>65%</td>
<td>68%</td>
<td>27%</td>
</tr>
<tr>
<td>Blantyre, M alawi</td>
<td>Groundnut</td>
<td>74%</td>
<td>44%</td>
<td>46%</td>
</tr>
<tr>
<td>Eastern Province, Kenya</td>
<td>Pigeonpea (MV)</td>
<td>na</td>
<td>67%</td>
<td>16%</td>
</tr>
<tr>
<td>Eastern Province, Kenya</td>
<td>Pigeonpea (local)</td>
<td>na</td>
<td>62%</td>
<td>38%</td>
</tr>
</tbody>
</table>

na = no data
When farmers do acquire seed off-farm the most frequent source is another farmer (Table 5). In the study areas conventional commercial seed sources for these crops play no role whatsoever. Grain markets are a common source, if they are accessible – grain is purchased and used as seed. However, it may not always be possible for farmers to distinguish between varieties from the appearance of the grain alone.

When farmers obtain seed from other farmers, they may pay cash, exchange seed for grain or labor, or obtain it as a gift. Gifts are more common for lower value crops, for small quantities, and for seed obtained from relatives. The majority of farmer-to-farmer seed transactions are between relatives (Table 8), and this may have implications for diffusion patterns of new varieties.

When farmers obtain seed off-farm they generally seek small quantities (Table 9), whether for crops with low seeding rates (sorghum, pearl millet, pigeonpea) or for crops with high seeding rates (groundnut). The latter is probably due to the high price of groundnut seed (i.e., grain) and the relatively small areas that are planted. For new varieties, a farmer may obtain a small amount of seed that can be tested, and then multiplied if the results are acceptable.

### Table 6. Seed obtained off-farm – data from other studies in Africa

<table>
<thead>
<tr>
<th>Location and year</th>
<th>Crop</th>
<th>Proportion of farmers obtaining seed off-farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senanga, Zambia, 1993/94¹</td>
<td>Sorghum</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Groundnut</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td>Cowpea</td>
<td>15%</td>
</tr>
<tr>
<td>Kalomo, Zambia, 1993/94¹</td>
<td>Sorghum</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Groundnut</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Cowpea</td>
<td>47%</td>
</tr>
<tr>
<td>Silobela, Zimbabwe, 1989/90²</td>
<td>Sorghum</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Groundnut</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>Pearl millet</td>
<td>10%</td>
</tr>
<tr>
<td>Southern Zimbabwe, 1995/96³</td>
<td>Sorghum</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Pearl millet</td>
<td>34%</td>
</tr>
<tr>
<td>Rwanda, 1991/92⁴</td>
<td>Beans</td>
<td>47%*</td>
</tr>
<tr>
<td>Zaire, 1991/92⁴</td>
<td>Beans</td>
<td>59%*</td>
</tr>
<tr>
<td>Wenchi, Ghana 1992-94⁵</td>
<td>Cowpea</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td>OPV maize</td>
<td>22%</td>
</tr>
<tr>
<td>Akatsi, Ghana, 1992-94⁵</td>
<td>Cowpea</td>
<td>52%</td>
</tr>
<tr>
<td></td>
<td>OPV maize</td>
<td>24%</td>
</tr>
</tbody>
</table>

* Some seed may also be from on-farm


### Table 7. Reasons for seeking seed of a pigeonpea variety already in use: Eastern Kenya

<table>
<thead>
<tr>
<th>Reason</th>
<th>Local pigeonpea (% of instances, N = 122)</th>
<th>MV (% of instances, N = 54)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost seed in drought</td>
<td>74%</td>
<td>46%</td>
</tr>
<tr>
<td>Seed consumed by family</td>
<td>14%</td>
<td>24%</td>
</tr>
<tr>
<td>Seed destroyed by pests</td>
<td>0</td>
<td>2%</td>
</tr>
<tr>
<td>To renew seed quality</td>
<td>12%</td>
<td>28%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Audi, Jones, and Tripp (see Appendix)
Several of our studies were done in areas where projects encouraged farmers to sell seed of new varieties in order to develop entrepreneurial skills. But very rarely is seed sold for a premium price; and the occasional small premium probably represents demand for a new variety, rather than any recognition of seed purity or quality that is associated with conventional, commercial seed demand. The price of grain usually rises near planting time, and hence ‘seed’ price is higher than grain price at harvest, but this does not constitute a premium for seed. Whether farmers buy seed in the grain market or from other farmers they are not accustomed to paying more than grain price.

The development of a commercial seed market for our target crops requires, at a minimum, the presence of commercial grain markets. In many areas the grain markets are poorly developed, and it is unreasonable to expect a commercial seed market to emerge. Demand for formal-sector seed will be stimulated by opportunities to sell these crops, and by markets that reward grain quality and type.

Table 8. Seed acquisition from farmers

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>Purchase seed for cash</th>
<th>Farmer who is seed source</th>
<th>Relation</th>
<th>Acquaintance</th>
<th>No relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Province, Zambia</td>
<td>Sorghum</td>
<td>38%</td>
<td>62%</td>
<td>23%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cowpea</td>
<td>&lt; 10%</td>
<td>70%</td>
<td>10%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Western Province, Zambia</td>
<td>Groundnut</td>
<td>69%</td>
<td>56%</td>
<td>18%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sorghum</td>
<td>20%</td>
<td>72%</td>
<td>12%</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>Mzuzu, Malawi</td>
<td>Groundnut</td>
<td>49%</td>
<td>79%</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Blantyre, Malawi</td>
<td>Groundnut</td>
<td>64%</td>
<td>64%</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Eastern Province, Kenya</td>
<td>Pigeonpea M V</td>
<td>67%</td>
<td>18%</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pigeonpea local</td>
<td>16%</td>
<td>46%</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
</tbody>
</table>

Table 9. Quantity of seed acquired

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Province, Zambia</td>
<td>Sorghum</td>
<td>59% of farmers acquire ≤ 5 kg</td>
</tr>
<tr>
<td></td>
<td>Cowpea</td>
<td>50% of farmers acquire ≤ 1 kg</td>
</tr>
<tr>
<td>Western Province, Zambia</td>
<td>Groundnut</td>
<td>63% of farmers acquire ≤ 3 kg</td>
</tr>
<tr>
<td></td>
<td>Sorghum</td>
<td>52% of farmers acquire ≤ 3 kg</td>
</tr>
<tr>
<td>Mzuzu, Malawi</td>
<td>Groundnut</td>
<td>11 kg (average)</td>
</tr>
<tr>
<td>Blantyre, Malawi</td>
<td>Groundnut</td>
<td>74% of farmers acquire ≤ 1 kg</td>
</tr>
<tr>
<td>Eastern Province, Kenya</td>
<td>Pigeonpea MV</td>
<td>1.9 kg (average)</td>
</tr>
</tbody>
</table>

Pigeonpea data are for farmers’ first acquisition of variety
na = no data
Opportunities for Commercial Seed Provision

Introduction
Formal seed supply in the study countries has been dominated by parastatal seed enterprises, but this is slowly changing. The Kenya Seed Company (KSC) has had a virtual monopoly on the local sale of seed of food grains and legumes. Liberalization in the past few years has allowed the entry of a few foreign or multinational seed companies, focusing on hybrid maize. A few private domestic seed companies also operate in Kenya. The National Seed Company of Malawi (NSCM) operated as a seed production arm of the national agricultural marketing corporation (ADMARC) until 1989, when Cargill obtained a controlling interest in the company. NSCM now operates as a private enterprise, concentrating on hybrid maize. Several other private companies also market hybrid maize seed in Malawi. In Zambia, the government is attempting to privatize the parastatal Zamseed, but it has been difficult to find buyers. Meanwhile, several foreign and multinational companies are marketing seed of hybrid maize and a few other crops such as soybean and sunflower. In Zimbabwe, the dominant enterprise is Seed Co, a private firm derived from the Seed Cooperative Company of Zimbabwe. The cooperative had an effective monopoly on seed sales of maize and other crops for many years, but is now facing competition from several foreign companies. Seed Co itself markets seed in several countries in the region.

Despite the trend towards liberalization and privatization, there is still one dominant seed company in each country, focusing largely on hybrid maize and a few other high-value crops. Although several small companies in Kenya and Zimbabwe also produce seed of grains and grain legumes, the vast majority of their sales are to NGO or donor relief projects, usually in other countries in the region.

A sustainable seed provision system requires collaboration between the private and public sectors (Jaffee and Srivastava 1994). However, national policies towards private seed enterprise are changing only slowly, and many unresolved questions remain – notably regulatory frameworks and plant variety protection. It is not reasonable to expect an immediate upsurge of private activity in a still uncertain policy environment.

The stages of seed provision
Figure 1 presents an outline of the major stages in the complex process of seed provision, and indicates the type of information flow that is required between the different stages. A number of stages are involved – plant breeding, production of breeder and foundation seed, multiplication, and distribution. Seed multiplication usually involves contracting seed growers, supervising their production, and ensuring that the seed is adequately conditioned (cleaned, treated, graded, and bagged) and stored. Once it is produced, delivery of seed to farmers requires marketing skills and infrastructure – and inadequacies in these areas represent the single most serious deficiency in most attempts to stimulate commercial seed provision.

Source seed
There is little commercial trade in foundation seed in the study countries. Several small seed companies in Kenya obtain foundation seed (for non-hybrid crops) from the Kenya Agricultural Research Institute (KARI). However, the quantities supplied are often insufficient, and the companies must bulk this seed before they can begin commercial production (some lack this capacity, and must rely entirely on KARI). In Malawi, foundation seed is produced by the government, with support from a European Union (EU) project, and provided to donor and NGO seed projects at subsidized prices. Zamseed produces most of the foundation seed of public varieties in Zambia, and uses it for its own commercial seed production and

1. This section is based on the following case studies: Kimenye, Rusike, Rusike and Gandanhamo (see Appendix). It also uses information from Rusike (1995).
Figure 1. The stages of seed provision

1. Plant Breeding
2. Source Seed
3. Seed Multiplication
4. Marketing
5. Quality Control
6. Farmers

Types of information flow
- Characteristics of variety
- Price of seed
- Quality of seed
for sale to NGOs. In Zimbabwe, Seed Co produces foundation seed of the target crops, mostly for its own use (see chapter on Public-sector plant breeding for more details on source seed production).

The emergence of a viable commercial seed system for the target crops will require adequate, reliable supplies of foundation seed. Breeder seed will come mostly from the public sector, but there is no reason why private firms cannot produce and market foundation seed - provided demand for commercial seed is sufficient to allow foundation seed to be sold at full cost.

**Seed multiplication**

Most commercial seed multiplication is done by contract farmers. While seed firms may prefer to contract with large-scale commercial farmers, this is often difficult with the target crops.

Seed growers are usually paid a premium over grain price, depending on the crop and the extra investments required for the seed crop. For open-pollinated seed crops purchased from the farmer after only basic cleaning, the premium is typically 6-8% for cereals and 8-15% for grain legumes (Chopra and Reusche 1994). The premiums may be somewhat higher if payment is made only after inspection and testing.

Large-scale farmers with more profitable alternatives (maize, tobacco) may not be willing to grow seed for these modest premiums. The alternative is to look for smaller-scale farmers who are less able to obtain high returns from commercial crops. There is a trade-off involved; smaller farmers will be willing to accept a lower price, but they need closer supervision and generally have lower yields. In some instances (e.g. inexperienced growers), supervision and management costs are high. Also, smallholders must be located in a fairly concentrated area in order to reduce assembly costs. And if full payment is made only after the seed has been inspected, smallholders are sometimes tempted to sell their harvest to someone else for immediate cash payment.

Commercial seed enterprises must strike the right balance between opportunity costs (commercial farmers) and transaction costs (smallholders). Several recent experiences in Zimbabwe illustrate the effectiveness of working through an NGO that can contact and organize smallholder growers (Kelly and Rusike 1997). However, it is important to remember that seed growers must have adequate land and labor resources - it may not be viable to contract the poorest farmers as supervision and delivery costs are simply too high.

**Seed conditioning and storage**

In very small operations (household level) seed conditioning can be done manually. But in most cases, seed shelling, cleaning, grading, treating, and bagging require some equipment. Depending on the scale of the conditioning operation an enterprise may choose to rent equipment or buy it. However, a rental market for equipment will exist only in areas where seed production is relatively well developed. Efficient utilization of equipment is enhanced if the enterprise produces several types of seed.

The seed enterprise must usually arrange for storage as well. This may require a small warehouse - one ton of cereal seed occupies approximately 3 cubic meters. Storage facilities may be purchased or rented, depending on circumstances. If seed production and distribution is decentralized, the identification of adequate storage facilities may be difficult.

**An example**

Tables 10 and 11 show a summary of production, supervision, conditioning, and delivery costs for groundnut and sorghum seed in Zimbabwe. Three options are considered: large farmers contracted by a large-scale seed company, small farmers contracted by a large-scale seed company, and small farmers contracted by a small-scale seed company.

The tables show considerable differences in the estimated wholesale price of seed. Because large farmers in Zimbabwe have other options, opportunity costs - and thus production costs - are
prohibitively high. Seed multiplication with small growers is much less expensive in this case, despite the higher costs of supervision.

Seed conditioning costs vary as well. For small-scale seed processing, the major investment is a motorized sheller for groundnuts. Other conditioning costs (assembly, chemicals, bags, labor, storage facilities) as well as administration and delivery costs depend on the scale of operation.

The Zimbabwe analysis is only an example, but it indicates that it is possible to produce and deliver seed for a reasonable price if the appropriate scales of seed multiplication and conditioning are available. Production costs of the two options using small producers compare favorably with wholesale seed prices.

**Marketing**

Marketing is a particularly weak point for commercial seed development in Africa. The dominant companies have fairly well established networks of stockists for their hybrid maize seed. In Kenya, KSC seed is available at more than 5000 stockists. In Zimbabwe, Seed Co seed is available from outlets in both urban and rural areas. Farmer cooperatives and self-help groups purchase seed from outlets in town for resale in local communities (Mugedza and Musa 1996).

However, it is much more difficult to find seed of other grains and grain legumes. Companies focus on promoting hybrid maize, and many merchants do not want to take the risk of stocking seed of crops that might not sell. Previous studies in Zambia have reported widespread farmer dissatisfaction with the

| Table 10. Estimated costs (Z$ per kg) of seed production, early-maturing groundnut, Zimbabwe, for different combinations of small/large seed growers and seed companies |
|---|---|---|---|
| Costs | Seed grower | Large | Small |
|       | Seed company | Large | Large | Small |
| Seed from growers | 15.36 | 5.78 | 5.78 |
| Supervision and quality control | 0.12 | 0.62 | 0.62 |
| Conditioning | 2.06 | 2.16 | 1.53 |
| Administration and delivery | 2.93 | 1.98 | 0.79 |
| Total | Z$ 20.47 | Z$ 10.54 | Z$ 8.72 |

in 1998, wholesale seed price = Z$ 15.60, grain price at harvest = Z$ 5.00, US$ 1 = Z$ 30 approx
Source: Rusike (see Appendix)

| Table 11. Estimated costs (Z$ per kg) of seed production, white sorghum, Zimbabwe, for different combinations of small/large seed growers and seed companies |
|---|---|---|---|
| Costs | Seed grower | Large | Small |
|       | Seed company | Large | Large | Small |
| Seed from growers | 3.55 | 1.69 | 1.69 |
| Supervision and quality control | 0.12 | 0.62 | 0.62 |
| Conditioning | 1.16 | 1.26 | 0.90 |
| Administration and delivery | 1.02 | 1.24 | 0.32 |
| Total | Z$ 5.85 | Z$ 4.81 | Z$ 3.53 |

in 1998, wholesale seed price = Z$ 5.00, grain price at harvest = Z$ 1.60 US$ 1 = Z$ 30 approx
Source: Rusike (see Appendix)
limited availability of most seed types at local retail outlets (Andren et al. 1991). The small companies in Kenya that produce non-maize seed have no established retail networks; retailers must come to the company warehouses.

Stockists and other retailers are often the primary link between seed companies and farmers. But there is little evidence of feedback between companies and stockists regarding farmer priorities or complaints. In addition, many stockists are unfamiliar with the varieties that are being sold. This problem must be addressed in order to stimulate demand for seed of grains and grain legumes.

**Demand for commercial seed**

There is a chicken-and-egg quality to the debate over farmers' willingness to buy commercial seed of the target crops. Farmers have essentially no access to formal seed supply and hence the precise level of demand remains unknown. It is often assumed that farmers are unwilling to pay for commercial seed, which for our target crops will cost 2 or 3 times grain price (at harvest). But several factors must be considered. First, grain prices fluctuate with the season - at planting time in local markets, commercial seed may be only slightly costlier than grain. For groundnut, part of the seasonal grain price increase is caused by demand for grain (to be used as seed) by farmers who have exhausted their own stocks. Willingness to buy commercial seed is also influenced by the seed requirements for the crop. For sorghum, pearl millet, or pigeonpea, seeding rates are low, and the cost of seed is a small proportion of the total cost of production. For groundnut, on the other hand, the seeding rate is very high, and the cost of seed is a much higher proportion of total production costs.

Commercial seed companies have not made sufficient efforts to market seed of many grains and grain legumes. A later section presents evidence that farmers are willing to buy seed of new varieties if it is sold in small packs.

Another strategy for commercial seed enterprise development is to encourage grain millers or merchants to expand into seed production and/or distribution. If they are able to manage contract seed growers, they can use their processing and storage facilities for seed production. These firms already have marketing contacts with farmers, and their interest in ensuring reliable grain supplies is a strong incentive

<table>
<thead>
<tr>
<th>Crop</th>
<th>Region/Country</th>
<th>Estimated area ('000 ha)</th>
<th>Seeding rate (kg ha⁻¹)</th>
<th>Annual requirement ('000 tons) if seed purchased every 3rd year ('000 tons)</th>
</tr>
</thead>
</table>
| Groundnut  | SADC            | 665                      | 90                     | 59.9                                                                      | 20.0
|            | Mozambique      | 255                      |                        | 23.0                                                                      | 7.7
| Pigeonpea  | SADC            | 113                      | 7                      | 0.8                                                                       | 0.3
|            | Malawi          | 88                       |                        | 0.6                                                                       | 0.2
| Sorghum    | SADC            | 1504                     | 10                     | 15.0                                                                      | 5.0
|            | Tanzania        | 663                      |                        | 6.6                                                                       | 2.2
| Pearl millet| SADC            | 954                      | 4                      | 3.8                                                                       | 1.3
|            | Tanzania        | 345                      |                        | 1.4                                                                       | 0.5
| Maize      | SADC            | 6875                     | 20                     | 137.5                                                                     | 45.8
|            | Tanzania        | 1796                     |                        | 35.9                                                                      | 12.0

**Sources:**
Area estimates from Musa and Rusike 1997 (1992-94 estimates)
Maize data from CIMMYT 1994 (1990-92) estimates
for providing good quality seed. For example, several cotton ginning operations in Mozambique have successfully expanded into seed production and distribution.

Thus, commercial seed capacity can be strengthened using a ‘top-down’ approach (build retail capacity, stimulate demand, and service it through existing seed companies) or a ‘bottom-up’ approach where contract growers or grain merchants/processors are able to develop into commercial enterprises. Another example of the bottom-up approach is local-level NGO seed projects, discussed in the next chapter.

Prospects for trade
The development of seed trade is further constrained by difficulties in moving seed between countries. Most countries in the region place significant restrictions on seed export and import (Musa and Rusike 1997). The prospects of developing sufficient seed demand for the target crops diminish considerably if seed enterprises are restricted to a single country.

Table 12 summarizes seed requirements for the SADC region. The total potential demand for seed of all four target crops is little more than half that of maize; and the major share is groundnut, due to its high seeding rate. Assuming that farmers will, on average, purchase seed every third year, annual requirements are 300 t of pigeonpea seed, 5000 t of sorghum, and 1300 t of pearl millet seed. Only groundnut, with an estimated demand of 20,000 t, represents a large potential demand. By comparison, current annual regional sales of maize seed (mostly hybrid) are about 55,000 t (CIMMYT 1994).
Local-Level Seed Projects

Introduction
A number of local-level seed projects have been established in Africa during the past decade, mostly funded by donors, often through NGOs or churches. When viewed individually, the projects are admirable. But examined from the perspective of national seed policy, the whole is much less than the sum of its parts.

Table 13 presents some examples from Zambia. Such projects are organized in many different ways and have different objectives (e.g. recovery of seed stocks after drought versus diffusion of new varieties). But the majority aim to provide designated farmers with source seed (often foundation seed) and technical supervision on seed production. A few projects also offer training in marketing.

This study examined four local-level seed projects as case studies - two in Zambia, one each in Malawi and Kenya. These four projects show different strategies for seed distribution.

Livingstone Food Security Project (LFSP), Southern Province, Zambia. The LFSP was initiated by CARE in response to severe drought. One of the early activities was a pilot scheme that loaned small quantities of sorghum and cowpea seed to farmers to help them acquire drought-tolerant varieties. The program was expanded by working through farmer groups of usually 5-7 participants. Approximately 1500 groups were formed; they could choose from several crops and were expected to repay their seed loans and manage their own seed stocks. Farmers were encouraged to sell or distribute any excess seed.

Farming Systems Research Team (FSRT), Western Province, Zambia. FSRT is responsible for adaptive research in Zambia. In Western Province they worked with farmer research groups to test new technologies. When a farmer group identified a new variety, a few farmers were nominated to multiply foundation seed provided by FSRT. All members of the group were entitled to a small amount of the seed and the group could sell any excess seed they produced. It was expected that some farmers would be able to establish small seed businesses in this way.

Malawi Smallholder Seed Development Project (MSSDP). This project is led by ActionAid, in collaboration with the Ministry of Agriculture. Approximately 300 groups of 10-20 farmers were formed in order to multiply seed of new varieties. Groups could choose which seed crops they wished to grow. The farmers received training in seed production and were loaned foundation seed. The groups were encouraged to sell as much of the seed as possible to other farmers. Because these were new varieties and the seed was multiplied under careful supervision it was assumed that farmers could sell the seed for more than the prevailing grain price.

University of Nairobi. In the mid 1980s the University of Nairobi developed and tested an early-maturing pigeonpea variety. The variety was included in demonstrations in a farmer’s field in Eastern Kenya. In 1987 the extension service purchased seed from this farmer and sold it to other farmers in the area. It was expected that the variety would diffuse from farmer to farmer, but there were no other formal efforts at seed production or promotion.

In some instances participating farmers are expected to repay a certain amount of seed to the project; this seed is sometimes used the following season for further distribution. The LFSP loaned seed to farmer groups, and established rules governing repayment of seed loans. Farmers were then encouraged to sell or distribute any excess seed to other farmers. In the FSRT project, groups of farmers were provided with foundation seed of new varieties; they were expected to organize seed multiplication and distribution within the group. In still other cases farmer groups are formed with the explicit aim of marketing seed; the project supplies foundation seed which must be repaid, after which farmers are expected to sell

1. This section is based on the following case studies: Audi et al., Lyoba and Tripp, Zulu and Miti, Phiri et al. (Malawi, MSSDP), Milimo and Tripp (see Appendix).
### Table 13. Local-level seed projects in Zambia

<table>
<thead>
<tr>
<th>Project</th>
<th>Donor</th>
<th>Coverage</th>
<th>Crops</th>
<th>Type of project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Province Household Food Security Program</td>
<td>IFAD</td>
<td>Southern Province</td>
<td>Cowpea, sorghum, sunflower, sesame, groundnut, bambaranut, sweet potato</td>
<td>Seed grower trained in each district. Project buys seed from them, distributes to village seed committees</td>
</tr>
<tr>
<td>Luapula Livelihood and Food Security Program</td>
<td>FINNIDA</td>
<td>Luapula Province</td>
<td>Beans, sorghum, finger millet, rice, groundnut, cassava, sweet potato</td>
<td>Farmers loaned seed for multiplication, and encouraged to sell seed</td>
</tr>
<tr>
<td>Multiplication and Distribution of Seed/Planting Materials Project</td>
<td>SIDA</td>
<td>Northern, Northwestern, Southern and Western Provinces</td>
<td>Sorghum, pearl millet, finger millet, groundnut, cowpea</td>
<td>156 farmers trained in seed production; expected to become seed producers</td>
</tr>
<tr>
<td>Smallholder Farm Systems Diversification Program</td>
<td>UNDP</td>
<td>Eastern, Lusaka, Central, Northern, Copperbelt and Luapula Provinces</td>
<td>Sorghum, finger millet, pearl millet, groundnut, maize, cowpea, beans, rice, soyabean, sunflower, cassava, sweet potato</td>
<td>164 farmers trained in seed production; expected to sell to other farmers or to merchants</td>
</tr>
<tr>
<td>Drought Rehabilitation Program</td>
<td>SIDA</td>
<td>Southern, Lusaka, Eastern, Western and North-western Provinces</td>
<td>Sorghum, cowpea, groundnut, pearl millet, cassava, sweet potato</td>
<td>Farmers trained as seed entrepreneurs; project also helps move seed between areas</td>
</tr>
<tr>
<td>Livingstone Food Security Program (CARE)</td>
<td>USAID</td>
<td>3 districts in Southern Province</td>
<td>Maize, sorghum, groundnut, bambaranut, millet, green gram, sunflower</td>
<td>Farmers being trained to be seed entrepreneurs</td>
</tr>
<tr>
<td>Bulima Seed Growers Association</td>
<td>EU</td>
<td>Mpongwe District, Western Province</td>
<td>Groundnut</td>
<td>Group has sold seed to various donor projects, also attempts its own marketing</td>
</tr>
<tr>
<td>International Union for Conservation of Nature (IUCN) Seed Multiplication Program</td>
<td>World Bank</td>
<td>Lukulo District, Western Province</td>
<td>Cowpea, sorghum, maize, rice</td>
<td>Farmers are loaned seed to multiply. Repay loan to project, which distributes to other farmers</td>
</tr>
<tr>
<td>Small-Scale Seed Production Project</td>
<td>GTZ</td>
<td>Southern Province</td>
<td>Maize, sorghum, pearl millet, cowpea, groundnut</td>
<td>A sabove</td>
</tr>
<tr>
<td>Chipata Diocese Development Project</td>
<td>Miserio (Catholic Church)</td>
<td>Several districts in Eastern Province</td>
<td>Groundnut, maize, sunflower</td>
<td>A sabove</td>
</tr>
<tr>
<td>Farming Systems Research Team</td>
<td>Govt of Zambia</td>
<td>Kaoma District, Southern Province</td>
<td>Cowpea, groundnut, sorghum, maize, pearl millet, cassava</td>
<td>Farmers multiply seed and are expected to sell it to others</td>
</tr>
<tr>
<td>Rural Community Development and Motivation Project</td>
<td>Lutheran World Fed.</td>
<td>Several districts in Eastern Province</td>
<td>Several crops</td>
<td>Seed is loaned to farmers and farmer groups for multiplication</td>
</tr>
</tbody>
</table>

Source: Zulu and Miti (see Appendix)
commercial’ seed to other farmers. In Malawi the MSSDP has helped establish over 300 groups to multiply and sell seed of selected crops. In other cases, projects hope to foster the emergence of individual seed producers and sellers (see Table 13).

Impact
Many of these small-scale seed projects have made a considerable contribution to local seed availability and have helped introduce or diffuse new crop varieties. The effect of these projects on MV adoption was shown in Table 2. In Zambia, nearly half the farmers living close to LFSP villages had obtained seed of a new sorghum variety from village seed producers, and more than half had first seen the variety in a seed group’s village. In Malawi, one-quarter of farmers living in the surveyed communities where MSSDP was active had adopted a new groundnut variety, and more than half of these farmers had acquired seed from a seed group member.

Many of the projects have formed partnerships with extension, and this has further stimulated diffusion of the new varieties. There is considerable scope for this type of collaboration, but more formal and long-term commitment from extension will be required. There is an obvious need to expand capacity for local-level variety testing. Productive partnerships must be formed among research, extension, commercial enterprises, and NGOs to develop farmers’ opportunities for accessing and testing the widest possible range of varieties, including MVs and local varieties. It might be argued that the success of the seed projects in helping to diffuse new varieties owes relatively little to any innovative methodologies; it is much more a function of the sustained and visible access to seed of new varieties provided by the projects that allowed opportunities for local testing and dissemination.

In contrast to the relative success in variety diffusion, there is much less evidence that these projects have improved local capacity to produce and supply seed. The project brings in source seed of new varieties, this seed is multiplied, and the harvested seed moves from farmer to farmer through gifts, purchases, and loans. Diffusion of new varieties increases, but there are few signs of any entrepreneurial activity that would signal the beginning of formal, sustainable seed provision.

In many cases, the quantities multiplied and available for distribution are quite small. Even the most successful seed multiplication groups in the MSSDP were rarely able to offer more than 500 kg of groundnut seed for sale to other farmers. In Uganda, 3 women’s groups who produced and sold bean seed sold just over 3 tons in 6 seasons (David 1997).

In addition, it is not clear that locally multiplied seed (apart from new varieties) is able to attract any kind of premium over grain price. Farmers who participated in variety testing with FSRT in Zambia were occasionally able to sell seed of a new groundnut variety for more than grain price. A few early adopters of a new pigeonpea variety in Kenya were able to sell seed at a slight premium. The women’s groups in Uganda selling seed of new bean varieties are reported to ask 2 or 3 times grain price (David 1997). On the other hand, there is little evidence that LFSP or MSSDP farmers received any premium for their seed.

Farmers are skeptical of the added value in seed produced locally through seed projects. If they are accustomed to obtaining seed as gifts or loans, or purchasing at grain price, they will have to recognize some special value in the locally produced seed to pay a premium for it. This may happen if there is high demand for seed of a new variety, but once that variety diffuses farmers will have many sources from which to acquire seed. Farmers do not generally perceive seed quality (germination, cleanliness, purity) as important enough to warrant a higher price. Research has shown that seed saved by farmers or obtained from neighbors or markets is usually of acceptable quality (Tripp et al. 1998 a,b). If farmers are not willing to pay a premium for locally produced seed, then seed project participants will be unwilling to invest the extra time needed for high levels of quality control or to promote marketing.

Weaknesses of local-level seed projects
One way of assessing the weaknesses of local-level seed projects is to refer to Figure 1. Although seed provision involves various stages, and requires good information flow among those stages, most small-
scale seed projects address a relatively small portion of the process – delivering source seed to farmers, providing technical advice on multiplication and seed quality. Other aspects of the process, and other types of information, are usually ignored.

**Source seed.** Most projects supply farmers with source seed. But for sustainable seed production at village level, farmers themselves would have to obtain information and foundation seed of new varieties, e.g. from research stations. Projects generally make very little effort to strengthen links between farmers and source seed suppliers or plant breeders. Even in the FSRT project in Zambia, which was managed by researchers, farmers were left with no experience in how to acquire source seed on their own.

**Seed multiplication.** Many projects have unrealistic strategies for seed multiplication. It is perfectly reasonable to provide farmers with small quantities of seed to replenish lost stocks or to provide access to new varieties. But it is not realistic to believe that the majority of these farmers have (or can develop) the skills and resources needed to become commercial seed growers. Just because a farmer is able to multiply and maintain seed for her own use, and perhaps for occasional gifts or sales to neighbors, does not qualify her as a commercial seed grower; it is unfair to raise her expectations in that direction.

While the idea of organizing local-level seed multiplication is attractive, decentralized seed production has a price. Firstly, seed is often in short supply at the local level because of problems such as drought. These problems affect all farmers, and over-reliance on local seed supply, even if formally organized, will expose farmers to the same risks. Decentralization also involves high supervision and coordination costs, even if production is confined to a single village. Many NGO projects form farmer groups to manage the participating farmers. The groups generally function as long as the NGO is present to provide incentives and advice, but maintaining a group for the sole purpose of seed production is very difficult in the absence of outside intervention. A review of the LFSP found that many group members looked to the NGO to provide additional benefits such as inputs or loans, rather than seeing the groups as a means for organizing their own activities (Milimo et al. 1997).

**Seed conditioning and storage.** Most projects assume that seed growers will manage seed conditioning and storage. This is possible so long as very small quantities of seed are involved, but equipment and storage facilities are needed for larger quantities. Another problem with expanding seed production is finance. Farmers sell their grain crop soon after harvest, while most seed sales take place just before planting. A seed producer group must have both storage capacity and financial flexibility if it is to expand its operation. Most projects have not considered these problems.

**Quality control.** Most seed projects pay considerable attention to quality control, for example extension agents may inspect the seed production plots. Given the small quantities of seed that are produced, and the fact that local seed buyers seem unwilling to pay anything extra for this level of quality, it is safe to say that many projects over-emphasize quality. If local-level seed production were to expand significantly, then some formal system of quality control would be needed. But at the current scale of operation, this level of technical advice and inspection is unsustainable. It relies on the presence of project funds and often on the temporary collaboration of extension agents who are liable to be pulled in other directions by competing donor or NGO projects.

The emphasis on ‘correct’ seed production practices can be counterproductive. One example is the time devoted by some seed projects to training farmers in maintaining isolation distances. Isolation is important in formal seed production, but less so in situations where the principal objective is to ensure that farmers have access to a wide range of varieties. We found instances where a project slowed or impeded the introduction of a new OPV because of concerns about inadequate isolation distances in small fields – the worst form of ‘extension from a textbook’.

**Marketing.** The biggest single gap in most small-scale seed projects is the complete lack of attention to marketing. Most projects assume that because seed traditionally changes hands at village level, participating farmers will easily be able to find buyers. This is unfortunately not the case. We have seen
(section on Farm-level seed provision) that the majority of transactions are between relatives or acquaintances. Farmers in some of the ActionAid seed groups in Malawi have made announcements in churches or at other meetings regarding the availability of seed, or pinned hand-written notices to trees or buildings. These efforts are admirable, but are not adequate for any significant marketing. In some projects local extension agents help spread the word about seed availability. But in the majority of cases in which larger amounts of seed have been sold, it is because the project itself, or another project, has purchased seed for its own use.

**Linkages beyond the target area.** One problem with many NGO seed projects is their over-reliance on a philosophy of local-level, self-contained seed systems. This philosophy originates in an understandable desire to have an immediate impact at the local level, and from an appeal to donor sentiments that are easily swayed by the image of resource-poor farmers establishing village enterprises. The image is attractive but unrealistic. This view is often accompanied by considerable bias against working with local merchants, who are too often seen as taking advantage of farmers. Insistence on this model leads to many well-meaning projects staffed by dedicated personnel that, unfortunately, move farmers no closer to a viable seed provision system.
Introducing Varieties with Small Seed Packs

**Introduction**

Many farmers complain that commercial seed is expensive because the package size is too large. One innovation is the production and sale of small seed packs of new varieties. The packs are much smaller than those generally offered by commercial seed firms, and are sold through a wider range of outlets.

This strategy assumes that farmers will be willing to pay a premium to acquire a small amount of seed of a new variety, from a nearby source. The small packs can be sold by a wide range of rural retailers (who tend to be overlooked by most local-level seed initiatives), or by other organizations such as extension offices, clinics, NGOs, or churches. The strategy can also help develop seed retailing skills in rural areas.

One approach is for a commercial seed enterprise to market small seed packs of a wide range of crops and varieties, while expanding its range of retailers. In Zimbabwe, Seed Co experimented with this approach for four crops (see below). The second approach is for public research programs to invest in seed distribution. This approach has been pioneered in Africa by several national bean research programs, in collaboration with the Centro Internacional de Agricultura Tropical (CIAT). One of the first examples was a CIAT-NGO initiative in Rwanda in the early 1990s. Small quantities of new bean varieties were sold by local merchants, government shops, and at open-air markets, and usually sold very quickly (Sperling et al. 1996). Small packs of bean seed have been sold through shops, rural clinics, women's groups, and an NGO in Uganda (David et al. 1997).

The current project examined three case studies (Table 14). One – Seed Co efforts in Zimbabwe – involved the first approach. Two involved the second approach: marketing of small packs of bean seed in Malawi, where the Bean Improvement Program was in its third year; and an experiment in Kenya (supported partly by the project) where the National Dryland Farming Research Centre (NDFRC) test-marketed seed of new varieties of six crops.

Promoting (and investing significant resources in) small seed packs does not imply that public research organizations should enter the commercial seed business. Rather, the small pack strategy is a concrete way in which the organization can encourage investment by other partners to improve seed availability for crops that are currently overlooked. But nonetheless, the research organization must walk a fine line between financial responsibility and variety promotion. These organizations have little commercial experience, and are most concerned with the diffusion of their varieties. But small pack schemes will make little impact unless they are run in a financially responsible manner, as close as possible to full cost recovery. Any deficits should be clearly identified as investments in variety promotion, and evaluated for cost-effectiveness in terms of the success of the promotion.

The strategy should also be organized so that most operations can eventually be taken over and viably managed by commercial or local-level organizations. In some cases, e.g. Seed Co in Zimbabwe, it may be possible for an established seed company to manage the entire operation, from production to marketing. In other cases, the public research organization may have to identify contractors to manage seed production and processing, and commercial networks to manage marketing.

One of the more difficult decisions is pricing. The price should be high enough to achieve cost recovery, but low enough so that a wide range of farmers can afford the seed packs. Costs and prices will vary greatly depending on the crop, the scale of operation, and the marketing and distribution possibilities. For cost recovery, seed must be sold for at least twice the grain price, and often higher. If farmers find the new varieties attractive, many will pay this price, at least for a small introductory quantity. As more farmers acquire the variety in this way, it will diffuse further (and perhaps even more rapidly) through seed sales and gifts between farmers.

---

1. This section is based on the following case studies: Omanga et al., Phiri et al. (Malawi, bean varieties), Rohrbach and Mulasalila (see Appendix).
Initial experience with small packs
The results of the three small pack experiments, though preliminary, are encouraging. Farmers are supportive of the scheme, the majority of the seed has been sold in all cases, and retailers are eager to expand the scheme.

In Zimbabwe, 49% of farmers said they would be interested in buying small pack seed every year, and a further 39% said they would buy at least occasionally. The majority of farmers said they were buying the seed to replenish their stocks, rather than to try a new variety. This indicates that the demand for small packs may go well beyond variety introduction. In Malawi, farmers were asked how much they would be willing to pay for seed packs of new bean varieties; 69% said they were willing to pay twice grain price, 43% said three times grain price. About 90% of the purchasers said they would buy small packs of bean seed again. There were similar responses in Kenya: 80% of the farmers said they would be willing to pay twice grain price to get fresh seed of a pigeonpea M V they were using, and 42% said they would buy fresh seed every year, if they had the opportunity.

The management of small pack schemes
Although there is still limited experience with small pack schemes, a review of several cases provides some lessons.
**Seed production.** Seed production must be cost-effective. Research institutes, in particular, often lack experience in identifying and supervising contract growers. The seed growers in the Malawi program are located in a small area, have access to irrigation, and are able to produce an off-season seed crop that is ready for sale in the main planting season. They are paid about 10% above grain price for their seed. In Kenya, the seed growers were inexperienced (participants in a program to strengthen local seed production) and were scattered over a wide area, so production costs were high.

**Seed conditioning.** The factors related to the choice of seed conditioning technology discussed in the section on commercial seed provision are relevant to small seed packs. In some cases small pack seed can be cleaned and graded by hand, or with very simple equipment. The seed may have to be treated with a storage chemical. Seed can be packed in heat-sealed polythene bags, with a label giving the variety name and, if possible, additional information. The cost of labor, equipment rental, and chemicals may be 20% or more of the cost of raw seed. In both Kenya and Malawi the seed was conditioned using labor and facilities at research stations.

**Storage and interest charges.** If a research organization is involved, adequate storage facilities will probably be available. But the costs must be considered. Another factor, sometimes overlooked, is interest charges. These could be substantial because production and distribution costs may not be recovered until after the packs are sold in the following planting season.

**Distribution.** One reason why commercial firms are unwilling to market small amounts of seed is the high cost of distribution. A small seed pack program must be willing to bear this cost. A significant investment must be made for delivery to scattered retail outlets. In the initial stages, an additional investment will have to be made to identify, contract, and monitor retailers – not every rural merchant will be a suitable retailer for the seed packs, and investigation and monitoring is necessary to develop a reliable group of retailers. In some cases it may be possible to utilize commercial wholesale networks that are already in place for other commodities.

Another key issue is to identify a seed company that will be interested in producing and distributing small seed packs. One reason why the seed sold quickly in Zimbabwe was because it was presented in bags with the name and logo of a reputable seed company that farmers recognized. Large firms may not be interested, while farmers may be wary of buying seed of unknown provenance. If smaller, less known firms are involved, it is important that they establish a good reputation among farmers.

**Sales and pricing.** The participating merchants must be able to make a profit. The Malawi program allows the seller to keep 20% of the retail price, while in Kenya stockists kept 20 to 33% of the retail price. These mark-ups are relatively high, but they may be required, at least initially, to interest merchants in small pack seed sale.

Neither the Malawi nor the Kenya small pack program recovered all their costs, although seed was sold for about twice grain price. There are ways in which both programs can reduce costs, and a modest increase in selling price may also be possible. It is hoped that the current schemes can be taken over as commercially viable operations. But even if this is not possible, a small subsidy for the seed packs may be one of the most effective investments the research organization can make to promote its varieties.

**Promotion.** In Malawi, the program produced attractive posters (placed in shops and at extension offices) describing the new bean varieties. Extension and radio announcements were also used to promote the new varieties and the small seed packs. In Kenya, some of the farmers who purchased the small packs were familiar with the varieties because of an on-farm testing program, but few were aware that the shops stocked this seed. Very little publicity was given to the small pack experiment in Zimbabwe, although most farmers were familiar with the groundnut and sorghum varieties on sale.

**Quality control.** Once the seed is in the hands of (often inexperienced) merchants, improper storage or sale of old stocks may cause problems. If a seed company manages the small pack operation, or if
wholesalers handle distribution, the seed packs will represent a very small part of their business, and they may not be able to provide adequate supervision. Possible precautions include stamping a date on each seed pack label so that old stock can be recognized, and conducting spot checks on retail outlets. Small packs can help promote new varieties and enhance the reputation of the research institute, but a badly supervised program will have the opposite effect.
Emergency Seed Programs

Introduction

Commercial seed supplies for many grains and grain legumes are practically non-existent in most African countries. But significant quantities of seed are regularly traded, to supply the many emergency seed programs that have appeared in the past decade in response to drought, civil conflict (large-scale displacement of populations), and other disasters. This project does not directly address the conduct of emergency programs, but a brief review is provided.

In some drought-prone areas, national governments have established virtually permanent drought relief programs that include seed distribution. In addition, a number of governments, donor agencies, and NGOs have established free or highly subsidized seed distribution as part of poverty alleviation efforts. Because these types of seed distribution share many characteristics in common, we can address these activities as a group.

Examples of emergency seed provision

A number of large-scale emergency seed programs were launched following the 1991/92 drought, one of the worst ever in southern Africa. In Zimbabwe, the government provided over 500 tons of sorghum and pearl millet seed, mostly new varieties, during the following season (Friis-Hansen and Rohrbach 1993). In subsequent years the government continued to provide free seed of various crops, as well as fertilizer, in an effort at poverty alleviation. In 1993/94 the sorghum and pearl millet seed distributed was sufficient to plant Zimbabwe's entire area of these crops. Free input distribution was discontinued after 1997/98, but in 1998/99 the government experimented with the distribution of vouchers that could be used for input purchase.

Table 15 presents a summary of some of the major seed distribution efforts in Malawi. The most recent example is the Starter Pack Scheme (SPS) which provides seed and fertilizer to all farm households in the country. Supporters of this program justify it in several ways. Significant food production deficits are projected and it is argued that it is more cost-effective to distribute inputs than to distribute food aid. It is also argued that the program will introduce farmers to new varieties and fertilizer that they will then be motivated to purchase in future years.

In Zambia, a coordinating body, the Program Against Malnutrition (PAM) has been established to manage various NGO relief efforts. In Botswana, from 1980 until recently, most certified sorghum seed was provided as part of a drought relief program (Musa and Rusike 1997).

The elements of emergency seed programs

Emergency seed programs have several features that deserve examination in the context of sustainable seed provision.

Seed demand. Even in extreme emergencies, planners often overestimate farmers' demand for seed. Immediately after the recent conflict in Rwanda, almost half the bean seed that farmers planted came from their own stocks, despite a significant seed relief effort (Sperling 1997). After the 1991/92 drought in Zimbabwe, farm-saved seed (or seed obtained in the community) accounted for a large share of total seed planted in several crops: white sorghum 40%, red sorghum 87%, pearl millet 45%, finger millet 100% (Friis-Hansen and Rohrbach 1993). These data indicate that much more emphasis needs to be given to the type of seed and the mode of distribution, rather than simply providing large quantities of seed.

---

1. This section is based on the following case studies: Longley, Phiri, Mazvimavi and Rohrbach (see Appendix).
2. Based on past experience, guidelines have been developed for the management of seed provision during emergencies (ODI Seeds and Biodiversity Programme 1996).
Choice of variety. Many emergency seed programs pay insufficient attention to choosing what varieties to distribute – there is a common misconception that ‘any seed is better than nothing’. Zimbabwe’s initial drought relief program included new sorghum and pearl millet varieties that were well received by farmers, but recent distributions have not included these varieties. Indeed, much of the ‘seed’ distributed is actually grain purchased in Zimbabwe. At the same time, seed of new varieties is kept from farmers because Seed Services is concerned about its proper certification (Rohrbach and Mutiro 1996).

In the SPS in Malawi, the emphasis is on hybrid maize seed, obtained from seed companies in Malawi and neighboring countries. Legume seed has also been distributed, mostly groundnut and some soybean. The majority of this ‘seed’ is in fact grain purchased in local markets. Although several projects in Malawi have tried to support seed production of new legume varieties, virtually none of this was available for the SPS.

In many cases the emergency seed has no identifying label. If it is a good variety, the farmer has no idea of what to look for in the future; if the variety performs poorly the farmer does not know what to avoid. In the cases where new varieties are distributed, most of the potential for education is lost when the seed is inadequately labeled.

Seed quality. Many emergency seed programs suffer from a lack of quality control. The programs are often organized at the last minute, with personnel and facilities co-opted from other activities. Inexperience and a lack of incentives means that no one may take responsibility for assessing seed quality. In addition, emergency seed is often delivered later than the recommended planting dates – it may cause additional hardship for a farm family that has prepared a plot and taken the time to plant seed that may not germinate. In Malawi, there were many complaints from farmers about the quality of SPS groundnut ‘seed’. Given that this was in fact grain from the market the complaints should not be surprising, despite the fact that each lot was supposedly inspected and tested. Seed quality problems for our target crops are compounded by the fact that there is often no commercial alternative available. Thus the organizers of the program must contract seed companies at the last minute and accept that in many cases the ‘seed’ is simply cleaned grain from the market.

Distribution policy. Free seed distribution makes sense in genuine emergencies, but leads to dependency when it is part of institutionalized seed programs. Farmers become accustomed to the government handing out seed (even if it is often bad quality) and they complain when there are threats to reduce the

Table 15. Free seed distribution in Malawi; some major examples

<table>
<thead>
<tr>
<th>Program</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought Relief Seeds Distribution Project, 1992/93</td>
<td>In response to drought of 1991/92, 1.3 million farmers each received 10 kg of maize ‘seed’, purchased on local grain market</td>
</tr>
<tr>
<td>Drought Recovery Inputs Program, 1994/95</td>
<td>In response to uneven rains the previous year, and collapse of agricultural credit system, 4139 t of hybrid maize seed distributed to farmers</td>
</tr>
<tr>
<td>Supplementary Inputs Program, 1995/96</td>
<td>3451 t of hybrid maize seed and 21 t of sorghum seed distributed. Fertilizer distributed in higher potential areas</td>
</tr>
<tr>
<td>Starter Pack Scheme, 1998/99</td>
<td>Hybrid maize seed, fertilizer and legume seed sufficient to plant 0.1 ha distributed to every farm household in Malawi (2.6 m packs). Total seed distribution 5200 t hybrid maize, 500 t OPV maize, 4000 t groundnut, 1600 t soybean</td>
</tr>
<tr>
<td>Starter Pack Scheme, 1999/2000</td>
<td>Plans underway to distribute starter packs for second year</td>
</tr>
</tbody>
</table>

Sources: Longley et al. 1999, Phiri (see Appendix)
A program (Van der Mheen-Sluijer 1996). Politicians and donors then find themselves in an awkward position. In some smaller programs seed is provided as a loan, but recovery is often difficult and expensive; and the ‘seed’ that is returned may be of poor quality and may have to be sold on the grain market.

Another problem is that free seed distribution is a serious disincentive to the development of any economically viable seed enterprise. Seed companies will not enter a market where their product may be part of a give-away scheme. Of course seed companies can profit from emergency seed schemes, but they focus on marketing to donor projects rather than on learning what farmers actually need. In Mozambique, the seed company SEMOC (formerly a parastatal) grew accustomed to selling to relief schemes. Now that it must sell its seed commercially, it finds that farmers are unwilling to pay for what they used to be given for free (Howard et. al. 1998). The competition for emergency seed in Africa has led to ludicrous situations – a number of seed companies in Kenya and Zimbabwe, for instance, can aggressively market to donors and NGOs outside the country, but have neither the economic incentive nor the regulatory permission to sell seed to their own farmers.

One frequently mentioned strategy for moving seed distribution schemes towards supporting commercial enterprise is the establishment of a voucher system. Vouchers – rather than inputs – are given away and can be exchanged at input dealers. Farmers can thus exercise some choice in the type of inputs they acquire, and gain familiarity with conventional commercial input sources. The voucher system is worth trying, despite some administrative problems. The Government of Zimbabwe experimented with a limited voucher scheme during 1998/99. The experience was not satisfactory, however, because most of the vouchers arrived late and went largely to better-off farmers who used them to purchase hybrid maize seed that they probably would have acquired in any case.

Unfortunately, seed distribution provides an almost irresistible attraction for both donors and governments. Seed is an attractive product, and it is relatively straightforward to organize, report on, and take credit for distribution. The realities of political and donor life would indicate that seed distribution will be with us for some time to come. These projects are usually justified with calculations of areas to be planted, and extra food to be produced. But on the ‘costs’ side is the fact that such programs can increase farmers’ dependence on outside donors and discourage any initiatives to organize sustainable seed provision.
Seed Regulation

Introduction

Seed is a commodity that requires special care, because its characteristics – viability, germination, purity, and sometimes even the identity of the variety – are difficult to assess at the time of sale. Because these characteristics may not be apparent until after planting, or even until harvest, some type of regulatory system is required. Regulation is often thought to be the responsibility of government, but in fact there are various alternatives (Tripp 1997). Any strategy must take account of the three participants in the regulatory process – regulators, consumers, and producers (Fig 2).

Figure 2. Participants in the regulatory process

<table>
<thead>
<tr>
<th>‘Third party’ regulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government certification and quality control</td>
</tr>
<tr>
<td>Private certification and quality control</td>
</tr>
<tr>
<td>Voluntary or mandatory</td>
</tr>
</tbody>
</table>

Consumers

- Consumer education and awareness
- Farmer organizations
- Consumer law

Producers

- Companies’ own quality control procedures
- Companies’ reputation
- Dealers’ reputation

Generally, a neutral ‘third party’ body assesses seed quality on behalf of the consumer. It is often assumed that this must be a government agency, but in fact it can be a private organization. Intervention by a regulatory body may be mandatory or voluntary. Seed producers and sellers also have an important role in the regulatory process. Seed companies often have their own quality control laboratories and procedures, and it is in the company’s interest to protect its reputation by providing good quality seed. Seed dealers similarly have a stake in maintaining quality. Farmers themselves must also play a key role. They should be aware of the information provided by third party regulation (e.g. certification tags or truthful labels). They should know of the principal seed companies and dealers and how to protect their own interests, either through pressure groups (farmer organizations) or through the legal mechanisms of consumer protection.

Seed regulation in the study countries is currently dominated by government regulatory agencies (see also Musa and Rusike 1997), which were established at a time when there was a single – usually parastatal – seed company. Government regulation served to enforce quality control, but it also restricted the entry of competing producers. The balance between quality control on behalf of the consumer and market protection on behalf of the dominant seed company is a particularly important issue, as liberalization promotes the entry of new seed enterprises.

Sharing of regulatory responsibilities

Another key issue is how best to transfer some of the regulatory responsibility from government agencies to seed producers. There are several ways, including licensing of seed inspection, more shared responsibility for seed quality control (e.g. QDS), voluntary certification and seed testing, and permitting the sale of truthfully labeled seed.

1. This section is based on the following case studies: Ochuodho et al., Luhanga, Mukanda et al., Rusike and Mpofu (see Appendix).
Seed sellers and farmers could also play a stronger role in the regulatory process. However, because the formal seed system is not well developed, neither group has sufficient experience in playing their regulatory roles. A survey in Zambia (Andren et al. 1991) found that half the farmers could not identify Zamseed, from where many of them purchased hybrid maize and other seed. Most farmers did not understand the purpose of a certification tag, and only 6% of farmers – and only 18% of Zamseed depot agents – could explain all the information it contained. Farmers in the study countries may complain to agricultural officials if they have problems with the quality of purchased seed, but there is often no established legal procedure through which they can seek redress.

**The current status of seed regulation**

Table 16 summarizes variety release procedures, seed quality control, and point-of-sale seed inspection in the study countries.

In all four countries, public sector varieties must undergo national testing before they are officially released. This generally involves at least 2 years of trials, following prescribed protocols and a standard

<table>
<thead>
<tr>
<th>Function</th>
<th>Kenya</th>
<th>Malawi</th>
<th>Zambia</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety release</td>
<td>Varieties must pass through National</td>
<td>Varieties must be tested in nationwide trials</td>
<td>Varieties must pass mandatory</td>
<td>Usually 3 years of testing</td>
</tr>
<tr>
<td></td>
<td>Performance Trials, but these are not</td>
<td>for 2 years. A approval required from National</td>
<td>2 years testing. A approval</td>
<td>required.</td>
</tr>
<tr>
<td></td>
<td>established for</td>
<td>Variety Release Committee. Private or foreign</td>
<td>required by Variety Release</td>
<td>by Variety Release</td>
</tr>
<tr>
<td></td>
<td>all crops. A approval required from</td>
<td>varieties pay fee for testing.</td>
<td>Committee. Private or foreign</td>
<td>Committee. Plant Breeders'</td>
</tr>
<tr>
<td></td>
<td>National Variety</td>
<td></td>
<td>varieties pay for testing.</td>
<td>Rights. Procedures for</td>
</tr>
<tr>
<td></td>
<td>Release Committee. Status of foreign and</td>
<td></td>
<td></td>
<td>foreign or private</td>
</tr>
<tr>
<td></td>
<td>private varieties not clear.</td>
<td></td>
<td></td>
<td>varieties not well</td>
</tr>
<tr>
<td>Seed certification</td>
<td>Mandatory certification for most food</td>
<td>Mandatory certification for hybrid maize and</td>
<td>Only seed of regulated varieties may be produced. Seed certification and testing mandatory. In small-scale seed projects, QDS scheme is being established.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>crops.</td>
<td>tobacco. O ther crops must pass germination and purity tests. No provision for truthfully labelled seed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Point of sale inspection</td>
<td>Inspection done by National Seed Quality</td>
<td>Inspections provided for in Seed A ct. Seed</td>
<td>Routine inspections managed by</td>
<td>No funding for Seed Services</td>
</tr>
<tr>
<td></td>
<td>Control Service, but not included in seed</td>
<td>Services conducts annual inspections, but funding not adequate.</td>
<td>Seed Control and Certification Institute. Approx 4000 samples per year. Inadequate funding.</td>
<td>to carry out inspections at point of sale.</td>
</tr>
</tbody>
</table>
procedure for approval. In Kenya and Zambia, small quantities of seed of new varieties can be Produced and sold during the ‘pre-release’ phase of testing.

Release procedures often do not work very effectively, especially for some of our target crops. Release committees do not always meet with the desired frequency and priority is usually given to a few crops. In Kenya, new varieties of several crops for semi-arid areas have just been officially released, even though they were developed and tested many years ago. In Malawi, 9 years elapsed between identification and release of new sorghum varieties (Musa and Rusike 1997).

Release procedures may impact on variety introductions by foreign organizations or local private plant breeders, and on the movement of varieties between countries. In Malawi and Zambia, foreign varieties have recently been permitted into the standard variety testing procedures. Sponsors of foreign varieties must simply pay a fee for testing. In Kenya and Zimbabwe there are no clear procedures for the testing or approval of outside varieties. In Zimbabwe, a research organization (the African Center for Fertilizer Development) established a partnership with a private seed company to produce new pigeonpea varieties, but delays in variety registration made the arrangement untenable (Musa and Rusike 1997).

Quality control regulations include two elements: seed certification to ensure the genetic identity and purity of the variety; and seed testing to assess physical qualities such as germination. These two analyses may be performed by separate agencies, but both are required before seed can be certified. In all four countries certification is mandatory for at least some crops. In Kenya and Zambia all commercial seed of major food crops must be certified. Zimbabwe has recently removed a number of crops (including groundnut, pearl millet, and sorghum) from mandatory certification. This seed can be sold as ‘standard seed’, but it must be tested for purity and germination by the government Seed Services or by a licensed inspector. Malawi currently requires certification only for hybrid maize and tobacco, but all marketed seed must be tested for germination and purity by the national Seed Services.

Point-of-sale inspection seeks to control post-production problems. Although seed may be tested and certified, it may be improperly transported or stored, or bags may be tampered with, before sale. Ideally, a regulatory agency (or consumer protection organization) should have the capacity to routinely monitor retail outlets. Unfortunately, as Table 16 illustrates, in no case is funding sufficient for adequate point-of-sale inspection. Zambia probably has the most extensive inspection system of the countries examined. Relatively few inspections can be supported in Kenya or Malawi, and Zimbabwe’s regulatory system is currently unable to carry out this function at all. In many cases, even when retail inspection is done, it is very difficult for the regulatory agency to punish or limit the sale of bad seed.

Regulatory systems and seed marketing scenarios

Seed regulation is meant to protect consumers and to promote a responsible and productive seed industry. Unfortunately, regulatory systems may also erect barriers that limit competition and discourage innovation. In particular, we consider how current seed regulations might support or hinder the emergence of commercial and local-level seed production initiatives. Table 17 describes five possible scenarios for increasing formal seed supply, and the regulations governing each of these scenarios.

Apart from MVs, there are also many local varieties and older (sometimes unregistered) MVs for which seed is in demand. A village-based entrepreneur might wish to produce and sell seed of some of these varieties. Such seed could be sold in Malawi and Zimbabwe, after purity and germination tests, so long as mandatory certification is not required for the crop in question. In Kenya and Zambia such sale would not be permitted. Small-pack seed sale has been used in several of the countries to promote new varieties, but the regulations are unclear. It is possible that regulations could be used to block any significant expansion of small-pack seed sale.

Community-level NGO and donor seed projects are often organized with the knowledge and support of the regulatory agency. Nevertheless, many of these activities contravene a strict interpretation of seed regulations. This puts national regulatory agencies in a difficult position. In Zambia, SCCI has
attempted to address this problem by introducing a Quality Declared Seed (QDS) scheme for seed projects. QDS is a way of monitoring seed quality without a formal certification system (FAO 1993). However, a number of seed projects in Zambia have found that the QDS scheme has not been sufficiently flexible – projects have had to wait while seed samples are tested at distant laboratories, and this delays their efforts to begin selling or distributing the seed.

In some industrialized countries, grain merchants have played an important role in the evolution of seed trade, by offering (at a small premium) clean grain of a particular variety to be used as seed. But in most of the study countries, this would be strictly illegal or subject to the same restrictions as conventional commercial seed sale.

Finally, commercial seed sale is subject to a number of restrictions such as mandatory certification or testing by government inspectors. However, some adjustments have been made – in Zimbabwe, several seed producing firms are licensed to certify seed and, in some cases, to test seed. The recent
re-introduction of the ‘standard seed’ category for certain crops removes the certification requirement, but seed testing is still mandatory. Licensing of seed inspectors is also under way in Zambia.

In summary, the present regulations hamper innovation. Many current local-level seed activities, and many potential innovations, are either prohibited or subject to uncertainties about how regulations might be interpreted. The changes taking place in national seed policy, and continuing seed shortages for many crops, make it imperative to reconsider the current rules.
Public Sector Plant Breeding

Introduction

This section examines what national agricultural research institutes (NARIs) are doing, and might do, to help strengthen the seed systems that can deliver their varieties.

When the NARIs were established, a clear-cut division of labor was envisaged. Research institutes would develop new varieties, public extension agencies would help test and promote them, and parastatal seed companies would produce and deliver the seed. Unfortunately, this strategy has not been successful. Extension agents have very few resources to help them learn about new varieties, much less to launch effective testing and promotion programs. The parastatal seed companies have chosen to concentrate on a few types of seed, principally hybrid maize, for which demand is assured. They have neither the resources nor the incentives to promote seed sales of other crops. Public agricultural research has not been adequately funded, so it has been difficult for researchers to conduct as many outreach activities as they should. The end result is that release of new varieties is slow, and seed production and diffusion ineffective.

Although a sustainable system of seed provision will require increasing emphasis on private commercial activity, there are still several important responsibilities for the NARIs. One area of concern is the provision of information about new varieties. Another is provision of source seed at cost to any interested seed enterprise or project.

The role of plant breeding in variety promotion

Besides inadequate funding and insufficient collaboration from other public organizations, several problems (internal to the NARIs) exist. Plant breeders have not placed sufficient emphasis on the promotion of new varieties. In some cases, once a variety is developed, there may be little pressure to obtain official release. Plant breeders are not rewarded for the extent to which farmers grow their varieties, but rather for the scientific quality of their work and the number of varieties they develop. Breeders thus have few incentives to be closely involved in variety promotion and diffusion.

There is also a tendency to promote the latest variety, rather than ensuring that a range of varieties is available. There is no such thing as a perfect variety; farmers must balance the characteristics of different varieties against multiple agronomic and socio-economic circumstances. Consequently, they often plant more than one variety or switch among varieties in different years or seasons. The strategy of focusing on only the latest variety means that the farmer may assume this is the only thing that research has to offer.

Another problem is the overemphasis on the national – as opposed to regional – character of variety development. There is some effort in the region to ease variety release procedures so that a variety that has been approved in one country can be produced and sold in another without undergoing a further lengthy period of testing (Commonwealth Secretariat 1994). But much more needs to be done. In many cases, particularly for some of our target crops, the national demand for seed of any one variety will not be sufficient to warrant a large investment in promotion or production. There are several cases where the same variety is released under completely different names in neighboring countries, making regional trade in seed more difficult.

Participation in the World Trade Organization means that countries will have to establish some form of plant variety protection. So far only Zimbabwe has enacted legislation that defines plant breeders' rights (PBR). This issue is now under debate in the other three countries. They will be required to adopt a model based on UPOV (International Union for the Protection of New Varieties of Plants) or to propose their own sui generis system of plant variety protection.

1. This section is based on the following case studies: Omanga, Chiyembekeza, Phiri et al. (Zambia), Mushonga (see Appendix). It also draws on Tripp (in press).
The existence of some type of PBR may be a requirement for private seed companies selling proprietary varieties, but the benefits are less clear for public plant breeding. With PBR, a public research institution (or an individual breeder) can charge royalties to any seed company that uses its varieties. In theory, such a system can provide revenue to the public research organization and may offer an incentive for the energetic promotion of the variety. In practice, such strategies are liable to be counterproductive in the region's current state of seed system development. The royalty income from most varieties will be very low. It is unlikely that seed companies will be willing to pay high fees for access to non-hybrid grain and legume varieties. Companies would express more interest if the legislation prohibited farmer seed saving, but this is out of the question. In addition, the efficient management of a royalty system often requires seed certification (for assessing the quantities of seed produced). Finally, if a seed company obtains exclusive rights to a variety, such access can be used to thwart competitors rather than to aggressively market the variety.

**Plant breeding organizations and source seed delivery**

Public breeding organizations are also responsible for providing source seed of their varieties. Seed multiplication is a step-wise process in which the original seed is multiplied in several stages to obtain sufficient quantities for sale or distribution. The first stage is breeder seed, i.e. very pure seed derived from the original parental material of the variety. Breeder seed is multiplied under careful supervision to give foundation seed, which seed growers then use to produce commercial or certified seed. No seed provision system will function unless supplies of source seed (breeder and foundation) are adequate. For the public varieties that are the focus of this study, breeder seed production is the responsibility of public research organizations. Tables 18 and 19 describe breeder and foundation seed production in the study countries. In Kenya, source seed production of the target crops is very irregular and there is no clear distinction between (and little production data on) breeder and foundation seed. Only limited quantities of source seed are produced in all countries, and there is significant variability between years.

**Breeder seed.** In Malawi a donor project currently provides some funds for breeder seed production. In Zambia breeder seed production of some crops has a separate budget, while for other crops it is funded from the overall breeding budget. All research organizations in the study feel that breeder seed production suffers from a lack of funds, planning, and facilities. In all cases, the research organization

---

**Table 18. Source seed production - lowest and highest production in 1996-98**

<table>
<thead>
<tr>
<th>Seed type and crop</th>
<th>Malawi</th>
<th>Zambia</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breeder seed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundnut</td>
<td>2700-4750 kg</td>
<td>5313-15,866 kg</td>
<td>220-478 kg</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>1500-5000 kg</td>
<td>52-1363 kg</td>
<td>0</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>80-120 kg</td>
<td>2100-3000 kg</td>
<td>900-1900 kg</td>
</tr>
<tr>
<td>Sorghum</td>
<td>80-250 kg</td>
<td>325-2657 kg</td>
<td>1700-3620 kg</td>
</tr>
<tr>
<td><strong>Foundation seed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundnut</td>
<td>14-52.5 t</td>
<td>8.6-10.0 t</td>
<td>0-40.9 t</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>3.5-10.0 t</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>0.02-2.0 t</td>
<td>0-6.3 t</td>
<td>0</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.2-8.5 t</td>
<td>9.4-27.9 t</td>
<td>0-80.0 t</td>
</tr>
</tbody>
</table>

Breeder and foundation seed known as pre-basic and basic seed in Zambia
For foundation seed in Zimbabwe, only Seed Co statistics available

1. This is only a summary – there are often additional, intermediate stages. There are two separate sets of nomenclature as well. This discussion follows AOSCA (Association of Official Seed Certifying Agencies) nomenclature. Under the nomenclature of the Organisation for Economic Cooperation and Development (OECD), a second stage of breeder seed is called pre-basic seed, and foundation seed is called basic seed.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Kenya</th>
<th>Malawi</th>
<th>Zambia</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding for breeder seed production</td>
<td>Not a separately budgeted activity for the target crops.</td>
<td>Budgeted as separate activity under EU project. Annual funds: groundnut US$ 7000, pigeonpea US$ 4600, sorghum and pearl millet US$ 2400.</td>
<td>Groundnut and pigeonpea budgeted as separate activity. Sorghum and pearl millet included in breeding budget. Targets rarely met.</td>
<td>Within breeding budget; breeders try to allocate 10% of budget.</td>
</tr>
<tr>
<td>Price of breeder seed</td>
<td>No policy for these crops. It has been sold to companies and individuals when available.</td>
<td>Varies, but subsidized to seed growers.</td>
<td>Sold to Zamseed at subsidized price, in return for access to land for seed multiplication.</td>
<td>Highly subsidized.</td>
</tr>
<tr>
<td>Problems in breeder seed production</td>
<td>Inadequate funding and facilities, failure of cold storage, lack of irrigation.</td>
<td>Inadequate financing, poor supervision, poor planning.</td>
<td>Insufficient funds and land; inadequate cold rooms.</td>
<td>Inadequate funds, labor, irrigation and processing facilities.</td>
</tr>
<tr>
<td>Who produces foundation seed</td>
<td>Kenya Seed Company has been the major producer. KARI has established a Foundation Seed Unit (FSU) to coordinate production and sale of foundation seed.</td>
<td>Farmers, estates and NGOs, contracted by Action Group 2 (EU project).</td>
<td>Zamseed is sole producer of foundation seed of public varieties.</td>
<td>Seed Co is sole producer for government varieties; other seed companies produce foundation seed of private or ICRISAT varieties.</td>
</tr>
<tr>
<td>How foundation seed is sold</td>
<td>No policy until recently. FSU will now sell to companies.</td>
<td>All requests are managed by Action Group 2.</td>
<td>Most NGOs and other seed producers obtain foundation seed from Zamseed.</td>
<td>The foundation seed is used by growers contracted by Seed Co. No standard procedure for other growers, such as NGOs.</td>
</tr>
<tr>
<td>Price of foundation seed</td>
<td>To be determined by FSU.</td>
<td>Varies depending on supply, sold at below cost.</td>
<td>Sold for less than certified seed.</td>
<td>Mostly internal use by Seed Co.</td>
</tr>
<tr>
<td>Problems in foundation seed production</td>
<td>Same as for breeder seed.</td>
<td>Uncertainty of demand. Inadequate storage facilities.</td>
<td>Limited capacity of Zamseed.</td>
<td>No clear responsibility for foundation seed production for many crops. Govt trying to expand options.</td>
</tr>
</tbody>
</table>
provides breeder seed to seed enterprises at less than the full cost of production. These losses drain the already limited funds available for breeder seed production.

**Foundation seed.** In Kenya, Zambia, and Zimbabwe most foundation seed is produced by the dominant seed company, which has had exclusive rights to public sector varieties. This situation must change if private firms are to produce public varieties. In Kenya some small companies bulk foundation seed obtained from KARI. KARI has recently established a Foundation Seed Unit, which will coordinate production of foundation seed of KARI varieties and then sell the seed on a commercial basis to seed companies and individuals. (KSC will continue to produce foundation seed of many of the KARI varieties that it sells.)

In Malawi, there is no set procedure for foundation seed production; a donor project currently provides funds to pay contract growers, but production is low as a result of financing and organization problems. A large number of NGO projects apply to the national seed policy coordinating body (Action Group 2) for foundation seed. A revolving fund has recently been established for the production of groundnut and pigeonpea foundation seed.

In Zambia, Zamseed may provide foundation seed to NGO projects. In Malawi and Zambia, foundation seed is provided to NGO projects at subsidized prices. In Zimbabwe, the main producer of foundation seed (Seed Co) uses much of the seed to produce commercial seed, and little is sold or distributed.

The supply of foundation seed is uncertain in all four countries. If foundation seed remains a state monopoly, the private sector may be no more efficient than parastatals in multiplying this foundation seed to commercial seed. There is no reason why foundation seed should not be produced on a commercial basis. However, it requires more skill and experience than commercial or certified seed production, so very small seed producers (and NGO projects) may wish to buy foundation seed from larger firms, rather than attempting to produce it themselves.

**The public sector role in a sustainable seed system**

One of our basic concerns is to identify the appropriate division of labor between the public and private sectors. For public varieties, the public sector will play the dominant role, and take responsibility for breeder seed provision. But subsequent stages, from foundation seed production to distribution of commercial seed, should be managed by commercial, cooperative, or community-level enterprises.

The private seed sector operates with fairly straightforward commercial incentives; it will respond if there is the possibility of sufficient sales volume. Incentives for seed enterprise at the local level may include an element of community service, but any sustainable local seed operation will have to be financially viable as well. Incentives in public sector research are more difficult to identify. Many public researchers are genuinely dedicated to their jobs and make great efforts to address farmers’ needs. But researchers’ salaries and promotions are only tenuously linked to the utilization of their varieties and recommendations. Until now, it has been possible to blame poor extension or uninterested parastatals for poor adoption of new varieties. If we acknowledge that public extension systems are weak and that seed parastatals are on their way out (and in any case unable to deliver a wide range of seed types), an alternative incentive system must be found.

To promote new varieties, it is vital to establish a link between the research organization and private seed enterprise. The NARI may have to establish a post of ‘seed contracting officer’ responsible for: (i) ensuring that a viable system of foundation seed multiplication is in place, preferably run on a commercial basis; (ii) seeking out and establishing contractual relations with organizations that can multiply and market seed; (iii) monitoring the performance of these alternatives and identifying where other organizations, donors, or NGOs might provide resources or training; and (iv) working towards a situation in which the research organization provides information and breeder seed of new varieties, while commercial seed (in small packs, from farmer group production, or from conventional commercial
sources) is managed by independent organizations that respond to farmer demand. This will need not only specific budgets for variety promotion and source seed production, but also (internal) changes - perhaps a new incentive structure where researchers’ rewards will depend on adoption of their varieties. Research administrators must emphasize that the future of the organization will depend on technology adoption rather than the mere release of varieties or the publication of papers. Neither governments nor external donors will continue to invest in public plant breeding programs that do not result in changes in farmers’ fields.
Summary and Recommendations

The current status of seed provision

This study reviewed the status of seed provision in four countries in Eastern and Southern Africa - Kenya, Malawi, Zambia, and Zimbabwe. It concentrated on sorghum, pearl millet, groundnut, and pigeonpea, but the analysis is relevant for a number of other grains and grain legumes. The study is concerned with the general development of formal seed systems, but particularly the delivery of seed of new varieties. Various aspects were examined: seed utilization at farm level and ways to strengthen formal seed provision systems, commercial seed activity, performance of local-level seed projects, sale of small seed packs of new varieties, and (briefly) emergency seed schemes. The study also examined how current seed regulations and the management of public sector plant breeding affect various seed provision options.

Although seed of most of the target crops can be saved on-farm, there is a significant amount of off-farm seed acquisition, often because of poverty, associated with poor harvests or consumption of seed stocks. This demand varies by season and by farming system. In these cases farmers generally obtain seed from neighbors or grain markets. When seed is purchased locally there is no evidence of any premium for seed quality. Farmers also seek seed when they become aware of a new variety. This type of demand is evident only for a limited number of crops and varieties, and is further constrained by farmers' lack of information about the characteristics and identity of new varieties. Growth in demand for formal seed provision for these crops will depend on how successfully public research can deliver appropriate technology and information, and on the development of grain and input markets. Such growth will necessarily be gradual, and correspondingly, seed systems will evolve slowly.

Commercial seed provision is well established in the region for only a few crops, most notably hybrid maize. The technical and organizational skills for commercial seed production are present, but seed companies do not yet see sufficient demand to justify seed production of the target crops. These crops vary in importance across the countries. Potential demand for seed of a particular crop in any one country may be limited; hence the importance of regional (rather than national) seed marketing.

Participation of the commercial seed sector is hindered by other issues as well. High opportunity costs for seed multiplication of the target crops may require firms to identify alternative seed growers. In all four countries studied, a single seed company predominates. Despite liberalization, competing firms have only recently begun to emerge. Seed marketing of the target crops is particularly weak. There are too few retail outlets, and most stockists are not familiar with the potential range of seed types that might be offered.

Instead of relying solely on established seed companies, seed of the target crops might be offered by potential new entrants to the seed market such as grain merchants, cooperatives, or large growers. But so far there is very little evidence of any emerging seed entrepreneurship that is independent of donor support.

Many donor projects and NGOs in the region have organized local-level seed activities. These projects have a range of objectives, but many of them were initiated in response to concerns about seed loss during droughts and the seed insecurity of many households. These projects provide small quantities of seed to farmers, often of new varieties. The expectation is that farmers will multiply this seed, maintain stocks in following seasons, and pass on some seed to other farmers. This may be mediated by the project itself, through farmer groups formed for this purpose, or through some type of local seed marketing. The aim is eventually to develop a sustainable system of local seed provision. The results have been mixed.

Many of the projects have contributed significantly to replenishing local seed stocks and introducing new varieties, which have often spread far beyond those farmers who are directly involved in the project.
But there is little evidence of the emergence of seed entrepreneurial capacity. The projects concentrate on seed multiplication and pay little attention either to developing contacts between seed multipliers and source seed providers, or (most crucially) to building marketing or distribution capacity. In addition, projected seed demand in these projects is rarely sufficient to warrant the investment of time and resources that would be required for a sustainable enterprise. The experience to date indicates that community-level seed enterprise is generally less viable than conventional commercial seed provision.

Several recent attempts have been made to increase the availability of new varieties by marketing small packs of seed. The strategy was initiated by several national bean research programs. The current project helped organize two additional experiments, one through a research station in Kenya and the other through a private seed company in Zimbabwe. The initial evidence indicates that this approach is feasible. It provides seed in small quantities that farmers can afford, and uses a wider range of rural merchants than is usual for seed marketing. There are several caveats, however. First, efforts must aim at cost recovery. Second, if the strategy is managed by a NARI, it requires considerable time and supervision; if it is poorly managed it will be counterproductive. Third, and most important, the small seed packs must be seen as part of a larger effort to move public breeders into more formal contact with seed companies and local-level seed projects and to stimulate the emergence of commercially viable seed provision options.

In many countries, large quantities of free seed are distributed through emergency seed programs. Although there are genuine cases of acute seed emergencies, usually caused by drought or civil conflict, many programs quickly become institutionalized, leading to dependency – thus delaying rather than stimulating recovery, and preventing the growth of commercially sustainable options. Many programs pay little attention to the correct choice of varieties or to seed quality, losing the opportunity to popularize new varieties.

All four countries have strong seed regulatory regimes. Until recently, these regulations were designed to support the monopoly national seed company. Liberalization has brought some change, and there is now widespread acceptance that regulations must support a competitive and diverse seed sector. In many cases it has become easier to register varieties from outside the national breeding program, but the procedures are still too complex. Seed certification (or seed quality testing) is still mandatory in many countries, and this hampers the emergence of alternative methods of seed provision – the majority of seed provision innovations we considered would be seriously constrained by a strict interpretation of current regulations. In addition to what the regulations clearly prohibit, there are also issues where interpretation is uncertain. This is a further disincentive to innovation. The current emphasis on national releases and nomenclature (and a disregard for regional collaboration) lowers the chances of developing a critical mass of seed demand.

The project is most concerned with seed provision for new varieties developed by national breeding programs. There are two areas of concern – promotion of new varieties and source seed. Traditionally, research organizations were not concerned with promotion; public extension systems and parastatal seed companies were mandated to promote and deliver the new varieties. Neither institution has succeeded, and so breeding programs need to play a larger role in variety promotion and dissemination of information to farmers. Equally important, source seed production is inadequate. Breeder seed production is poorly financed and managed, and the links to (and responsibilities for) foundation seed production poorly defined. If support for public plant breeding is to continue, NARIs must devote more of their resources to promoting their varieties and participating more actively in the development of sustainable seed provision capacity.

Some NARIs are considering enforcing plant breeders’ rights (royalty payments for access to public varieties) to boost research budgets, but this will almost surely be counterproductive. In any case, when seed projects or commercial enterprises seek to produce seed of new varieties, the critical constraint is often shortage of source seed.
**Recommendations**

While seed system development is a gradual process, linked to change in the wider agricultural economy, it can be guided – and accelerated – by concerted action from public research, policymakers, the private sector, NGOs, and donors. It is best supported by a long-term commitment to coherent, comprehensive policies rather than by numerous unrelated seed projects. The following is a set of recommendations for improving the performance of seed provision in sub-Saharan Africa.

Because our focus has been the delivery of new public varieties, the recommendations begin with a possible course of action for public agricultural research. This is followed by suggestions for the reform of seed regulation and the reorientation of emergency seed programs; both of these efforts require substantial political will. Subsequent recommendations are made for the private sector and for NGOs and other organizations that develop seed projects. The concluding recommendations are directed towards the strengthening of seed policy and the reform of donor strategies.

**Public agricultural research**

Our principal concern is the slow and incomplete diffusion of new crop varieties developed by public agricultural research. This study was based on the hypothesis that the problem is partly caused by an inadequate system of seed provision. There is no established seed channel for the introduction and promotion of these varieties, parastatal seed companies have not performed well, private companies are not interested, and local-level seed projects are often temporary and uncoordinated. But it is no longer adequate to blame the seed system. Research institutes receive public and donor funds to develop varieties that will benefit the country’s farmers. If those products are not reaching the farmers, then the funds are badly spent. The inadequacies of the seed system are not the fault of the research organizations, but unless they devote more resources to helping develop a financially viable seed system, it will be difficult to defend the continued investment of public monies in plant breeding.

The first requirement for moving public varieties is promotion. Plant breeders and research organizations will have to devote a larger proportion of their budgets to providing information about their products. Some of this information may go to the extension service, but much of it will have to be delivered directly to farmers, for example through printed matter, radio, or other media. Specifically, the information should aim to help farmers appreciate the range of variety options that are available, rather than concentrating solely on the latest variety. The impact of the promotional strategy will need to be assessed, to avoid wasting time and money on ineffective methods.

Increased variety diffusion also requires greater openness from research organizations. There should be much greater effort at regional collaboration in variety testing and release. Insistence on national varieties can be counterproductive when demand in a single country for a particular variety is insufficient to support promotion and seed production. There should be much greater movement and utilization of public varieties between countries in the region.

Financing and management of source seed production must be improved. All legitimate seed producers (public, commercial, or local-level) should have access to source seed of public varieties at a reasonable price. Adequate quantities of breeder seed must be available, and the research organization must invest sufficiently in its production and storage. The system of foundation seed production must also be clearly established, and must aim at soon becoming commercially viable. There must be a simple, transparent procedure through which seed producers can place orders for breeder and foundation seed.

National research organizations must become proactive in forming strong links with potential seed producers and distributors. Someone in the research organization must be made responsible for variety promotion and seed system links. Productive relations must be formed with seed companies, entrepreneurs, rural merchants, community groups, and NGOs. These may include producing small seed packs of new varieties and promoting their marketing and distribution. These small packs can be used to test demand, demonstrate the feasibility of commercial seed production, and link the research
organization to NGOs and other interested parties. However, small packs must be part of a broader strategy that promotes independent seed production and distribution.

Policy makers and donors must make it clear that future support for plant breeding programs is contingent on evidence of adoption. The research organization must be recognized as a provider of new varieties, information, and source seed. Its performance should be evaluated on the basis of variety diffusion, and on the viability of emerging seed enterprises and local-level seed options that can deliver those varieties.

Regulation
Regulatory organizations should see their role as stimulating seed system development rather than policing seed production. They must redirect their considerable experience and skills to widen participation in regulatory responsibility. Rather than discouraging new methods of seed provision, the regulatory system should provide a clear set of guidelines that stimulate innovation and encourage legitimate entrants. The requirements for variety registration and approval should be re-examined, and much more responsibility for seed quality control should pass to seed producers and consumers.

Variety registration should be simplified. Testing should not be mandatory for varieties already released in other countries in the region. Testing and registration procedures still tend to favor the varieties of the national research system. Rather than mandatory multilocational testing (which will still be unable to simulate the full range of farming conditions), a voluntary testing and demonstration program should be developed, in which all companies and breeding programs are encouraged to participate. Registration should be simplified – for example, requiring only the limited information needed to distinguish the new variety from others. If registration is mandatory it should be part of a regional approach where varieties approved in one country do not have to pass through lengthy tests in another.

Seed certification and quality control should be voluntary. Regulatory organizations should be made responsible for stimulating the emergence of new seed enterprises. Regulatory agencies can help develop the certification and seed testing capabilities of seed enterprises, and provide advice and training to local-level initiatives. A system of truthful labeling should be instituted and vigorously enforced. Where more supervision is required, a Quality Declared Seed scheme can be instituted for those seed producers who are interested.

Seed regulators should devote much more resources to consumer education and point-of-sale monitoring. Consumer education will help improve farmer demand for, and understanding of, seed quality. As commercial seed markets expand, training and supervision will be required for merchants who are unfamiliar with managing seed as a commodity.

Emergency seed programs
The provision of seed for post-emergency rehabilitation is outside the scope of this study. But longer-term institutionalized seed distribution – which is likely to continue because of political realities – has direct consequences for our interests. Free seed distribution must be assessed not only in terms of estimated production or welfare benefits, but also with respect to costs, including the contribution to dependency, the devaluation of seed in farmers’ eyes, and the disincentive effect on seed enterprise development.

Distribution programs must pay more attention to providing good quality seed of appropriate varieties. There is no excuse for importing grain for distribution as seed when attractive new varieties are available domestically. Farmers should receive the best varieties, clearly labelled, so they know what they are planting.

Seed distribution should support, rather than demoralize, an emerging commercial seed capability. Emergency seed should be purchased from enterprises that can survive after the emergency funds dry up. Farmers should be provided not with seed but with access to seed markets (through vouchers or other mechanisms) where they can make choices and gain experience.
The commercial seed sector

The commercial seed sector is still very small and fragile. It can be strengthened by expanding and upgrading the network of stockists, giving more attention to appropriate size and presentation of seed packaging, and exploring opportunities to develop seed supply linked to product markets.

Seed companies must increase the number and skills (e.g. ability to provide information) of input stockists. There are too few stockists to serve a dispersed farming population. In addition, stockists are often uninformed about the seeds they sell, or that might be available. Seed companies should help provide training and support for stockists so that they can provide farmers with information about inputs, and feedback from farmers to seed companies.

Seed companies should use more innovative marketing (e.g. small packs) to attract resource-poor farmers. Several experiences have demonstrated that farmers are willing to buy small packs of seed of new varieties. They are also more likely to understand the value of commercial seed to replenish or improve their seed stocks if they have the opportunity to buy small packs of high-quality, attractively packaged seed.

NGO and donor seed projects

The NGO sector is remarkably diverse and it would be impossible to offer any kind of blanket recommendations. In addition, one of the strengths of NGOs is their ability to innovate, so any comprehensive attempt to coordinate or supervise their activities would be unwise. But several recommendations for NGOs do emerge from this study. The key areas include contributing to a transparent system of access to source seed, the reconsideration of strategies to foster seed entrepreneurship, strengthening adaptive variety testing, and helping farmers gain access to input and output markets.

NGO projects should support the development of a transparent commercial system for access to source seed. NGOs can assist public research organizations in their efforts to improve access to breeder and foundation seed. For example, many projects use source seed of public varieties. If NGOs make their seed requests well in advance and are willing to pay a fair price, this will help source seed producers improve their planning and budgeting.

Before a project is initiated, NGOs should consider the requirements and prospects for local-level seed enterprise. Ill-conceived projects unfairly raise farmers' hopes about generating income through seed production. Projects must begin with a proper costing of the activities that entrepreneurs will be expected to manage, and thus calculate what seed price they should charge in order to recover their investment. Many projects are unrealistic about marketing requirements, and fail to account for the capital and infrastructure required for seed storage and delivery. Most projects pay high transaction costs (for source seed, production supervision, and marketing) that the potential entrepreneurs will eventually have to take on if the activity is to be sustainable.

Seed projects should improve farmers' access to information about crop varieties, their capacity for variety testing, and access to source seed. NGOs can make much larger contributions to adaptive variety testing and farming system diversification; both activities will stimulate seed demand. They can help farmers experiment with a range of local and improved varieties, and organize experimentation with new crops or cropping systems. NGOs must also focus on promoting better farming practices and more remunerative crop production. This will help convert persistent poverty-driven seed demand into effective demand that can be sustainably and profitably serviced.

NGOs must help improve farmers' capacity to market their grain and their knowledge about purchased inputs. NGOs can help farmers develop markets for their crops, both within and outside the community or project area, which will in turn stimulate seed demand. They can also improve awareness about agricultural inputs and associated consumer rights, so that farmers are able to make better input choices.
**Seed policy**
Countries need to develop comprehensive, integrated seed policies. Seed policy should be the responsibility of high-level decision-makers. The policy-making body should include (but should not be limited to) representatives of research, regulatory agencies, emergency programs, and extension. The role and expected outputs of public research, in relation to the capabilities and limitations of the private sector, must be more clearly delineated.

**Policies must develop an enabling environment for commercial seed development.** This is a long-term, complex task that goes beyond simply privatization (which, in any case, often transfers control of public assets to well connected individuals). Instead, it must allow full participation in agricultural markets by anyone with the necessary resources and skills.

**Support must be provided for entrepreneurs who wish to link crop marketing to seed supply, e.g., for grain millers or processors to supply seed to farmers.** One important source of demand for commercial seed is farmers who can sell their grain in markets that pay a premium for quality. Grain buyers often have the knowledge and infrastructure to facilitate seed supply, either independently or in collaboration with an established seed enterprise. Once commercial seed begins to appear in these markets, demand can quickly widen.

**Links between general agricultural development policy and seed sector development should be recognized and exploited.** Priority areas include the development of markets that place more emphasis on quality, and the provision of credit, transport, and communication facilities to rural enterprises. A long-term vision for seed system development, with periodic assessments of the agricultural economy, will help ensure that the seed system is able to meet increasing demand.

**Donors**
The present donor climate hinders the development of a coherent national seed policy. National policy is often simply a series of responses to donor initiatives. Current donor behaviour presents two major problems. First, an adequate seed policy requires long-term commitment, which is incompatible with the donor project cycle. Second, an integrated approach is required, which competing donor projects are unlikely to engender.

Seed projects are usually designed to be completed in a few years and to demonstrate some measurable result at the end. This commonly results in the development of one element in the seed system without reference to the others. Community seed production is organized without reference to seed distribution mechanisms. Training is offered in seed quality maintenance with no assessment of farmers’ priorities or perceptions. Seed growers’ associations are formed before seed growers express any demand for such initiatives. Emergency seed distribution is organized with little thought of an exit strategy. The result is temporary support to one or another activity that is unsustainable when the project is completed.

Appropriate incentives can be developed for farmers, entrepreneurs, and scientists. But donor incentives are more problematic. Seed is an attractive target for funding. Project outputs can be measured in seed distributed or produced, training courses given, or meetings held. So in any given year, seed is donated, subsidized, produced by hopeful entrepreneurs, and demonstrated to farmers. Calls are made for the seed system to be liberalized, deregulated, and studied. Networks are formed, stakeholder meetings are convened, equipment is donated, staff are hired or seconded, and a myriad of projects struggle forward. Each project sees itself as contributing to the seed system, but their cumulative effect is to wear away the fabric from which a national seed policy must be woven.

In countries where there are many donor seed projects, it is imperative that donors take more responsibility for coordinating and rationalizing their efforts. Increasing emphasis is now given to coordination and networking among similar seed activities within a country or region. This is a step forward. What is missing is any significant effort at coordinating the donors who fund these activities.
Seed projects must be monitored more closely, by both donors and governments. Most projects include some type of assessment, but usually towards the end of the project. More effort is required to monitor the ongoing performance of seed projects and ensure they are consistent with national seed objectives. Little attention is given to following the long-term impact or sustainability of projects that try to improve farmers' access to seed or varieties.
References


Musa, T. and Rusike, J. 1997. Constraints to variety release, seed production and distribution of sorghum, pearl millet, groundnut, and pigeonpea in SADC countries. ICRISAT Southern and Eastern Africa Region Working Paper no. 97/02. PO Box 776, Bulawayo, Zimbabwe: ICRISAT.


Appendix

Twenty-two studies, listed below, were completed for the project “Linking Seed Producers and Consumers: Diagnosing Constraints to Institutional Performance”.

Kenya

Audi, P., Jones, R., and Tripp, R. Diffusion and adoption of Nairobi pigeonpea variety 670 (NPP 670) in Mwea division of Mbeere district, Eastern Province, Kenya.

Kimenye, L. Commercial provision of non-hybrid seed in Kenya.

Ochuodho, J.O., Sigunga, D.O., and Songa, W.A. Seed regulations and seed provision options with particular reference to food cereal and legume grains in Kenya.

Omanga, P.A. Source seed supply: current status of breeder and foundation seed supply for pearl millet, sorghum, groundnut, and pigeonpea in Kenya.

Omanga, P.A., Jones, R., and Audi, P. Preliminary experiences from test marketing of small seed packs in Machakos, Mbeere, Makueni, and Mwingi districts, Eastern Province, Kenya.

Malawi

Chiyembekeza, A.J. Source seed supply in Malawi.

Longley, C. A village-level assessment of the Starter Pack Scheme in Malawi.

Luhanga, J. H. Seed regulations and seed provision options in Malawi.

Phiri, M.A.R. Seed distribution in the 1990s in Malawi.


Zambia


Zulu, E. and Miti, F. Inventory of the informal seed sector in Zambia.

Zimbabwe

Mazvimavi, K. and Rohrbach, D. Assessment of the agricultural input voucher scheme in Zimbabwe.


Rohrbach, D. and Malusalila, P. Developing rural retail trade of seed through small packs.

Rusike, J. Investment analysis of different scales of seed operation: a case study from Zimbabwe.

Rusike, J. and Gandanhamo, T. The impact of the CARE Zimbabwe Agribusiness Entrepreneur Network and Training (AGNET) Program: a survey of farm input dealers in Makoni North and South Districts.

Rusike, J. and Mpofu, B. Seed regulation and seed provision options in Zimbabwe.
About ICRISAT

The semi-arid tropics (SAT) encompasses parts of 48 developing countries including most of India, parts of southeast Asia, a swathe across sub-Saharan Africa, much of southern and eastern Africa, and parts of Latin America. Many of these countries are among the poorest in the world. Approximately one-sixth of the world’s population lives in the SAT, which is typified by unpredictable weather, limited and erratic rainfall, and nutrient-poor soils.

ICRISAT’s mandate crops are sorghum, pearl millet, finger millet, chickpea, pigeonpea, and groundnut; these six crops are vital to life for the ever-increasing populations of the semi-arid tropics. ICRISAT’s mission is to conduct research which can lead to enhanced, sustainable production of these crops and to improved management of the limited natural resources of the SAT. ICRISAT communicates information on technologies as they are developed through workshops, networks, training, library services, and publishing.

ICRISAT was established in 1972. It is one of 16 nonprofit, research and training centers funded through the Consultative Group on International Agricultural Research (CGIAR). The CGIAR is an informal association of approximately 50 public and private sector donors; it is co-sponsored by the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Bank.