Seed saving and climate change in Zimbabwe

Progressio Zimbabwe

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Progressio
Unit 3, Canonbury Yard
190a New North Road
London N1 7BJ, UK
www.progressio.org.uk

Progressio Zimbabwe
PO Box 4572
Harare, Zimbabwe

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Cover photo: A woman preparing planting basins in Uzumba Maramba Pfungwe (UMP) province
Photo: Canford Chiroro

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Canford Chiroro designed and coordinated the research and drafted the report that forms the basis of this publication. Canford holds a Masters degree in Development and Project Planning and is a Projects Consultant at Jimat Consult. The research team consisted of Canford Chiroro, Alice Thole, Margaret Samhembere and Christopher Chagumaira.

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List of acronyms and abbreviations

AREX	Department of Agricultural Research and Extension
CIMMYT	International Maize and Wheat Improvement Centre
CRS	Catholic Relief Services
CTDT	Community Technology Development Trust (Commutech)
GEF	Global Environment Facility
GMB	Grain Marketing Board
GMOs	Genetically Modified Organisms
ICRISAT	International Crops Research Institute for the Semi Arid Tropics
NGO	Non Governmental Organisation
ODI	Overseas Development Institute
OPV	Open Pollinated Variety
UMP	Uzumba Maramba Pfungwe
UNCBD	United Nations Convention on Biological Diversity
UNFCCC	United Nations Framework Convention on Climate Change

Contents

Executive summary

This study of farmers in two districts in Zimbabwe revealed that seed insecurity has been one of the main causes of protracted food insecurity – and that the reverse is also true: food insecurity results in seed insecurity or scarcity. In the context of a changing climate and a difficult socio-economic environment, seed access has become a critical issue, resulting in farmers struggling to access a limited supply of saved seed. The study found that an intervention strategy of increasing seed availability would strengthen small farmers' capacity to produce or purchase adequate food, and also enable them to save or purchase seed. Farmers and institutions working in agriculture acknowledge the need to review seed aid activities as a basis for understanding how the effectiveness and sustainability of seed-based interventions could be enhanced.

The study found that food security is not solely a result of seed security, but depends on several interrelated factors. For smallholder farmers to be able to produce enough food in a changing environment depends on the availability of seed which can adapt to the new climate. Therefore, other key areas of focus in seed-based interventions include the conservation and preservation of diverse crop seed resources to ensure that seed can be developed with an enhanced capacity to adapt to climate change. Improving seed marketing and increasing access to seed through seed fairs are also crucial. However, these approaches are currently constrained by national and international legal and policy frameworks. Farmers are using other strategies to adapt to seed shortages and climate change, including seed multiplication projects, establishment of seed banks and the adoption of appropriate conservation farming methods.

Most farmers are increasingly dependent on saved seed compared to hybrid varieties because of the high cost and/or unavailability of hybrid seeds, and because hybrid seeds produce only one crop (crops grown from hybrid seeds do not produce viable seeds for future planting). Farmers' knowledge of seed saving was demonstrated through their preferences for saving open pollinated varieties (OPVs) and indigenous seed. A number of indigenous methods are used to preserve seed, especially indigenous seed, and this knowledge will become increasingly valuable as seed saving becomes more widespread.

The study found that farmers preferred to use hybrid seed for maize and indigenous saved seed for other crops such as sorghum and millet, groundnut and bambara nuts (which are important for cash and food). The adoption rate for hybrids was generally lower in Uzumba Maramba Pfungwe (UMP), located predominantly in Zimbabwe's agro-ecological region 4 (low agricultural potential), than in Murehwa, which is in agro-ecological region 2B (high agricultural potential).

Taking a rights-based approach, the study investigated the positive and negative impact of current laws and policies on resource poor farmers struggling to access seed. In particular, the study analysed legislative frameworks at a national level (the Plant Breeders' Rights Act and the Seed Act), finding that 93 per cent of smallholder farmers were not aware of their rights as farmers. There are no provisions which cater for the rights of smallholder farmers, especially those which relate to their capacity to access, market and protect their plant genetic resources. Legislation and policy frameworks were perceived to support commercial seed production companies rather than farmers themselves, while making seed saving systems such as community gene banks and seed fairs illegal.

1 Introduction

Climate change threatens to reverse the gains achieved in human development as droughts, floods, intermittent rainfall and extremes of temperature, among other variables induced by climate change, compromise potential food and income security (Dervis, 2007). This is especially so in the developing world where the majority of people (and the majority of the poor) depend on rain-fed agriculture for sustenance (Devereaux and Maxwell, 2001). Even in cases where these smallholder and often resource-poor farmers have adequate access to land and agricultural inputs, the fruits of their resources and labour are challenged by the complexities of the increasing climatic changes. These poor and vulnerable farmers unfortunately have had limited capacity to adapt, and in many cases policy and institutional, financial and legal factors, as well as a lack of political will, have added to their constraints. Given the increased frequency of extreme weather events induced by climate change, creating a framework for adaptation is crucial to protect the poorest and most vulnerable.

The important role of seed security (including both saved and purchased seed) as a determinant for food security in households that depend on agriculture cannot be over-emphasised. Due to financial constraints, the majority of smallholder farmers in developing countries have saved and traded in seed for many generations, and have developed seed which possesses favourable characteristics, such as drought resistance or high yield potential.

This study is based on the premise that seed saving is an important component in ensuring household food security for smallholder farmers, particularly in view of the uncertainties caused by climate change, and by resource constraints. It investigates the role that seed saving plays as a strategy helping farmers to adapt to an ever-changing climate. It also explores the issues limiting farmers' access to, marketing and preservation of plant genetic resources as a basis for ensuring seed security.

1.1 Study objectives

- To explore the role of seed diversity in managing the effects of climate change in Zimbabwe by analysing the extent to which seed conservation practices are a key part of adaptation strategies to climate change, and to provide evidence on the importance of seed saving in guaranteeing the food security of poor farmers in Zimbabwe.
- To assess the extent to which current national and international legal frameworks protect small-scale farmers' access to and preservation of indigenous seed varieties. In particular, to analyse current and potential synergies and conflicts between two biodiversity-related conventions, the UN Convention on Biological Diversity (UNCBD) and the UN Framework Convention on Climate Change (UNFCCC).
- To make recommendations for the setting up of policies, systems and structures that encourage indigenous seed production, conservation and marketing as a strategy to adapt to food security challenges (especially owing to climate change), based on best practice.
- To make recommendations for donors and policymakers on how to put systems and structures in place for supporting programmes for the production, conservation and marketing of indigenous seeds.

The study is divided into two sections: a situation analysis of current approaches, policies and challenges in ensuring seed security in the context of a changing climate, and an analysis of policies and legal frameworks that constrain or enhance farmers' capacity to access, market and preserve plant genetic resources.

The key issues covered are summarised below.

Table 1: Themes and key issues

Theme	Key issues
Seed conservation, diversity and adaptation	• Situation analysis of indigenous seed saving, use and marketing • Comparison of indigenous seed versus hybrid seed in relation to adaptability to climate change • Assessment of farmers' knowledge of genetically modified organisms (GMOs)
Preservation, protection and access to indigenous seed	• Analysis of existing legal frameworks and protocols relating to the preservation and protection of indigenous seeds, and how these impact on access by small-scale farmers • Recognition of farmers' rights as they relate to access, marketing and preservation of plant genetic resources • Potential threats that climate change represents to indigenous seed saving mechanisms • Practices and constraints in preserving and protecting indigenous seed • Level and form of institutional capacity and support • Role of private and public sectors
Policy recommendations	• Policy and programme recommendations to make seed saving work for climate change adaptation • Strategies required for policy, systems and structural frameworks • Promoting indigenous seed production, conservation and marketing to improve food security
Way forward for donors and policy makers	• Role of donors and policy makers • Recommendations on level and nature of input in setting up functional and effective systems for programme support in production, marketing and conservation of plant genetic resources

2 Study methodology

2.1 Study design

A descriptive case study methodology was used for an in-depth, small-scale exploration of the issues relating to seed saving and climate change. The locations chosen were Murehwa and Uzumba Maramba Pfungwe (UMP) districts, which are both in Mashonaland East Province. Quantitative and qualitative data collection methods were used.

2.2 Data collection methods

Document review

To gain an understanding of the regulatory frameworks that have an impact on farmers' rights and their capacity to utilise preserved plant genetic resources, a review of the relevant literature and an analysis of national legislative and policy frameworks as well as of international instruments such as the UNCBD and the UNFCCC, was carried out.

Key participant interviews

To get an expert view, key participants were interviewed from target village, ward, district and national level. Key participants were drawn from various sectors and various levels of expertise, including local government, government departments, seed companies, non-governmental organisations (NGOs), donors, and research and policy organisations.

Household survey

A household survey was carried out using a semi-structured questionnaire to provide information on farmers' socio-economic status and current seed saving, marketing and conservation practices. Households were also questioned about their awareness of GMOs, farmers' rights, and how to cope with climate change. Sixty households were interviewed, 15 in each of the four wards surveyed. A balanced number of men and women were interviewed to ensure that gender-specific perspectives would be heard.

Focus group discussions

Focus group discussions were held in each of the four wards surveyed to provide a wider and deeper understanding of the study's key issues. Two focus group discussions were held in each ward, one for men and one for women, with an average of 10 people attending per group.

2.3 Data management and analysis

Debriefing meetings were held at the end of each field day and at the conclusion of the field work to discuss emerging issues, experiences, findings and case studies. Questionnaires were checked to ensure that questions were being asked in a consistent way, and that responses were being collected correctly. Quantitative data from household surveys was validated, cleaned, entered and analysed using the Statistical Package for Social Scientists. Qualitative data was entered into a computer and analysed based on the study's thematic areas and research questions.

2.4 Study limitations

The main constraint was the unavailability of some key participants. Given the study's short notice, it was not possible to meet some key participants because of their full schedules. The study also coincided with conferences on climate change and disaster preparedness being held in Harare and Brussels, which several prospective key participants attended. However, the researchers ensured that those who were available were interviewed in depth to ensure that all relevant issues were explored.

3 Study findings

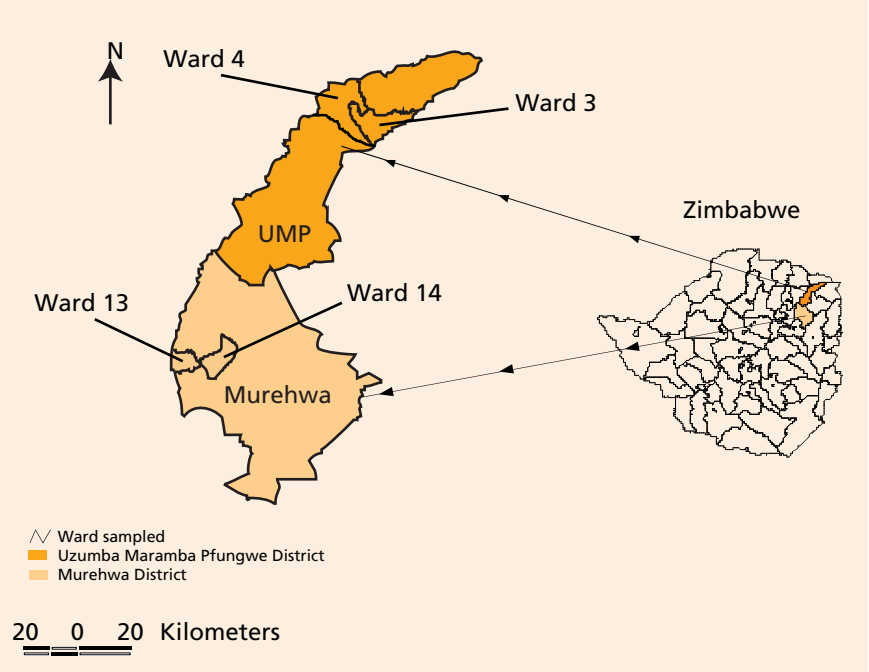
3.1 Introduction

To provide a context for the study's findings, it is important to outline the socio-economic, agro-ecological and climatic conditions in the areas where the study was carried out. The key issues explored – seed security, and the factors that limit or facilitate access to seed by smallholder farmers – are dependent on the factors influencing farmers' capacity to produce or earn an adequate income from their livelihood sources in order to purchase seed.

3.2 Description of study sites

Figure 1 below shows the location of Murehwa and UMP districts and the specific wards in which the study was undertaken. In Murehwa, wards 13 and 14 were chosen and in UMP, wards 3 and 4.

Figure 1: Map showing the location of study sites



Murehwa predominantly lies in the high potential agro-ecological zone 2B characterised by moderately high rainfall and moderate temperatures for crop production (more detailed information on Zimbabwe's agro-ecological zones is provided in Annex 1). This has a bearing on the choice of crops cultivated, yield potential and alternative income sources, as well as on the level and magnitude of poverty. Wetlands and gardens prolong the growing season, especially for maize, and allow for intensive vegetable production. Cash and food security crops like potatoes, sweet potatoes and tomatoes are grown, especially for Mbare produce market in Harare.

In contrast UMP, although classified as in the green category by the Ministry of Agriculture (implying that households are food secure; see map of zones in Annex 1), is actually a zone of low potential. The majority of the district is in agro-ecological region 4 which is characterised by low rainfall, high temperatures and low potential for crops such as maize. Only 16 per cent (42,000ha) of UMP is in agro-ecological region 2B with good granitic loams, while the remainder (225,000ha) is in agro-ecological regions 3 and 4.

In UMP, due to the limited availability of water, livelihoods are not dependent on gardens. Gardens near dams cannot function when there are water shortages. Alternative livelihood strategies are pursued, such as illegal gold panning which carries with it the risk of arrest. Some households use an

increased amount of land for cotton production due to the higher market prices that this attracts, but they often still face serious food insecurity when they cannot afford to purchase food from markets.

Socio-economic issues

In both of the districts studied a majority of study respondents depended on farming as a livelihood strategy. In Murehwa district, 74 per cent of respondents depended on farming, and in UMP 64 per cent. All of the households interviewed were living below the Poverty Datum Line, based on an average household size of 6.6 people, of Z$12,000,000 (then US$32) per month (Zimbabwe Central Statistical Office, 18 September 2007). The Poverty Datum Line is defined as the cost of a given standard of living that must be attained for a person or family not to be deemed poor. The incomes that respondents earned from farming were insufficient to buy food or farm inputs, and explain why most of those interviewed had limited access to seed. For example, Z$500,000 (about US$1.33 on the parallel market and US$14.29 at the official rate: exchange rates on 18 September 2007 were 1US$=Z$375,000 on the parallel market and 1US$=Z$35,000 on the official rate) was enough to buy a 10kg packet of hybrid seed, but not to pay for transport costs to the growth points where the seed would be procured from (costs going up to about Z$250,000 for a distance of about 50km. 'Growth points' are business centres within the rural areas, typically having a shopping centre, fuel station, a bus terminus and one or two banks).

A wealth ranking exercise (see next page) was carried out among respondents to assess what the communities in both districts perceived as proxies for household food and income security (which also have a bearing on the capacity of households to preserve or purchase seed).

Table 2: Wealth ranking exercise

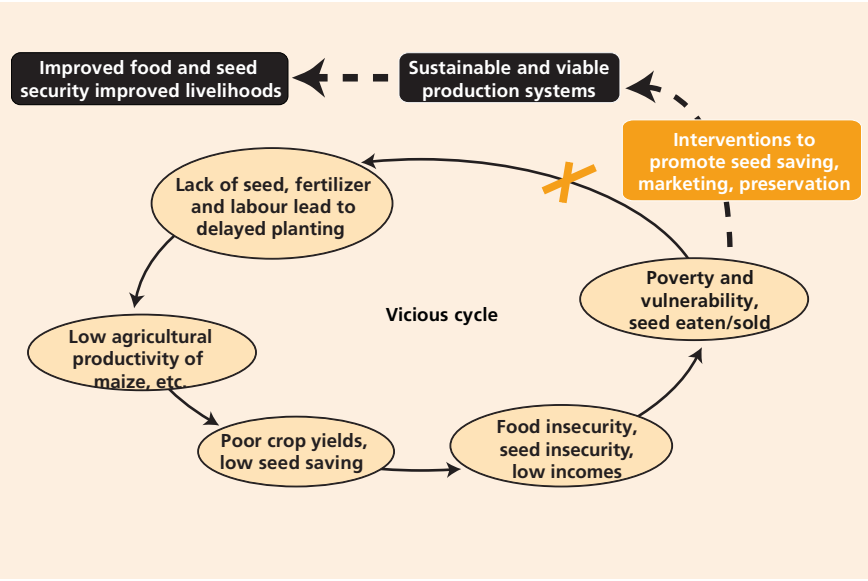
Category	Indicators for Murehwa	Indicators for UMP
Ultra poor	• Has no livestock • Lacks draught power • Has no access to seed and fertiliser unless assisted by NGOs • Has no husband or working children • Often hosts old people or those constrained by HIV and AIDS, which limit labour access	• Frequently faces food shortages • Depends on external food support • Lacks clothing • Cannot afford seed or fertiliser unless assisted by NGOs. Often eats seed as grain • Has to sell labour to obtain food and seed
Poor	• May have either a plough or an animal or both and may pair up with a neighbour to till land • Has a 'proper' hut or house which is not dilapidated • May have some form of livelihood source, though insufficient to meet household requirements • Often does not have a garden for growing market vegetables	• May have a plough but has no cattle • May afford to save seed for next season, but can seldom afford to buy seed • Sells labour to richer households for food and seed
Better off	• Has between 2 and 10 cattle. Very few people have more than 10 cattle in this ward because of a recent anthrax outbreak that severely depleted cattle numbers • Has draught power and farm implements like a plough, and does not rely on others • Husband works and children send remittances • Can afford to buy seed and fertiliser • Has a 'proper' house • Owns a larger garden	• Focus group participants felt that none of the households in their wards could be classified as better off, but rather as less poor. • Has 2 to 8+ head of cattle • Obtains a slightly higher yield on average, but this may not last through to the next season • Buys seed and fertiliser • Often involved in cash crop production, eg cotton growing

3.3 Links between poverty and seed saving

It emerged from focus group discussions that the poorer the household was, the greater their dependence on saved seed. However, as poverty worsened, families' ability to keep their saved seed until the planting season was reduced due to their need to consume or sell it. Less poor households tended to retain their seed and were more able to purchase saved seed, or at least prepare their land earlier, than the ultra-poor.

The illustration below shows the vicious cycle of poverty and vulnerability experienced by farming households in the areas studied. Although seed assistance will not work without food assistance, the illustration shows how interventions that increase households' capacity to save, market or preserve seed may move the poor out of food insecurity and poverty.

Figure 2: The cycle of poverty and vulnerability



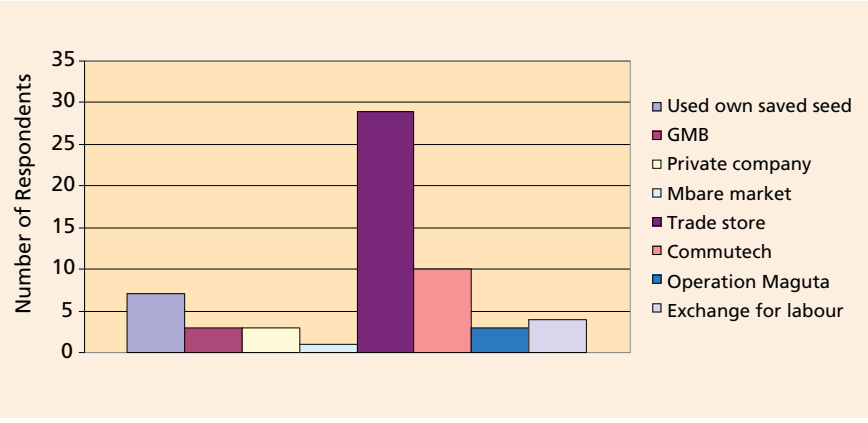
3.4 Seed access, preference and conservation

Source of seed

Cereals

For most of the cereals grown (with the exception of maize), the major source was farmers' own seed saved from the previous season.

Figure 3: Sources of maize seed



Forty-seven per cent of farmers obtained seed from local trade stores or major markets in Murehwa, UMP or Harare, while 12 per cent used their own saved seed, and seven per cent received seed in exchange for labour. Seventeen per cent obtained seed from Commutech, the Community Technology Development Trust, which is spearheading sustainable agriculture projects in both districts, and is also a member of the GMOs Coalition. Other sources of seed included the Grain Marketing Board (GMB).

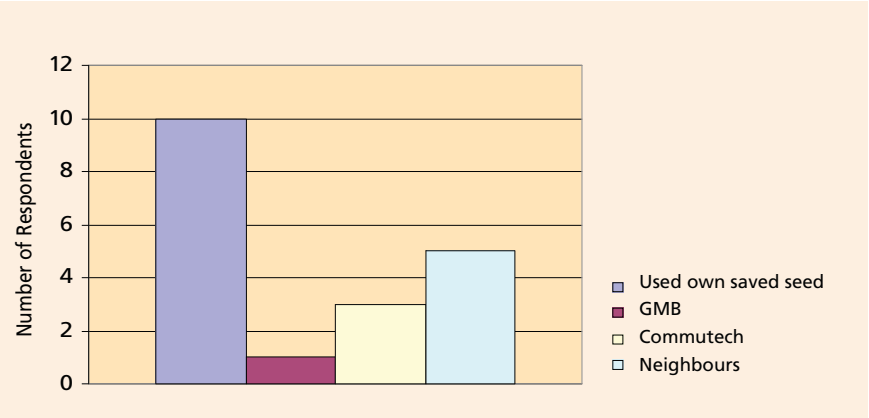
The maize seed bought from trade stores was hybrid, ie commercially produced seed derived from crossing varieties with desired traits from two selected parent plants. Hybrid plants have uniform features including maturity and height. Hybrids are often high yielding, but if replanted they will not produce uniform plants, and the yield will reduce by about 50 per cent.

The maize seed obtained from Commutech and the GMB was OPV seed, which is derived from broad populations of many parent seeds. This seed can be saved without much yield loss in the second season. OPVs yield at least 15 per cent less than hybrids. Indigenous maize seeds like Hickory King are, in principle, also OPV.

In UMP, 70 per cent of respondents said that the cost of transport was the factor that most limited their access to seed. A 10kg packet of Seed Co variety SC513 was being sold for $1,200,000 (US$3.20 or US$40 on the parallel and official market, respectively) at a trade store in Chiunze 2 Ward, compared to a retail price of $450,000 in Mutawatawa Growth Point, about 60 kilometres away. OPVs like ZM421 and ZM521, grown in both districts, were obtained from Commutech through seed fairs and seed multiplication schemes, while other indigenous and OPV lines like Hickory King were mainly sourced from farmers' saved seed, seed fairs and local exchange.

On a national scale, maize seed availability remains a perennial problem. Currently seed companies can supply 30,000 tonnes per season compared to a market demand of 50,000 tonnes, making it difficult for farmers to access enough affordable seed to meet their requirements.

Figure 4: Sources of sorghum seed

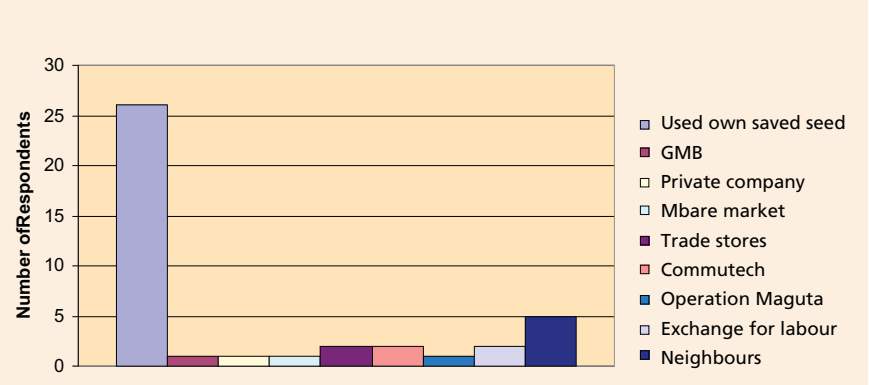


Farmers seldom bought sorghum and pearl millet seed, but when they did, they often chose a new variety such as Marcia or PMV3, and saved the seed for the following season. The major sources for these traditional crops were seed fairs and informal farmer-to-farmer market systems. Of the 19 respondents who planted sorghum, 10 used their own saved seed while five obtained seed from their neighbours, three from Commutech, and one from GMB.

Legumes

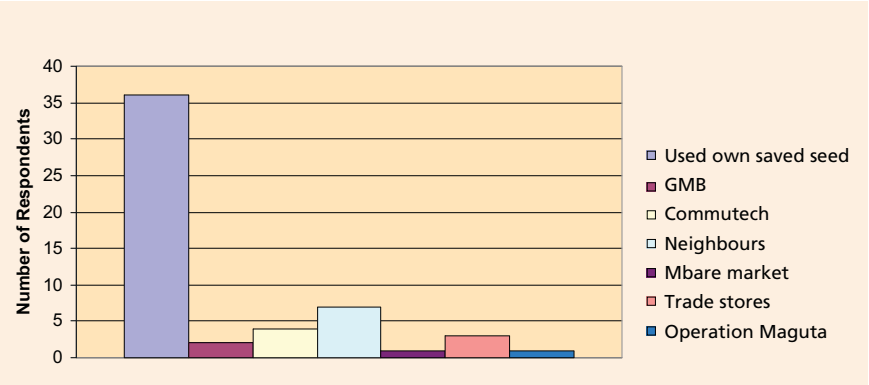
For groundnut and bambara nut seed, farmers preferred to use their own saved seed or that sourced from neighbours, seed fairs and other informal exchanges. When there was not enough seed available, farmers tend to prefer to buy from Mbare market. Seed companies are currently producing very low amounts of seed for these crops, or none at all.

Figure 5: Sources of bambara nut seed



Farmers found groundnut seed purchased from seed companies to be susceptible to peeling off of the seed coat, a factor which they said affected the seed's keeping quality. There was agreement in both districts that current varieties of saved seed had been selected over a long period of time by farmers themselves, meaning that they were adapted to local conditions. However, some strains with desirable features had been wiped out by recent droughts, such as Chimbaura, a traditional two seeded groundnut variety.

Figure 6: Sources of groundnut seed



Fifty-five out of 60 respondents planted groundnut. Of these, 65 per cent used their own saved seed, 12 per cent obtained seed from neighbours and 7 per cent from Commutech. The rest of the respondents obtained seed from Mbare market, Operation Maguta and trade stores.

Constraints in access to and utilisation of seed

The survey identified a number of constraints experienced by farmers in both districts in accessing and utilising seed.

Access-related constraints

- The high market cost of seed was worsened by transport costs. The retail prices at both growth points for Seed Co varieties SC513 and SC517 were as follows:

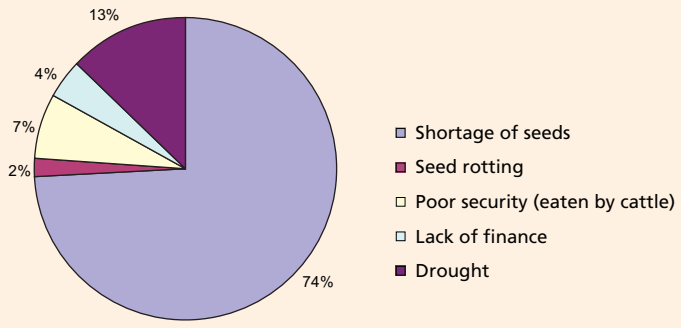
Table 3: Seed retail prices at 7 September 2007

Unit Size	Price	Official Rate	Parallel Market
5kg	Z$230,000	US$7.67	US$0.61
10kg	Z$450,000	US$15	US$1.20
25kg	Z$1,100,000	US$36.67	US$2.93

Source: Exchange rates: official rate on 7 September 2007: US$1:Z$30,000; parallel market US$1:Z$375,000

- Insufficient quantities of seed available on the market. Each trade store in Murehwa is allowed up to a maximum of 500kg of seed from seed companies.
- Delays in receipt of seed from NGOs and from the GMB.
- The quality of seed sold by seed traders and in seed fairs is not always reliable, and sometimes the percentage of seedlings that emerge may be too low to sustain a reasonable crop. In 2006, the groundnut seed sold (Nyanda) was of poor quality, with seeds splitting even before planting. However, other factors could also have inhibited seedling emergence.

Figure 7: Main problems in accessing seed



Constraints related to utilisation

- Increasingly unpredictable rainfall means that farmers have to seed or gap fill several times to establish a reasonable crop. When poor rainfall causes total crop failure, farmers have no crops to harvest and therefore no grain from which to save seed for the next season. This was the case with groundnut seed in the 2006/7 season.
- Food insecurity is very important in determining how much seed a farmer can bank for the next season. About 40 per cent of households interviewed had already started either grinding maize seed for consumption or processing groundnut seed into peanut butter to use as a cooking oil substitute or sell to local or external markets.
- Drought and other forms of extreme weather can also be devastating. Most respondents usually plant all of their seed in the current season, meaning that in the event of droughts, floods, or veld fires they can lose the entire crop and be left with no seed to retain. Many desirable varieties of legumes have been lost in this way.

3.5 Strategies and approaches to increase seed security

Recognition of the interconnectedness of livelihood systems and development interventions has led to several strategies to enhance food security. These have focused on strengthening rural communities' capacities to access, market and conserve seed, while also enhancing seed diversity and preserving desirable traits. This study refers mainly to the work of Commutech in Murehwa and UMP, although important lessons have also been drawn from other organisations that have conducted or are still conducting related work.

Promotion of OPVs

Programmes that seek to strengthen local communities' capacity to ensure access to seed through building on seed reserves have tended to promote OPV seed. In both of the districts studied, Commutech promotes the cultivation of OPV seed. Crops covered include maize (ZM521 and ZM421) and soya beans. OPVs have the advantage that, in spite of their relatively lower yield compared to hybrids (where the latter are well adapted), they are cheaper, as seed can be retained over at least three seasons with a reasonably sized yield. In UMP, respondents who said they preferred using OPV seed explained that the district received low rainfall and high temperatures, implying high evapotranspiration rates (evapotranspiration is the combination of evaporation from soil and other surfaces and from plants). Although respondents had tried some more resistant hybrids, these had not been as resilient as OPVs. Even those respondents who preferred using hybrid seed agreed that OPV seed had better resistance against storage pests. Another desirable trait was that OPV crops were good for roasting and for making boiled green mealies. Maize meal prepared from King Korn appeared whiter and was perceived as superior.

One elderly farmer was asked why he preferred OPV seed to hybrids. He said that OPV crops had more fibrous roots than hybrids, and their stems and cob leaves had higher water retention capacity than hybrid plants.

In contrast, another farmer who was asked the same question replied, 'It is every poor farmer's dream to one day graduate to using hybrid seed.'

Limitations of promoting OPVs

- OPVs often have a longer growing season than hybrid varieties like SC413 and SC517. As a result most respondents said that OPVs were best suited to farmers who cultivate using wetlands (which allow an extension of the growing season) or who have gardens.
- There is limited market availability of OPV seeds for households not included in seed assistance programmes.
- In most areas, farmer field days are organised by seed companies and the winning farmers (those with the highest yields) are usually those who use hybrid seed. Most farmers therefore believe that hybrids are the best seed to use. However, promotion of OPVs has emphasised cost cutting rather than yield levels, making them ideal for the resource poor.
- OPV seed assistance targets vulnerable households, but these households often lack labour to work in the fields, which may reduce the effectiveness of interventions. In some areas, communities organise and provide labour assistance to vulnerable households. A labour voucher system is yet to be implemented as an incentive to assist vulnerable households, and also to provide capital to other less vulnerable households.

Conservation farming

In the context of climate change, conservation farming is an adaptation strategy. The conservation farming programme is multifaceted in approach, and as well as conserving labour, soil and moisture, it also reduces the amount of seed that a farmer has to use. Planting basins are used to harvest the first rains and the moisture retained may be sufficient to keep plants alive until the next rainfall. By ensuring more effective crop emergence, conservation farming saves seed, as a farmer may otherwise have to seed a number of times before the soil has enough moisture to carry a plant through various critical stages.

In conservation farming, farmers start preparing their planting basins around July following the harvesting of all crops. Depending on the labour available and the size of the field, farmers may work until October when rains are traditionally expected. This means that even labour-constrained households can at least manage to finish preparing their land in time to plant with the first effective rains, which often determines whether a harvest is successful or not. There are two key advantages to this:

- Respondents agreed that farmers practising conservation farming harvested much higher yields in drier years than those using the conventional plough. High yield means that there is more grain available for the household, and so seed may be kept until the next planting season instead of being consumed.
- Traditionally, poorer households tend to sell their labour in exchange for seed or other farm inputs. Since peak demand for labour usually continues until the first rains, poorer farmers would have to prepare their own fields after those of their employers, or when those with cattle had finished ploughing their own fields. The poorest farmers would therefore often plant too late, fail to harvest much, and be trapped in a cycle of poverty. Conservation farming breaks that cycle and provides opportunities for food and seed security. Some farmers noted that although initially conservation farming was seen as an appropriate strategy for households without cattle, now even the richer households have adopted it too. If richer households need additional labour, poorer ones can now work for an income and still have enough time to finish preparing their own fields. Incomes earned in this way can diversify poorer farmers' livelihood bases and reduce their vulnerability to seed insecurity.

Limitations of conservation farming

Most respondents gave positive feedback on conservation farming. The Department of Agricultural Research and Extension (AREX) office in UMP estimates that 90 per cent of farmers have adopted the technology, and says that conservation farming has produced better results than any other previous innovation.

In spite of its obvious positive results, more needs to be done:

- Planting basins must be protected from livestock passing through, so that labour-constrained farmers do not have to re-dig the basins. A month's labour can be lost if cattle pass through a field where basins have been dug. More fencing is needed.
- The technology depends on some stover (the leaves and stalks of crops that remain after harvest) being left on the field, but farmers with livestock find this difficult, as stover is an important food for cattle. Even those without livestock usually let animals feed on the stover as they benefit from milk, meat and other animal products through established norms of reciprocity. Further research is needed to find out how little stover can be left on the fields. Stover yield under limited rainfall is in any case often very low.
- Current practices in conservation agriculture do not incorporate legumes, which are important as intercrops (crops grown alongside a main crop) for optimising water use efficiency, and for providing cover to suppress weeds.

Instead of emphasising that farmers should adhere to a set spacing (90cm by 30cm), farmers should be supported to participate in technology development in ways that benefit their farming practices and allow them to grow diverse crops on a limited field size.

The seed fair and voucher system

Seed fairs were first introduced in Zimbabwe by Commutech in the mid 1990s to promote the use and preservation of traditional seed varieties. The evolution of seed fairs has seen wider implementation by organisations including Catholic Relief Services (CRS), CARE and Practical Action, as well as the introduction of a voucher system. This was introduced by the government in 1999 as a means of helping farmers make the transition from free seed distribution programmes. Through vouchers, farmers can offset part of their transport costs when making bulk purchases of inputs such as seed and fertiliser, as only distant wholesalers offering favourable prices are supported.

The table below shows the model that has been adopted by most organisations using seed fairs as a strategy to improve seed security, including Commutech.

Table 4: Model for organising a seed fair with a voucher system

Activity	Actions
Assessment of need	• Identify district/ward/village • Research seed available in districts/ward/villages • Identify number of beneficiaries • Calculate seed requirements
Planning	• Determine voucher value, design, organise printing • Meet with local authorities to plan seed fair • Meet with target communities to explain seed fair • Select and register beneficiaries • Select seed fair date and venue • Identify local organising committee • Mobilise external seed sources such as seed companies and agro-dealers
Implementation	• Clarify rules • Register sellers, seed crops, varieties and quantities • Inspect seed quality • Distribute vouchers • Beneficiaries exchange vouchers for seed • Voucher reconciliation and payment to sellers
Evaluation	• Debriefing session for buyers and sellers • Post seed fair evaluation

The role of seed fairs has been to promote farmer to farmer exchange of seed (and thus boost diversity of plant genetic resources), as well as to promote the buying and selling of seed for vouchers (encashed by Commutech) or cash (after vouchers have all been spent). In spite of their obvious benefit in making seed available to households who could otherwise not access it, seed vouchers would be more effective if combined with a labour voucher system, and widened to cover more wards beyond where Commutech is operating, assuming more funds were made available for this.

It is also important to note that seed is normally exchanged and sold informally in villages. The rationale underlying the seed fair approach is that vulnerable households are often excluded from such market systems as they have limited or no purchasing power. By offering vouchers to the vulnerable, local market systems are strengthened and, through prizes given to farmers who bring large amounts of seed and a range of crops to seed fairs, local seed production systems are also promoted.

The major crops brought to seed fairs varied between Murehwa and UMP. Maize was common in both areas, but hybrid maize was less common in UMP. In Murehwa, hybrid seed was brought by local traders to allow the retention of its benefits locally. Seed companies felt that high transport costs and the availability of a ready market at their wholesalers made attending seed fairs uneconomic for them. They had obvious concerns, among them the illegality of farmers selling seed without a breeder's permit, which the companies viewed as a violation of plant breeders' rights, and the possibility of losing their market as more farmers learn how to produce seed and sell to their neighbours. However, the legal instruments protecting breeders have not been well policed, allowing space in which farmers can participate in seed fairs.

The crops sold at seed fairs included maize (hybrid and OPV), groundnut (traditional varieties from farmers' selected and saved seed), bambara nut, sorghum, pearl millet, cowpeas, cotton, sunflower and soya beans (OPV). In selecting seed suppliers, preference was given to growers trained through the seed multiplication scheme (see below) as this guaranteed high quality. AREX's inclusion through all the stages of organisation ensured technical assistance in seed quality assurance, and strengthened AREX's capacity and involvement in working directly with communities.

Limitations of the seed fair approach

Sixty-eight per cent of respondents were aware of seed fairs in the previous season, but 25 per cent were not. When respondents were asked about the effectiveness of seed fairs in ensuring seed security, they identified several limitations:

- Traditionally farmers have given each other seed as gifts or for repayment upon harvest, providing a safety net for poorer households. Some respondents felt that seed fairs commercialised seed access and that some of the poorest households, who would normally be casually assisted by their neighbours, would no longer receive that assistance, and would suffer even more if they were not included on seed fair beneficiary lists.
- Seed prices after seed fairs would normally rise to the levels set by the seed fair, making access to seed difficult. However, Commutech has set a pricing policy that recognises the need to use realistic market prices based on a consultative process. Some respondents felt that prices escalated after seed fairs because seed sellers knew they were charging the 'donor' and set their prices too high. However, when these same respondents were asked to comment on price trends for other inputs and basic commodities, they agreed that prices were continuously increasing for these items as well.
- Farmers who did not have vouchers often had limited access to popular varieties of seed, as cash sales were only allowed after all vouchers had been used. There were limited quantities of some varieties, and so only a few farmers could access them. It is essential that seed likely to be in high demand is identified and that efforts to ensure multiplication are implemented.

- Although seed was assessed visually, some respondents claimed that they had experienced germination failure when using seed from seed fairs.
- There were some cases where local farmers purchased seed from markets such as Mbare to sell at seed fairs. According to focus groups, this led to the introduction of new varieties which did not do well under local conditions. It also increased the risk of contamination with foreign germplasm (see below) leading to poor yield or loss of resistance.

Seed multiplication scheme

The study found that only 14 per cent of respondents in both Murehwa and UMP had received any form of training in seed multiplication. These low figures imply that farmers' capacities to produce their own seed is low. The seed multiplication scheme thus fills an important gap in ensuring access to seed, as well as its diversity.

In both Murehwa and UMP, the seed multiplication scheme is run by Commutech, in partnership with AREX. The scheme's key objective is to increase seed stock and diversity, and to increase its distribution.

Targeted seed growers are identified and trained in seed multiplication techniques including isolation distances, seed selection and storage. They are given OPV seed (currently 10kg of maize and 2kg of soya beans) and when they harvest it, they return twice the amount of their initial loan. This extra seed is passed on to other farmers in the next season, and so investment benefits are spread across the whole community. The seed multiplication scheme is linked with community seed banks.

Community seed banks

Community seed banks seek to promote seed diversity as well to conserve and preserve germplasm. Germplasm is the genetic material that carries an organism's inherited characteristics and in the case of plants, usually refers to seeds or other materials from which a plant is propagated. Of the two districts studied, only UMP has a seed bank. The seed bank in UMP stores seed in the cool temperatures that are required to maintain viability. Farmers are encouraged to bring different kinds of seed with desirable traits. This seed is tested for germination and stored in glass containers in the gene bank. To encourage deposits, farmers who bring the highest diversity of crop seeds are given prizes. Traditional crops and vegetables are encouraged by running traditional dish competitions concurrently with other seed bank fairs. Participants prepare dishes using traditional crops (millets and sorghum) and indigenous vegetables. Survey respondents said that encouraging pearl millet and sorghum was working well, as maize is less suitable for UMP, and milling prices were expensive for maize, whereas sorghum and millet are processed at home.

The main benefit identified by respondents was that seed banks are a 'safe deposit' for farmers' most prized seed. In the event of total crop failure caused by drought, floods or fire, leaving farmers with no seed to harvest, they can get samples of their own saved seed from the seed bank. The risk of seed and germplasm loss was very high before the seed bank was set up, as farmers would often sow all their seed and lose all or most of it in extreme weather events.

In Murehwa, where a seed bank has not yet been built, seed for vulnerable households where risk of seed consumption is high is kept under the custody of other community members and board members who work with Commutech.

3.6 Seed preference

The study identified the type of seed respondents were using based on three options: hybrid, indigenous (including OPV) or both.

Table 5: Seed preference

Crop	Preference for hybrid	Reason for preference	Preference for indigenous	Reasons for preference	Both hybrid and indigenous
Maize	88.1%	High yielding, early maturing, adapted to the area, drought tolerant, better availability, recommended by demonstrators, large cobs, pest resistant	8.5%	Pest resistant, drought tolerant, high yielding, accustomed to using the variety, large cobs, short seasoned	3.4%
Groundnut	7.4%	Early maturing, availability, good for peanut butter, does not explode readily when there is excess water, adapted to the area, establishes quickly and performs well, good taste and quality	88.9%	High yielding, drought tolerant, more pods per plant, early maturing, does not explode, adapted to the area, good taste and quality, accustomed to the variety	3.7%
Bambara	15%	High yielding, better availability, good taste, pest resistant, early maturing, establishes quickly and performs well, adapted to the area, high demand on the market, good taste and quality, affordable	85%	Accustomed to the variety, more pods per plant, establishes quickly and performs well	-
Sweet potato			100%	Suitable for sandy soils, drought tolerant, desirable sweet taste, lower susceptibility to weevil attack	
Sorghum	52.9%	High yields, drought tolerance	41.2%	Short seasoned, high yielding, drought tolerant, easy to process, large grain	5.9%
P. Millet	–		100%	Good availability, tolerates drought and heat stress, as well as low soil fertility	-
Sunflower	20%	Larger head and gives higher oil yields than saved seeds	80%	High oil yield, better availability of seed	-

Table 6: Varieties of seed available and those preferred by farmers

Crop	Varieties available	Preferred variety
Maize	SC414, SC513, Pioneer, Pannar Hickory King, ZM521, ZM421	SC513 Hickory King
Groundnut	Bob white, Falcon, Valencia, Nyanda, Natal Common, Kaboko, Chipofu, Kasawaya, Kamugabe, Murambatsvina	Nyanda, Kaboko
Bambara nut	Tumbe, Misodzi, Dhindiri, Nyadava, Nyamandebvu, Tsvuku, Chena Chingara, Dahwa, Gunguwo	Chena, Tumbe
Sweet potato	Chizai, Zadzangoro, Chingova, German 2	Zadzangoro, Chingova
Sorghum	Marcia, Gokwe, Ka 2 months, Mashawa marefu, Red sorghum, SV3	Marcia
P. Millet	Ka 2 months, Nhuri, Red millet,	Ka 2 months
Sunflower	Peredovic	Peredovic

3.7 Seed treatment

Fifty per cent of survey respondents depended on saved seed for most food and cash crops other than maize and cotton. If access to seed is increased through programmes that promote higher seed production, like the seed multiplication scheme and conservation farming, this should improve farmers' ability to store seed effectively to ensure its viability when planted.

Table 7: Proportion of respondents retaining crop seed

Crop	% of farmers retaining seed
Maize	12%
Cotton	25%
Groundnut	65.5%
Bambara nut	66.7%
Sorghum	52.6%
Pearl millet	63.6%
Sunflower	92.9%
Sweet potato	82.4%
Green vegetables	19%

Table 7 shows that respondents tended to use saved seed for most legume crops, which are important for both cash and home consumption. To enhance understanding of current seed saving practices, respondents were asked how they treated each one of the crop seeds prior to storage. The results are shown in Table 8.

Table 8: Treatment methods used for various crops

Crop	Treatment methods used
Maize	• Smoke treatment • Mix with sorghum or millet chaff • Treat with chemicals • Mix with cooking oil or paraffin • Mix with cow dung ash • Mix with gum tree leaves • Leave seed on cob
Groundnut	• Left on shells until just before planting • Mix with cooking oil or paraffin
Bambara nut	• Left on shell until just before planting • Mix with cooking oil or paraffin
Sorghum	• Often placed in bags and saved without any treatment
Pearl millet	• Saved in bags or in mud gourds and saved without treatment
Sunflower	• No treatment
Sweet potato	• Vines selected and kept in gardens
Green vegetables	• Dry seed

3.8 GMOs and their implications for seed saving and climate change

Farmers' perceptions of GMOs

Evidence from the study indicates that there is almost no knowledge on the issue of GMOs among farmers: 98 per cent of respondents in the household survey did not know what GMOs were. The quotes below show what happened in one focus group after farmers were asked what they understood GMOs to be:

> 'GMOs are Genetically Modified Organisms. They take a gene from a broiler because it matures fast, and place it in maize. The resulting maize plant then matures in eight weeks like the broiler,' said one focus group participant from Murehwa.
>
> The other participants replied, 'If that maize can be brought here, we would like it very much because it would fit into our rainfall season well.'

Some farmers felt that GMOs would allow for the development of seed varieties which are adaptable to current and future harsh climatic conditions within a shorter time frame than would be possible with conventional breeding. They argued that the environmental risks would be minimal, as the GMOs were only hastening processes that would occur normally anyway, but in a longer time frame.

Implications of GMOs for the preservation of plant genetic resources

Zimbabwe has no clear policy on GMOs but the general stance is that GMOs are restricted from entering the country, or used only under controlled environments for research purposes. The main concern has been their potential health and biodiversity risks, which are still uncertain, as there is a lack of empirical evidence on either side of the debate. There is widespread lack of knowledge and awareness about GMOs, from policy makers to farmers, as the technology remains restricted to scientists and advocacy groups.

Zimbabwe has signed and ratified the Cartagena Convention on Biodiversity and the Convention on Biological Diversity, bio-piracy, property rights and other international conventions. Within these frameworks, bio-safety is seen as ensuring an adequate level of protection, safe transfer, handling and use of living modified organisms resulting from biotechnology that may have adverse effects on conservation and the sustainable use of biodiversity.

A study conducted by the Biotechnology Trust of Zimbabwe found that the level of GM contamination in five sampled countries in the Southern African Development Community (excluding South Africa) ranged from 3 to 30 per cent (Emmett, 2006). In Zimbabwe, positive results for GM material were found in fields, granaries, seed stocks and GMB silos. In addition, most of the food items that Zimbabwe imports from South Africa, including cooking oil, flour, mealie meal and sugar, tested positive for GMOs. Seventy-six per cent of the 58 products analysed were GM positive – although approximately 71 per cent of these products were labelled 'non GMO', 'GM free' or organic.

Zimbabwe imports grain and seed from South Africa, where 6 to 20 per cent of the area used to grow maize is producing GM crops. Zimbabwe, in spite of its conservative stance on GMOs, has limited capacity to test materials due to lack of testing instruments and skilled personnel to carry out the tests. Borders are highly porous due to corruption at border points, and seed or grain may easily evade authorities. Some of the food aid distributed in Zimbabwe has been sourced from South Africa, and farmers have planted some of this material.

Key to the GMO issue is the fact that biodiversity is under threat. Some seed which farmers consider to be their own may have traces of GM material, and it could be that the traits that farmers are selecting as favourable are actually those carried by GMOs. The implications are even more far reaching when this germplasm is collected by institutions working on crop improvement – such as the International Crops Research Institute for the Semi Arid Tropics (ICRISAT), the International Maize and Wheat Improvement Centre (CIMMYT), and the government Crop Breeding Institute – and added to national collections. Selections and crosses of this germplasm will then mean that GM crops become widespread.

GM contamination, especially where genes such as the 'terminator gene' are concerned, threatens the viability of crop seeds. Most importantly, it prevents farmers already struggling to access seed from saving their own seed. This worsens their vulnerability to both seed and food insecurity and weakens the biodiversity from which adaptable crops and varieties may be selected by farmers. GM contamination would also lead to the loss of some traditional European Union markets which restrict GM contamination to less than 0.9 per cent, resulting in a loss of potential income for smallholder farmers involved in horticulture.

3.9 Climate change and adaptation strategies

Vulnerability to climate change

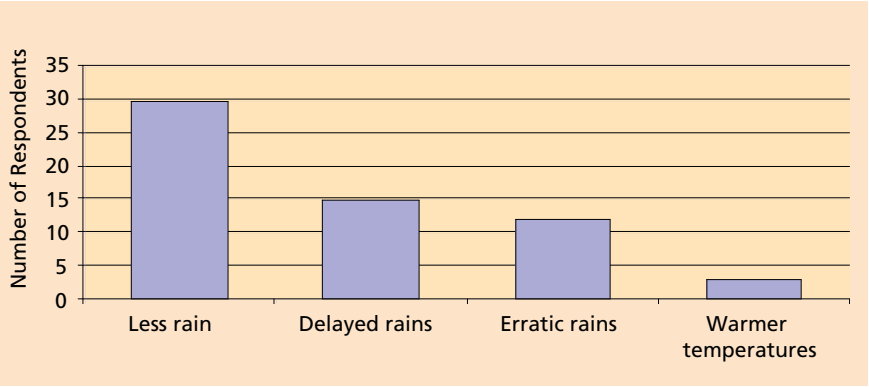
Seventy-four per cent and 64 per cent of study respondents' livelihoods in Murehwa and UMP respectively depend directly on rain-fed and labour intensive agriculture. The changes in rainfall and temperature associated with climate change therefore increase the risk of livelihood systems failing to produce adequate food and seed, or to provide sufficient income to purchase adequate food and seed to meet household requirements. Understanding the nature of farmers' vulnerability to climate change is the first step in determining what needs to be done to enable them to adapt. This section looks at perceptions of climate change and its impacts on food and seed security, and at strategies that have been implemented in both districts which mainstream climate change risk.

Perceptions of climate change

All the households interviewed believed that the climate has changed. From focus group discussions, it emerged that most of these changes had taken place in the last few years, with ranges from five to 20 years being given. The last good harvests were 1998 in Murehwa and in 2000 in UMP (which was related to Cyclone Eline). An 84-year-old respondent from Murehwa said that since the 1960s, rainfall has declined in both reliability and distribution.

When asked how the climate had changed, based on first responses only, 50 per cent of respondents said that the rains were now less, 25 per cent mentioned delayed rains and 20 per cent said that the rains were now more erratic. Only five per cent of respondents cited warmer temperatures.

Figure 8: Respondents' views about aspects of the climate that had changed



Respondents in both areas gave the following examples of climate change:

- One hundred per cent of respondents in focus groups felt that the length of the growing season had shortened. Rains used to start on 15 October and last until April, but the season now starts in mid December and does not usually last even until the end of February. In some cases rains come too soon and then disappear for a prolonged time.
- The mid-season drought is often more intense and prolonged, and the general warmer temperatures mean that any earlier rains are quickly lost through evapotranspiration. The combined effect of drought and warmer temperatures is that crops often fail to get properly established, leading to replanting and greater use of seed. Erratic rains also mean that too much rain may be received at certain stages of plant growth and too little at critical stages like grain maturation. Yields have suffered as a result, diminishing farmers' ability to access seed and reducing the harvest from which they can select seed for the next season.
- Rainfall is more variable from place to place. For example, one village might receive significant amounts of rainfall while another barely five kilometres away receives none. Yields thus vary widely even within relatively small geographical areas.

Figures from AREX show that UMP received 500mm of rainfall in total in the 2006/7 planting season, compared to 700mm in 2003/4, 850mm in 2004/5 and 900mm in the 2005/6 planting season. Although these rainfall figures are comparatively good, its distribution has been variable.

Implications of climate change on seed security

- Erratic rains mean that farmers have to use more seed than in a season with normal rainfall. Because of the high cost of seed and its unavailability, this makes some farmers' livelihoods very vulnerable.
- Prolonged midseason drought and poor rainfall distribution means that there is less moisture available for grain and seed to grow, and consequently less grain and seed is harvested for saving.
- Respondents also discussed some of the more complex implications of

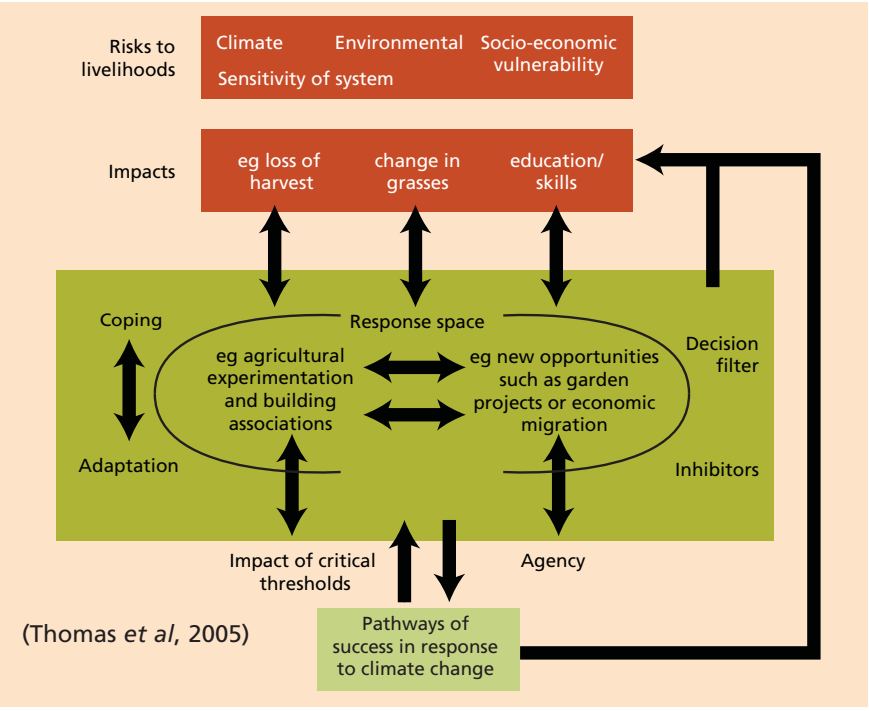
climate change. The women's focus group discussions told how climate change had resulted in people moving from traditional farming to other livelihoods, including gold panning and working in urban areas. Some felt that this change brought benefits: those who migrated or found alternative sources of income could afford to buy enough fertiliser to meet their household needs. Others felt differently, saying that many of those who migrated came back sick (most often with HIV and AIDS-related illnesses), meaning that there was less labour available for farming, resulting in reduced food and seed security.

- Experts interviewed argued that on a national level, an increase in temperatures of 2°C would make a large proportion of the areas currently used to grow maize unsuitable for its production. The limited feasibility of maize production in UMP is evidence of this. Simulation models have been developed and are being used to identify communities at high risk. Shifts in farming systems should encourage more resilient varieties and also encourage a shift in culture from maize to sorghum and millet.

Current strategies for coping with and adapting to climate change

Farmers' vulnerability to climate change and the need to strengthen the capacity of their livelihoods to cope and adapt creates a 'response space' in which interventions are centred. The conceptual model below (after Thomas et al, 2005) summarises current adaptation strategies used in both Murehwa and UMP.

Figure 9: Adaptation strategies



(Thomas *et al*, 2005)

Conservation agriculture

In both districts, most respondents felt that the conservation farming project being promoted by Commutech, working together with AREX, was helping them to cope with the changing climate. Even respondents who had not yet implemented the technology said that they had observed that farmers using planting basins had higher chances of an average to good harvest because of their early land preparation. By the time the first rains fell, these farmers were ready to seed their crops. Planting basins also allowed prolonged moisture retention, reducing the impact of the long mid-season dry spell, and improving grain maturation. Feeding fertiliser to planting basins only also boosted crop productivity. Conventionally, fertiliser is spread across fields, making less of it available for crops, and nourishing weeds instead.

Choice of seed and crop varieties

Respondents in UMP had noticed a significant increase in the number of fields allocated to sorghum, pearl and finger millets, as these traditional crops were more resilient to the 'new' climate. Also, because of the high costs of milling maize, traditional cereals were proving more cost effective than maize, as they could be processed at home, or brewed into beer and sold at a profit. Seed fairs, the seed bank and the germplasm programme all promoted the production and consumption of more drought-resilient crops. The widening variety and increasing quantities of plant genetic resources held by the seed bank provided a wealth of seed from which more resilient varieties could be selected. It also allowed farmers to replenish their seed stocks following crop failure. Widening the range of crops grown also spreads the risk of crop failure in the event of unfavourable weather.

Adjusting to season length

Respondents said that although sorghum and millet were more appropriate for dry conditions, there was still a widespread preference for maize. To improve maize production, they were now planting early and using wetlands and gardens. The most popular variety used in gardens and wetlands was Hickory King, which has a slightly longer season length than short season hybrids. Preferred maize hybrids in both UMP and Murehwa were Seed Co varieties SC414 and SC513, Panner and Pioneer short season varieties. Respondents in UMP tended to prefer OPVs as they are more suited to dry and hot conditions.

3.10 Farmers' rights and capacity to access, market and preserve plant genetic resources

Introduction

Previous sections of this study have focused on what is currently being done or could be done in the future to strengthen farmers' livelihoods and achieve the goals of food security and poverty reduction. It has sought to identify how sustainable development could be achieved in the context of a changing climate through making seed more accessible, improving its marketing, and preserving plant genetic resources. Although such interventions could reduce vulnerability and poverty, potential gains are constrained by unfavourable laws and policies. This section discusses issues relating to farmers' rights in Zimbabwe, and identifies constraints to the access, marketing and preservation of plant genetic resources presented by current laws. It argues that national and international legal frameworks should be reworked to address and promote communities' livelihoods.

Farmers' rights in Zimbabwe

Farmers' rights are based on their practices and customs, and encompass the conservation, use, exchange, sale and development of seeds and propagating material to meet farmers' needs. The basis of farmers' rights is the recognition – as stated in the International Treaty on Plant Genetic Resources for Agriculture – of their past, present and future contributions to the improvement, conservation and availability of plant genetic resources for food and agriculture. The concept of farmers' rights stems from the growing recognition of the exploitation of farmers' plant genetic materials by seed companies and other related institutions. Unfortunately, putting this concept into practice in Zimbabwe remains difficult and elusive, and the message is not reaching farmers themselves: only seven per cent of respondents were aware of any form of rights that they had as farmers.

Although the Government of Zimbabwe has signed and ratified several international treaties and conventions relating to the preservation of plant genetic resources and the protection of intellectual property, much work remains to be done to ensure that these agreements work for local communities. Some of the conventions that Zimbabwe has signed and ratified are listed below, as well as the domestic legal frameworks developed from these.

Table 9: International treaties signed, ratified and implemented by Zimbabwe

Conventions signed and ratified	Legislation in Zimbabwe
Convention on Biological Resources, 1992	Environmental Management Act, Chapter 20:27
International Treaty on Plant Genetic Resources for Agriculture (ITPGRFA), 2001	Regulations on Access to Genetic Resources and Benefits Sharing, 2006
Union of the Protection of New Varieties (UPOV)	Plant Breeders' Rights Act Chapter 18:16, as amended by Act No 11 of 2001
Trade Related Aspects of Intellectual Property Rights Paris Convention for the Protection of Industrial Property (1883) Berne Union for the Protection of Literary and Artistic Works (1886) World International Property Organisation	Patents Act, Chapter 26:03 Copyrights and Neighbouring Rights Act No. 11, Chapter 26:05 Trade Marks Act, Chapter 26:04
Cartagena Protocol on Biodiversity International Plant Protection Conventions	Biotechnology Policy and Act, 2006

(Source: CTDT, 2006)

As far as Zimbabwe's general legal framework is concerned, there are no provisions that cater for the rights of smallholder farmers, especially those which relate to their capacity to access, market and protect their plant genetic resources. The current legal framework was inherited from a colonial government which put the interests of large-scale commercial crop producers over those of smallholder farmers. It is clear that, especially prior to their amendment, the Plant Breeders Rights' and the Seed Act are laws that stifle farmers' potential contribution towards developing plant genetic resources.

Legal framework affecting realisation of farmers' rights

Various laws relating to patents for plant genetic resources (material which has generally been developed by farmers through long term selection) restrict farmers from accessing, marketing and preserving these resources. There are two laws in particular which are key in Zimbabwe.

Plant Breeders' Rights Act

This legislation ignores the contribution farmers have made to developing plant variety. Seed varieties which have been developed by farmers over a long period of time are taken by breeders and crossed with other seed, also developed by farmers, then sold back to farmers. According to this Act, the breeder has the sole right to sell and multiply the plant that has been bred, and any plant essentially derived from it. The key limitation is that the farmer is not recognised as the 'breeder', in spite of his or her contribution, in time and resources, to the development of seed varieties through years of seed selection. Breeders receive royalties on the seed they produce for at least 20

years. By implication, this Act also makes it illegal for farmers to sell seed to each other, disrupting local market systems which could support seed security, even though seed companies are currently unable to cope with the demand for seed.

Amendments to the Plant Breeders' Rights Act have added exceptions which to some extent assist smallholder farmers. A smallholder farmer who earns 80 per cent of their income from agriculture is legally allowed to multiply and exchange seed. If their total field size is below 10 hectares then they may be allowed to save their seed. Seed companies have, since independence, worked to promote hybrids and discourage seed saving, which has been largely viewed as low yielding and unproductive. The popularisation of OPVs through institutions such as AREX improves seed access for most smallholder farmers.

The Seed Act

This Act deals with the registration of seed sellers and also regulates the import and export of plant materials. Under this Act, farmers are not allowed to sell seed unless they are registered. However, because of the difficulties caused by drought and poor seed availability, seed fairs have been allowed to continue as a mechanism to strengthen seed and food security.

For farmers, the process of registration is time consuming and expensive. Before they can be registered to sell seed, they have to prove that the variety in question is original and distinct, uniform and true to type, and has been stable over a number of seasons.

The Seed Act protects farmers from foreign seed, although more in theory than in practice. Its quality control system should ensure that seed has only a minimal risk of contamination, thus enhancing the preservation and protection of desirable plant genetic resources. However, food shortages and a high dependence on food aid, coupled with poor monitoring mechanisms, restrict Zimbabwe's capacity to fully implement this policy, leaving the country vulnerable to unknown foreign germplasm. Farmers also tend to plant grain received from outside the country as food aid.

3.11 International policy influencing seed saving as a climate change adaptation technology: a review of the UNFCCC and the UNCBD

Opportunities for enhancing adaptation to climate change and promoting plant biodiversity depend largely on the provisions of international conventions and national strategies, as well as on a commitment to implementation and enforcement of such conventions and strategies. This section reviews the two key policies relevant to the preservation of plant genetic resources in conjunction with effective adaptation to climate change. Opportunities for synergy as well as potential conflicts are identified. The section concludes by making recommendations on the way forward.

The UN Framework Convention on Climate Change

The UNFCCC was opened for signature at the UN Conference on Environment and Development in Rio de Janeiro in 1992 and came into force in 1994. This study focuses on the following Articles:

> **Article 2:** The ultimate objective of this Convention and any related legal instrument that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a stable manner.

Article 4.1(b): All Parties shall 'formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol and measures to facilitate adequate adaptation to climate change'.

Article 4.1(e): All Parties shall 'cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification as well as floods'.

Article 4.1(f): All Parties shall 'take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example, impact assessments, formulated and determined nationally, with a view to minimising adverse effects on the economy, public health and on the quality of the environment, of projects and measures undertaken by them to mitigate and adapt to climate change.'

The UN Convention on Biological Diversity

The UNCBD was opened for signature at the UN Conference on Environment and Development in 1992 and came into force in 1993.

The Convention's purposes are to conserve biological species, genetic resources, habitats and ecosystems to ensure the sustainable use of biological materials, and to provide for the fair and equitable sharing of benefits derived from genetic resources. Included in the Convention are provisions for conservation of biological elements both inside and outside their natural habitats. Maintenance of natural habitats is crucial for the conservation of biologically diverse species, which would otherwise face extinction.

Convention provisions

The Convention's major provisions include:

- The requirement for countries to adopt regulations to conserve their biological resources
- Governments' legal responsibility for the environmental impact in other countries of activities within their jurisdiction, including those of private corporations
- Funding to assist developing countries to implement the Convention's provisions (to be administered through the Global Environment Facility – GEF)
- The transfer of technology to developing countries on preferential and concessional terms, where such transfer does not prejudice intellectual property rights or patents
- Participation in biotechnology research by countries providing genetic resources
- Fair access to the benefits of genetic research by countries providing genetic resources
- Compensation to developing countries for extraction of their genetic materials
- Commitment to build capacity in developing countries to implement the Convention through training, awareness-raising and technology transfer exercises.

3.12 Policy conflict and synergy between the UNFCCC and UNCBD in Zimbabwe

The challenges that climate change presents to communities have the potential to reverse efforts to manage environmental resources, and reduce biodiversity. Based on the locations studied, as well as other national experiences, the areas of synergy, conflict and recommendations for resolution are identified below.

Use of wetlands

Farmers in Murehwa have resorted to using wetlands to prolong the length of the growing season, to compensate for the short season caused by climate change and climate variability. Although this strategy is in line with various community based coping and adaptation strategies, it violates the UNCBD, which spells out the need for regulations that conserve biological diversity. The use of wetlands is also a violation of Zimbabwe's Environmental Management Act Chapter 20:27 subsection 113(2) which states that:

> No person shall, except in accordance with the express written authorisation of the Environmental Management Agency, given in consultation with the Environmental Management Board and the Minister responsible for water resources:
>
> (a) reclaim or drain any wetland
> (b) disturb any wetland by drilling or tunnelling the wetland in a manner that has or is likely to have an adverse impact on any wetland or adversely affect any animal or plant life therein
> (c) introduce any exotic animal or plant species into the wetland.
>
> Any person who contravenes this Act shall be liable to a fine not exceeding level eight or imprisonment not exceeding two years or to both such a fine and such imprisonment.

Wetlands are referred to as the 'ecological kidneys' as they absorb and purify pollutants, absorb storm and flood water, and slowly release this into rivers and streams during dry periods, and replenish wells for drinking water (Department of Natural Resources, 2005).

When wetlands are used for farming, their potential ability to help to deal with climate change-related disasters such as floods and drought is compromised. The plant diversity that exists in wetlands is affected by the introduction of exotic species like maize and other crops and vegetables. However, one respondent felt that growing maize in wetlands would actually be good for the environment as it would create a sink for carbon dioxide, which lowers carbon levels to sustainable quantities, as required by the UNFCCC. Recommendations on the use of wetlands for climate change adaptation should be based on strengthening institutions to raise awareness on the role of wetlands and educate farmers on their sustainable use.

Harmonising the UNFCCC and the UNCBD

There is a clear relationship between the UNFCCC and the UNCBD, and harmony between the two should be possible, given the strong interrelationship between the environment and the threats to it (and especially to biodiversity) that climate change presents. The GEF is one institution that can help to maintain a synergy. Funding may be used as a tool to ensure that the two sets of policies are mainstreamed in programme and policy planning and implementation.

Crop diversification for climate change adaptation

Crop diversification has been widely used to help communities dependent on agriculture, and therefore also on the natural environment, to adapt to climate change. By broadening their choice of crops, farmers can reduce their vulnerability to stresses caused by climate change, such as droughts and floods. The need to diversify farming systems, coupled with the realisation that sustainable development can be achieved when strategies for maintaining diversity are promoted, creates an opportunity for synergy between the two policies. Work on either climate change or biodiversity should thus ensure that the other is also taken into account.

GMOs, the UNFCCC and the UNCBD

The Kyoto Protocol promotes the conservation and enhancement of biodiversity, and so efforts to promote adaptation to climate change should not ignore the need for sustainable use and protection of plant biodiversity. Although some sectors argue that using GMOs is the best way to improve crops in the face of climate change, the risks that this poses to the environment may be so extreme as to wipe out some plant species. Where genetic material is extracted from developing countries, funds should be established to facilitate programmes for adaptation to climate change and biodiversity management.

Other synergies

The UNFCCC and the UNCBD are both legally binding multilateral environmental agreements, and with the exception of only a few countries, the parties to the Conventions are nearly identical. This makes it imperative that any activity undertaken under the UNFCCC should be consistent with the provisions of the UNCBD. Strategies implemented under international agreements on climate change should be scientifically assessed for their potential consequences for biodiversity.

Any activity undertaken under such agreements (arising from the UNFCCC) falls under Article 6(b) of the UNCBD, which requires the integration of conservation and sustainable use of biological diversity into all relevant sectoral or cross-sectoral plans, programmes and policies. All strategies should be assessed to examine how they may affect biodiversity and the knowledge, innovations and practices of indigenous peoples and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biodiversity (UN, 2007).

National strategy on climate change adaptation

The Government of Zimbabwe signed but did not ratify the Kyoto Protocol, and has therefore neither confirmed its commitment to tackling climate change nor taken action towards doing so. There is no national strategy on adaptation to climate change in place, although efforts are being made at institutional and organisational levels. The Crop Breeding Institute and various seed companies are currently breeding seed varieties for drought and heat stress tolerance, while institutions like CIMMYT and ICRISAT are working in partnership with AREX to promote technologies, such as conservation farming, that will give agriculture the resilience to adapt to climate change.

4 Conclusions and recommendations

4.1 Conclusions

It is clear that the preservation and subsequent use of seed, whether indigenous or OPVs, played a crucial part in ensuring household food security among the smallholder farmers involved in this study. This was especially true given Zimbabwe's difficult socio-economic conditions, as both the cost and the poor availability of quality seed on commercial markets caused difficulties for many farmers. Trade in surplus crops from saved seeds tended to increase farmers' income levels, enhancing their capacity to buy more food and therefore keep rather than consume their saved seed. It also enabled them to purchase seed to use in the next season. The study thus established a connection in both directions between food security and seed security.

Despite the important role that seed saving plays in enhancing food security for smallholder farmers, legislative and policy frameworks do not support it in practice. Legal frameworks, especially at the national level, tend to favour commercial seed producers, and make seed saving systems such as community gene banks and seed fairs illegal. Despite this, the study found that most smallholders experienced difficulties in obtaining commercial seed.

The study also established that climate change was affecting crop production systems through phenomena such as erratic rainfall patterns, higher temperatures, droughts and floods. To cope with this, farmers have adopted crops which have greater tolerance to moisture and temperature stress, but which can still maintain sustainable yields. These characteristics are found in indigenous seed varieties, especially small grains such as sorghum and millet, and legumes, as well as in OPV maize varieties. However, there is currently only limited support for enhancing the production of these crop varieties, although they could potentially save lives by reducing food insecurity caused by climate change. The lack of a clear national strategy on responding to the challenges of climate change means there is potential for vast food insecurity, especially among resource-poor farmers.

The study also found that most smallholder farmers lacked awareness of their rights and of contemporary issues such as GMOs, which could potentially have a negative impact on their production capacities.

In the next section, specific recommendations are made to address the issues highlighted in the study.

4.2 Recommendations

Seed access and conservation

- Donors should support programmes preserving indigenous knowledge systems – in this case those relating to the multiplication, preservation and free trade of indigenous seeds.
- NGOs working with smallholder farmers should promote appropriate technologies, eg solar driers, to enhance the preservation of indigenous plant genetic resources.
- The Government of Zimbabwe should enhance incentive systems – such as higher market values – for the production of indigenous cereal and legume crops, which are mainly produced from saved seed. These are a critical source of food security in the context of climate change and poor availability of hybrid seed.
- Farmers and the organisations which manage seed banks should have better facilities for screening seed before it is stored. This would reduce the contamination of local germplasm by 'foreign' seeds unsuited to local conditions.

- There is a risk that seed fairs could lead to the 'commercialisation' of trade in indigenous seed varieties, depriving the poorest and most vulnerable of the traditional safety net provided by free and barter trade in seed. Seed fair programmes therefore need to consider the most vulnerable, and ensure equitable access to valuable seed for all.

Use of GM seeds and crops

- There is a need for increased awareness about the nature and implications of GMOs across various sectors and levels, and particularly amongst policymakers and farmers. Awareness campaigns are recommended, including workshops involving key stakeholders, the use of electronic and print media, and advocacy work aimed at influencing policy review.
- Zimbabwe should develop and adopt a clear policy on GMOs based on a thorough understanding of their potential benefits and risks.
- There is a need for the Government of Zimbabwe to source funding from international donors to scale up its GMO testing, monitoring and tracking mechanisms. This will ensure the safe utilisation of GM products as well as minimise contamination of non-GM products in the country.

Putting farmers' rights into practice

- Farmers' capacity to produce their own seed and enhance their seed systems should be strengthened through participatory plant breeding.
- Farmers' seed varieties and related knowledge should be registered.
- When seed that farmers have developed is used to breed hybrids, the financial benefits should be shared between breeders and farmers. Breeders should acknowledge that farmers' seed has been used, and set up systems to ensure that farmers receive monetary benefit.
- Farmers' awareness of the existence of gene or seed banks should be improved, so that they can access plant genetic resources from these banks.
- Training on the conservation of plant genetic resources should be broadened, and the setting up of seed banks promoted at village level. Systems should be designed to allow farmers free access to information and to genetic resources.
- The seed fair approach should be strengthened and expanded, especially the germplasm exchange component, to cover more districts and reach more farmers within those districts.
- Farmers should be involved in the debate about agriculture and biodiversity, and in the formulation of national strategies relating to these issues.
- Appropriate strategies and approaches should be identified to conceptualise farmers' rights in Zimbabwe.
- Legislation for farmers' rights should be developed through advocacy and participatory processes.

Adaptation to climate change

- In several socio-economic sectors in Zimbabwe, there is a compelling need to strengthen institutional awareness of climate change and biodiversity, as well as the capacity to deal with, analyse the implications of, and address issues relating to both these areas. This is vital to developing appropriate strategies in response to the challenges climate change brings to sustainable development.
- Work on climate change, and the funding provided for it, should be linked to disaster preparedness. This investment may well be cost effective, for example if the severity of drought increases as a result of climate change.
- Research which explores current strategies used to adapt to climate change in Zimbabwe and other vulnerable countries, and identifying how to enhance local adaptation strategies, should be encouraged and funded. Research should also focus on improving methods for storing grain and seed reserves at household, local and national levels.

- Lobbying and advocacy efforts should be targeted towards encouraging recognition of the threats that climate change poses to livelihoods, economic stability and development. These efforts should also seek to influence the allocation of funding to relevant line ministries to carry out vulnerability assessments, and to develop and implement strategies effectively.
- Changes in the GMB's pricing policy could both support climate change adaptation and enhance biodiversity. Farmers' crop choices are often determined by input costs and product pricing. By formulating price regimes that favour adaptable crops like sorghum and millet, food security under difficult conditions would be enhanced, and biodiversity promoted.
- In the light of the changes in climate being experienced in Zimbabwe, research into the development of crop varieties suited to drier and warmer conditions should continue.

Sustainable use of natural resources and biodiversity

- The Government of Zimbabwe should be encouraged to sign and ratify any future international climate change agreements and develop action plans to put them into practice.
- Zimbabwe and other developing countries should be supported to develop national action plans for all international conventions, and to ensure synergy between these conventions. Community-based natural resource management and environmental protection policies should also be promoted and implemented.
- The Government of Zimbabwe should give high priority to sustainable growth and agricultural production systems. Crop diversification, appropriate farm technologies and management practices that improve the capacity of threatened farming systems to adapt in a sustainable way should be encouraged in all agricultural sectors. Anticipatory measures to alleviate the effects of climate change will enhance farmers' ability to adapt and their rate of adaptation, therefore lowering its costs.
- Advocacy and awareness work must be carried out to highlight the need to mainstream both climate change adaptation and the preservation of plant genetic resources. This could be done through awareness workshops, mainstreaming in policy and programme planning, and through the electronic and print media, following the development of relevant curricula. At community level, mechanisms should be set up that can intensify awareness among communities and promote a bottom up approach, so that communities fully participate and take leadership in project initiation, formulation, monitoring and evaluation.
- Effective systems should be set up to enable chain monitoring and reporting on national resources management and environmental protection, from local to international level.
- Strategies should be identified that will give communities an incentive to protect their environment and biodiversity, while also improving their capacity to adapt. One option would be to identify partners in the private and public sector to implement projects such as carbon trading. Communities involved in planting trees for carbon sequestration would improve the diversity of plant species, and also earn an income from tree planting, reducing their vulnerability caused by high reliance on farming for sustaining livelihoods. Options for Clean Development Mechanisms should also be identified.

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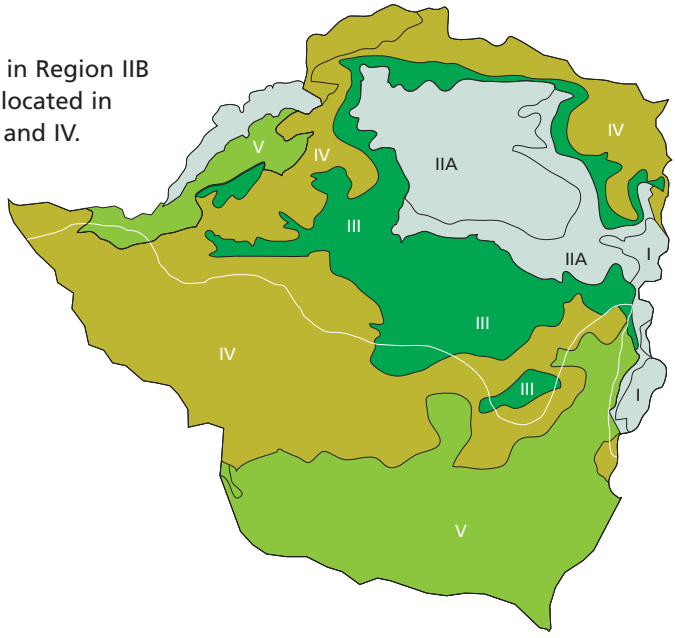
Annex 1: Description of Zimbabwe's agro-ecological regions

Agro-ecological region	Annual Rainfall	Farming System
I	>1000mm. Rainfall in all months of the year, relatively low temperatures.	Suitable for dairy farming, forestry, tea, coffee, fruit, beef and maize production.
II	700-1050mm. Rainfall confined to summer.	Suitable for intensive farming, based on maize, tobacco, cotton and livestock.
III	500-800mm. Relatively high temperatures and infrequent, heavy falls of rain, and subject to seasonal droughts and severe mid-season dry spells.	Semi-intensive farming region. Suitable for livestock production, together with production of fodder crops and cash crops under good farm management.
IV	450-650mm. Rainfall subject to frequent seasonal droughts and severe dry spells during the rainy season.	Semi-extensive farming region. Suitable for farm systems based on livestock and drought-resistant fodder crops. Forestry, wildlife/tourism.
V	< 450mm. Very erratic rainfall. Northern low veldt may have more rain but the topography and soils are poor.	Extensive farming region. Suitable for extensive cattle ranching. Zambezi Valley is infested with tsetse fly. Forestry, wildlife/tourism.

Murehwa lies in Region IIB while UMP is located in Region IIB, III and IV.



Annex 2: List of key participants

Mrs Angeline Maregerere, AREX Extension Officer, Murehwa
Mr Mandizvidza, Assistant District Administrator, UMP
Mr E Tembo, Maize Breeder, Seed Co
Mr T Soko, Plant Breeder, Crop Breeding Institute, AREX, Harare
Mrs Murangi, National Gene Bank, AREX, Harare
Mr M Sibanda, Research Fellow, World Wide Fund for Nature (WWF)
Dr W Zhakata, Zimbabwe Representative to the UNFCCC, Climate Change Office, Ministry of Environment and Tourism
Mr N Bhunu, Executive Director, Biotechnology Trust of Zimbabwe
Ms J Manda, Livelihood Advisor, Department for International Development
Dr J N Mushonga, Deputy Director, CTDT (Commutech)
Ms M A Munzara, Policy and Advocacy Co-ordinator, COMMUTECH
Mr Jonasi, Counsellor, Ward 13, Murehwa
Mr J Tigere, Field Officer, CTDT, Murehwa
Mrs S Nhende, Shop Assistant, Murehwa Business Centre
Mr G Musana, Field Officer, CTDT, UMP
Mr D Shumba, CTDT, UMP
Mr Madya, Village Head, Madya Village, UMP
Mr Matsikure, District Agricultural Extension Officer, UMP
Mr J Mugonhi, International Union for the Conservation of Nature
Mr T Musitini Scientific Officer, Socioeconomics, ICRISAT
Mrs S Nsingo, Scientific Officer, Gene Bank, ICRISAT

Annex 3: Household questionnaire

Seed saving and climate change study

District:	Ward number:
Village:	Date of interview:
Name of respondent:	

A: Introduction

A1: Sex of respondent

1=male
2=female

A2: Age of respondent: (*Probe if below 18*)

A3: Position of respondent in household:

1= head
2= spouse
3= child
4=others (specify)

A4: Age of household head:

A5: Sex of household head

1=male
2=female

A6: What is your highest level of education attained?

1= ZJC;
2= O level;
3= A level;
4= diploma;
5= certificate;
6= primary;
7= university
8=other.

A7: How many people live in this household?
(Exclude people staying for less than 3 months):

B: Socio-economic status

B1: What is the **main** source of income/occupation

1=farming
2=small home enterprise
3=employed
4=unemployed
5=remittances

B2: How much did you earn in the last three months? of the household head?
(*Probe for earlier income if respondent is a farmer*)

1= below $500,000
2=$501,000- $2,000,000
3=$2,000,001-$10,000,000
4=above $10,000,000

B3: Which crops did you grow in the previous season, on how much land, how much seed was used and how much did you harvest? Do you produce surplus for selling or do you buy any of the crops?

Crop	**Area (indicate acres/ hectares)**	**Amount of Seed (kg)**	**Yield (kg)**	**Do you sometimes have surplus to sell? 1=yes 2=no**	**If yes, who buys?** 1=neighbours 2=Grain Marketing Board 3=private company (name) 4=Mbare market 5=private individuals	**If no, where do you obtain what you need?** 1=neighbours 2=Grain Marketing Board 3=private company (name) 4=Mbare market 5=private individuals 6=NGO (specify)
1=maize						
2=cotton						
3=roundnuts						
4=groundnut						
5=sweet potatoes						
6=beans						
7=tomatoes						
8=green vegetables						
9=sunflowers						

C: Seed saving and marketing

C1: Which seeds do you buy or save/keep? Where do you buy your seed or where do you save it from?

Crop seed	**Where did you obtain the seed?** 1=used own saved seed 2=neighbours 3=Grain Marketing Board 4=private company (name) 5=Mbare market 6=trade stores 7=private individuals 8=NGO (name) 9=others	**Where do you normally keep the seed?** 1=granary 2=mud gourd 3=bags 4=other: specify
1=maize		
2=cotton		
3=roundnuts		
4=groundnut		
5=sweet potatoes		
6=beans		
7=tomatoes		
8=green vegetables		
9=sunflowers		

C2: For the crops that you grow, do you use indigenous or hybrid seed?

Crop	**Seed type 1=indigenous 2=hybrid**	**How many varieties do you use? Name them**	**Which one is most preferred and why?**
1=maize			
2=cotton			
3=roundnuts			
4=groundnut			
5=sweet potatoes			
6=beans			
7=tomatoes			
8=green vegetables			
9=sunflowers			

C3: Have you had problems obtaining indigenous seed in the past?

1= yes 2= no

C4: What problems have you faced? (*Probe if they can recall when and what had happened*)

C5: How long have you been saving seed? (*Give answer in years where possible*).

1=ever since I started farming
2=10 years ago
3=less than 5 years ago

C6: If less than 10 years, why have you started saving seed or using saved seed?

1=hybrid seed no longer readily available
2=hybrid seed too expensive
3=encouraged by seed fairs
4=saved seed performs better with new climate
5=other reason (*Please state*)

C7: Do you treat the seed you save?

1=yes 2=no

If yes, how?

Crop seed	Treatment

C8: Do you use any fertilizer?

C9: Do you have any experience in seed breeding?

1=yes 2=no

If yes, where did you get training from?

C10: Do you/farmers in your local area exchange seed?

1=yes 2=no

C11: Are there any seed fairs in your area?

C12: How frequent are they held and for how long?

C13: Which organisations are involved?

C14: Are there any initiatives to conserve seed in your area?

1=yes 2=no

If yes, what are they?

C15: Which organisations are involved?

C16: If such an initiative was set up, would you like to be part of it?

1=yes 2=no

D: Climate change and seeds

D1: From your knowledge of this area, how has the climate changed?

D2: What has been the effect of this climate change on food security?

D3: What adjustments have you made in your farming practices to cope with the changing climate?

D4: What has been the impact of these strategies on:

Food security:

Environment:

D5: How do changes in climate affect the availability and diversity of seed?

D6: How have you responded to these changes and with what impacts?

D7: Considering resilience to extreme weather, which seed do you prefer?

1=indigenous
2=hybrid

D8: What comparative experiences have you had? (*Get years and varieties in question*)

E: GMOs

E1: Do you know what GMOs are?

1=yes 2=no

If yes, define:

E2: Have your crops ever been contaminated by GMOs?

1=yes 2=no

How do you know?

E3: Have you had a problem of seed failing to germinate?

1=yes 2=no

E4: Was this seed?

1= indigenous 2= hybrid

E5: In your view, what was the cause of failure to germinate? Score from 1=most important to 5=least important

Cause	**Score**
Poor seed quality	
Rodents eating seed	
Low moisture/drought	
Excessive moisture	
Fertilizer application	
Other	

E6: From your experiences with indigenous seed, are you aware of any laws or policies which inhibit your access to and ability to share and save indigenous seed?
1=yes 2=no

If yes, give details.

E7: In your view, what should be done to promote access, marketing and saving of indigenous seed? (*Probe for law changes*)

Interviewer's name: .....

Checked by supervisor: .....

Thank you very much for your time. Your contribution has been invaluable for this study we are undertaking.

Annex 4: Focus group discussions

Discussion guides

Socio-economic status

1. What are the main sources of income in this ward?
2. Based on various proxies that you use, whom would you consider as poor, average and better off? (cattle ownership, field size, etc may be used)
3. On average, how much land is owned by a poor, average, or better off household?
4. What are the major crops grown in this area?
5. On average, how much do you harvest per acre for each of the crops given?
6. Do you have enough to sell, and if so, which crops do you sell and which are your markets?
7. If you do not harvest enough for your household requirements, where do you get the difference from?

Seed saving and marketing

1. Where do you normally obtain your seed from? (rank in order of importance)
2. Of the crops that you grow, for which ones do you buy/use saved seed? Why?
3. For the seed that you save, for how long do you keep it? Where do you keep it?
4. How do you ensure that the seed stores well?
5. Do you treat the seed before storing it? How do you treat it?
6. What constraints do you face with saving seed?
7. What constraints do you face with using saved seed?
8. Do you share/exchange seed within your wards?
9. Do you sometimes have seed fairs in your area?
10. Who facilitates these seed fairs, how frequently are they held and how long do they last for? What is the attendance like? (probe: proportion of farmers who attend these)
11. Do you have experience in breeding seed? If so, who is involved and where did you get training?
12. If there was a programme to conserve seed, would you like to be part of that initiative? (record expectations as well)
13. Who, in your household, decides which crops to grow, when to plant and on which fields?

Seed diversity

1. Of the hybrid seed that you grow for maize, how many varieties do you grow?
2. Of the indigenous seed that you grow, how many varieties do you grow?
3. What influences your choice of variety?
4. Considering the changes in climate, which seed do you prefer (indigenous/hybrid) and what features make the seed of your choice adaptable?

Climate change and seeds

1. From your knowledge of this area, how has the farming season changed? (also capture time frames, worst drought and floods, last good harvest etc)
2. How have these changes in climate affected food security and the environment?
3. How have you adjusted your systems to cope with these changes in climate?
4. What has been the implication of these extreme weather events on your ability to save seed?
5. What aspects of climate change are important? (for the above question)
6. How does climate change affect the diversity of seed available?
7. Which crops are more susceptible to the changes in climate and which ones are more resilient?
8. Which seed keeps well/poorly and which ones are more constrained by climate change?

GMOs

1. Do you know what GMOs are?
2. What have you heard about GMOs?
3. Have you ever planted GMOs?
4. Have your crops ever been contaminated by GMOs and how do you know this?
5. Do you have problems of high germination failure?
6. In your view, what has been the cause for this?

Laws and Policies

1. Are you aware of any laws or policies that prevent or limit your access to indigenous seed, your ability to share, market and preserve these seed varieties?
2. What changes do you propose to make saving and marketing of indigenous seed easier?
3. What roles should NGOs, donors, government and the private sector play in these issues?

Annex 5: Key participant interviews

Level	Theme	Key issues and questions	Organisations
Programme	**Seed fairs**	• What is the rationale for seed fairs? • Who is targeted in seed fairs? Can poor farmers access seed this way? • Which crops are covered and how diverse is the seed brought by farmers? • What mechanisms ensure that quality of seed is good? • Is commercial seed exchanged in seed fairs? • What volumes of seed are traded and how important are seed fairs in ensuring seed security? (proportion of farmers who attend) • For maize, what seed varieties are sold/exchanged? • How do farmers ensure seed stores well? What treatment mechanisms are in place? • How do you evaluate the adaptability to extreme weather of indigenous seed versus hybrid seed? • How are prices of seed set? How do these prices compare with trade store prices? • Do seed fairs allow for maintenance of seed diversity? How? • What are the policy and institutional constraints in operationalising seed fairs and conserving indigenous seed? • What recommendations for donors and government can you make? • What challenges do farmers face in saving seed? • How important are OPVs in seed fairs?	• ICRISAT • Practical Action • CTDT • AREX
	Seed supply	• How are you responding to the effects of climate change in terms of appropriateness of your seed? • What is your level and effort in participating in seed fairs? • What strategies do you have in promoting conservation of plant genetic resources? • How do you perceive the effectiveness of current strategies to treat, store and market seed through seed fairs? • What are your current seed demand levels and how much can you supply? • What are the barriers to effective programming to popularise the importance of storing plant genetic resources? • Is there any training support you are offering to farmers in terms of seed multiplication and treatment?	• SEEDCO • PANNER
	Trade stores	• What has been the trend in seed purchases over the last five years? • What explains this trend? • In your view, what is the general farmers' preference for seed: hybrid or indigenous seed?	

Level	Theme	Key issues and questions	Organisations
Programme	**Donors**	Questions in other sections apply	• Various trade stores in the districts
Policy/ Programme	**Genetic resources**	Questions from other sections apply. Add on: • What legal framework protects the diversity of farmers' seed? • What is the national policy on GMOs? • What are the implications of genetic engineering on the ability of farmers to access, market and preserve plant genetic resources?	• Department for International Development • Biotechnology Trust of Zimbabwe • ICRISAT • International Union for the Conservation of Nature • WWF • Other NGOs
	Property legal frameworks	• What legal frameworks protect farmers' rights to indigenous seed resources and prevent exploitation of their seed by seed companies? • What are the constraints in ensuring protection and conservation of plant genetic resources? • What laws prevent farmers from accessing indigenous seed resources, marketing and conserving? • What are the policy and legal frameworks required to ensure that farmers have access to, can market and conserve plant genetic resources?	
	Climate change	• Has the climate of Zimbabwe changed? If so, how and with what impacts on food security and the environment? • What climate change adaptation strategies are being used or could be used, especially as related to food and the environment? • What has been the impact of climate change on crop seed diversity? • What constrains the climate change adaptation process? • Can you comment on the UNCBD and the UNFCCC? In particular, what are the opportunities for policy synergy and conflict between these two? • Farmers are now using wetlands as a strategy to grow crops under the new rainfall regime. Are there any concerns? • If GMOs that fit into a short season and are temperature hardy were introduced to deal with the climate change problem, would that be a problem? • What is the legislation on GMOs in Zimbabwe? • In your view, how can we operationalise mechanisms (policy, programme) for ensuring seed access, marketing and preservation of plant genetic resources?	

Seed saving and climate change in Zimbabwe

This report into a study of farmers in two districts of Zimbabwe shows the key role that seed saving plays in helping farmers to face the challenges posed by increasing climatic changes and Zimbabwe's difficult socio-economic conditions. The report provides a detailed analysis of the role of seed saving in small-scale agriculture, includes a review of the legal and policy frameworks, and concludes with recommendations on seed access and conservation, farmers' rights, adaptation to climate change, and sustainable use of natural resources. Taken together, the report's findings show what is needed to enable farmers in Zimbabwe to meet the challenges of achieving food security and sustainable livelihoods in the face of the increasing impacts of climate change.

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