Coping with Drought and Climate Change Project




Project Baseline Study

Final Report

Table of Contents

List of Tables

List of Figures

List of Equations

Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
Agritex	Agricultural and Technical Extension Services
AKAP	Awareness, knowledge, attitudes and practices
CBO	Community Based Organisation
CSFAM	Crop Food Security Assessment Mission
CwDaCC	Coping with Drought and Climate Change Project
DVS	Department of Veterinary Services
EMA	Environmental Management Agency
EWS	Early Warning System
FACT	Family AIDS Caring Trust
FAO	Food and Agricultural Organisation
FGD	Focus Group Discussion
FMD	Foot and Mouth Disease
GEF	Global Environment Facility
GMB	Grain Marketing Board
GOZ	Government of Zimbabwe
HBC	Home Based Care
HIV	Human Immuno-Virus
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IOM	International Organisation for Migration
MDGs	Millennium Developmental Goals
NGO	Non Governmental Organisation
OPV	Open Pollinated Variety
R	Rand (South African Rand)
RAs	Research Assistants
SLA	Sustainable Livelihoods Approach
SPSS	Statistical Package for Social Scientists
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
VIDCO	Village Development Committees
WADCO	Ward Development Committees
WFP	World Food Programme
WHO	World Health Organisation

Acknowledgements

This Project Baseline Study was conducted by JIMAT Development Consultants. The Consultants acknowledge the guidance and support of Dr. L. Unganai (Project Manager), Mrs. D. Bizeki (Project Assistant), EMA staff at provincial and district levels, Mr. Muusha and Mr. Mugodi, and the wonderful team of research assistants that we worked with on this baseline study.

The consultants are grateful for the cooperation of communities in targeted wards, partners, government units and NGO/CBO staff who spared their time for group discussions, household and key informant interviews.

The views expressed in this report are those of the Consultants and do not necessarily reflect those of EMA or UNDP. The authors accept sole responsibility for the report.

The baseline study team was comprised of the following:

Canford Chiroro	Consultant
Virginia Mangoma	Project Support
Ignatius Chorira	Research Assistant
Patience Dhlakama	Research Assistant
Enoch Marapira	Research Assistant
Loren Makoni	Research Assistant
Thomas Tsikai	Research Assistant
Fadzai Upare	Research Assistant

Executive Summary

This report presents the "without project" scenario for the GoZ-UNDP/GEF project, "Coping with Drought and Climate Change" focusing on Chiredzi district. The study was commissioned by the Environmental Management Agency in collaboration with UNDP from September – October 2008.

A combination of primary and secondary data was used to determine the "without project" scenario. In-depth household questionnaires, focus group discussions and key informant interviews were the tools used for primary data collection covering a sample of 102 households across 4 wards in Chiredzi district. Indicator selection was informed by the project log frame and literature review.

Findings

i. Vulnerability baseline

At project onset 57% of households are classified as poor, 31% as very poor and 5.6% and 6.5% as better off and moderate, respectively. For the 2008/9 consumption year 59% of Chiredzi's rural population (137000 people) required urgent food assistance as a consequence of food production falling below production. In 17 of the 24 wards mean cereal deficit based on own production was estimated at 7-9 months (CSFAM, 2008). Most vulnerable households included female headed households, households with no access to irrigation and poor households.

ii. Exposure and sensitivity to climate shocks

Drought is the main climate change risk in Chiredzi. Droughts are expected every 3 years, with a major drought expected every ten years. Soils are aridic, and given a mean annual rainfall coefficient of variation (40%), the risk of reduced agricultural productivity is high. Sensitivity to drought was higher for farmers relying predominantly on dryland farming relative to those with access to irrigation schemes.

iii. Adaptive capacity

Current adaptation mechanisms are centred on timing of planting and use of drought tolerant crops and varieties. Seed availability is in short supply as a result of shortage in the market systems and failure to save seed from own production. For livestock farmers, providing feed and water to animals was the main strategy used. There is limited diversification away from agriculture. Level of knowledge of adaptation options is moderately high, but resources for implementation are scarce.

iv. Use of seasonal climate forecasts

32% of farmers at the project site were using scientific climate forecast to inform farm decision making. The radio (73%) was the main source of climate forecast information. Use of traditional indicators for predicting climate was also relatively low, mainly because of weak transfer of indigenous knowledge. The key limitations to use of climate forecast information were previous history of unreliability, lack of access and inadequate non-locus specific information for decision making.

v. Awareness of climate change risk

81% of respondents interviewed believe that the climate has changed. The main change observed was the delayed season onset (48%), longer and more intense mid-season drought spells (21%) and early cessation of rainfall (15%). These changes ultimately culminate in a reduced agricultural season length.

Level of awareness and technical capacity available to support climate change adaptation were both low at project onset. Linkages between climate change and various sectors were unclear to respondents in both Government and the NGO institutions interviewed. At policy level, the agricultural commodity marketing policy is constraining of adaptation mechanisms, while economic stressors worsen vulnerability.

Recommendations

On monitoring and evaluation for project impact measurement, the baseline study recommends adoption of a participatory community based project monitoring system which uses simple and accessible indicators. The community should identify indicators for monitoring the implementation and impact of the project. This could enhance ownership and hence effectiveness.

To ensure effectiveness in project implementation processes, training in monitoring should be prioritised for staff in partner implementing organisations. Field monitors at ward level would allow for more a more robust monitoring system, while existing systems (Agritex, ZimVAC, and CSFAM) should be considered as complimentary indicator sources.

A combination of field observations, pre and post-planting and harvest surveys could be considered. Lessons should be learned and shared from previous interventions implemented in Chiredzi and aimed at improving agricultural productivity under drought constrained conditions.

1 Introduction

This report presents findings from the baseline study for the UNDP/GEF-GoZ: Coping with Drought and Climate Change Project. The Coping with Drought and Climate Change Project is a joint UNDP- Government of Zimbabwe (GoZ) project being implemented under the adaptation portfolio of climate change with financial support from the Global Environment Facility (GEF). The Environmental Management Agency (EMA) is hosting the project. The intervention seeks to reduce the vulnerability of farmers and pastoralists in Chiredzi District (Fig. 11) to climate change impacts through piloting a range of adaptation options during the period 2008 to 2012.

Figure 1.1 Location of Chiredzi

1.1 Purpose of the Baseline Study

This baseline study was commissioned by EMA to assist the objective monitoring of the implementation and evaluation of the impacts of the Coping with Drought and Climate Change project on target beneficiaries (Figure 1.2). The study was conducted during October-December 2008 in Chiredzi District and represents the most likely "without project" scenario at the selected pilot project site.

The specific objectives of the baseline study are:

1. To quantitatively and qualitatively establish the vulnerability situation and adaptive capacity of households in the project area to drought and climate change impacts before the start of project activities and
2. To provide information for the objective monitoring of project implementation and evaluation of project impact on household vulnerability and adaptive capacity.

The baseline study report is in five sections. Section 1 is introductory and outlines the key project elements from the project Logical Framework (Log Frame) and conceptual framework used for analysing the project baseline. Section 2 describes the data and methodology used. The findings of the baseline study are detailed in Section 3. Section 4 presents key conclusions and recommendations. Annexes to the report are in section 5.

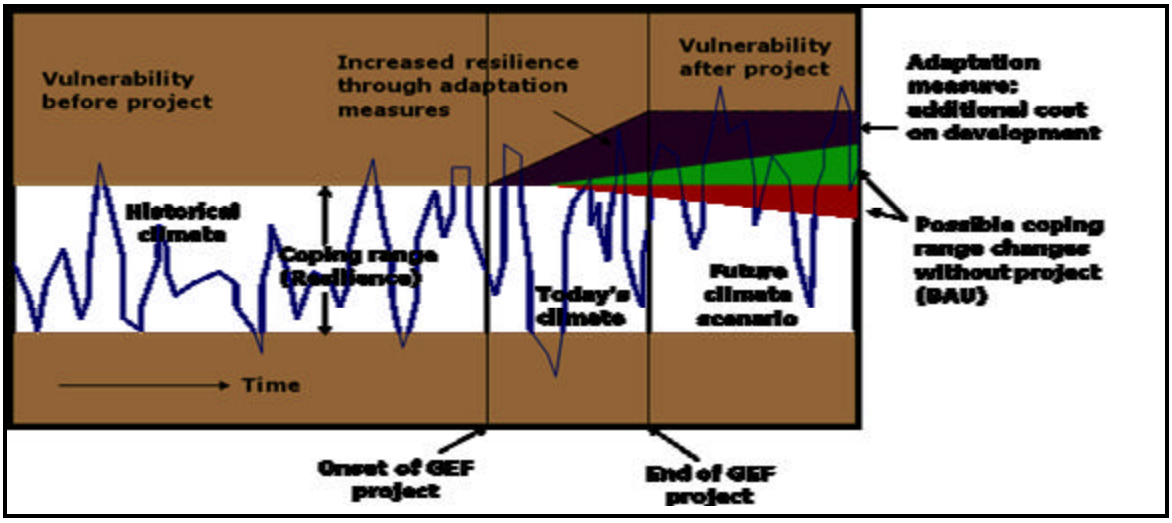


Figure 1.2: Conceptual framework for project impact evaluation (Adapted from UNDP/GEF: Adaptation Policy Framework)

1.2 Project Background

The 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) concludes that climate change will have various effects on water resources and agriculture in Africa (IPCC, 2007). In Natural Regions III, IV and V of Zimbabwe where the majority of smallholder farmers are found, a warming of 2-4°C leads to a cereal crop yield reduction of 10-30%. Cereal crop yields in the present climate average 0.6 t/ha with a range of 0.1 to 1.8 t/ha for smallholder farmers. During drought years, rainfed cereal crop yields usually drop to near zero, with devastating impacts on household food security. Therefore, with climate change household food insecurity for rural households would worsen.

The Zimbabwe Coping with Drought and Climate Change Project is part of a regional response to these impacts of climate variability and change. The other participating countries are Ethiopia, Kenya, and Mozambique. Across all four participating countries, drought vulnerability is a common challenge and future climate change is expected to result in more frequent and prolonged droughts.

Figure 1.3 summarizes the CwDaCC project structure:

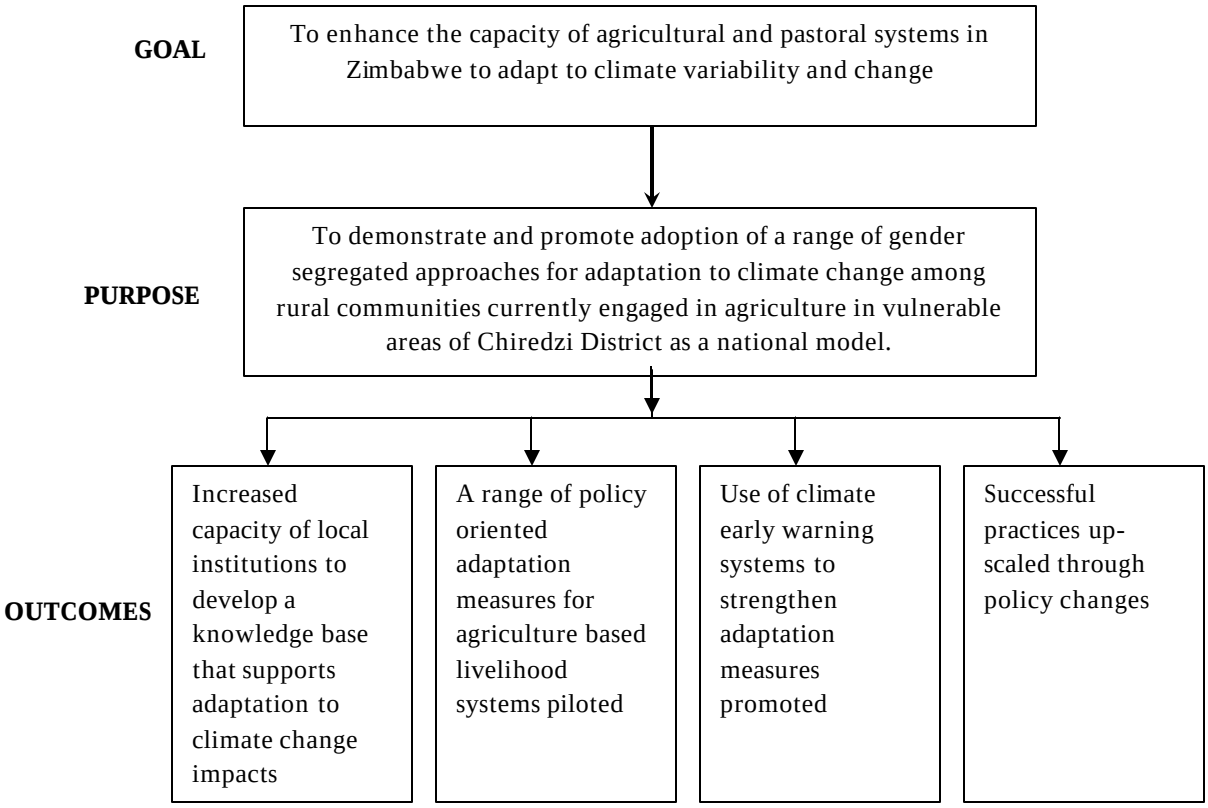


Figure 1.3: CwDaCC Project Structure Summary

1.3 Description of Project Site

Chiredzi District is downstream of the Save and Runde Catchments, located in the South-east Lowveld of Zimbabwe. The District borders Mozambique to the east and South Africa to the south, extending over an area of 17 629 square kilometers with a population of 232 616 (2002 Census) of which 90% is rural.

The altitude of the area is generally below 500 metres above sea level. Chiredzi is situated in Zimbabwe's agro-ecological region 5 characterised by low rainfall of below 500mm per annum and high mean annual temperatures of about 22.5°C. The climatic conditions are key determinants of the crops grown, with drought tolerant crops like sorghum being the most appropriate under dryland farming. Although, the District experiences low rainfall, six major river systems provide significant water quantities to support irrigation.

Gonarezhou National Park, and other conservancines like Malilangwe, Save and Manjinji Pan take up about 95% Chiredzi district. These wildlife sanctuaries provide

scope for alternative rural livelihood systems. However, the wildlife habitat also provides a good breeding ground for quelea birds, which thrive on the white sorghum crop, preferred by local communities. Wild animals also seldom attack villagers and fields and the buffalo is a carrier of Foot and Mouth Disease, which affect cattle. The high temperatures exacerbate livestock and crop pests and diseases. Malaria is endemic in the area, curtailing labour availability for agricultural production.

1.4 Project Environment

This section analyses the political, economic, social, technological and ecological factors that may influence the baseline and project performance (Table 1.1).

Table 1.1: Project Environment

Environmental factor		**Implications for Project**
Political	*1.4.1.1.1 Opportunities* - Increased global political recognition of climate change as a priority development challenge	- Increased political will to tackle climate change - Enhanced opportunities to raise additional funding for programme activities
	1.4.1.1.2 Challenges - Low level of awareness of climate change at policy level (national level) - No clear national climate change policy and strategy - Unpredictable political environment	- Identify appropriate communication tools for policymakers - Implementation and monitoring schedule may be affected - Poor donor perceptions of Zimbabwe may limit funding opportunities
Economic	*Opportunities* - Dollarization of economy	- It will be easier for the project to attract expertise and conduct transactions - Exchange losses minimised
	Challenges - Global economic recession - Hyperinflation - Poor macro-economic environment - Unstable policy environment	- It may be difficult to leverage additional donor funds for project activities - Economic environment may militate against adoption of certain adaptation options - Unstable policy environment makes project planning difficult

Social	*Opportunities* - Local communities already have some structures - High prevalence of food insecurity during 2008	- Project entry points clear - Easier to justify the need for adaptation to drought and climate change
	Challenges - Brain drain - Labour bottlenecks in pilot site as most men have migrated to neighbouring countries in search of employment - Gender imbalances in decision making - Food relief syndrome - HIV/AIDS pandemic	- Skills shortage may affect quality of certain project outputs. - Loss of institutional memory among project partners - There may be a higher need for external consultants than originally anticipated - Shortage of male labour for pilot projects - There is need for gender mainstreaming in project activities to ensure maximum participation by women - Food relief syndrome may militate against the self-reliance principle - HIV/AIDS may affect availability of labour
Technological	*Opportunities* - Information and communication Technology	- ICT cffers easier mode for wider dissemination of lessons learned and knowledge sharing
	Challenges - Shortage of agricultural inputs	- Shortage of agricultural inputs may weigh against some adaptation options
Ecological	*Opportunities* - Chiredzi is home to wild-life which is a tourist attraction	- Makes ecotourism a possible livelihood option
	Challenges - Wild-life: human conflict - Semi-arid climate - Over harvesting of certain forest resources	- Makes certain agricultural ventures less attractive eg. Quelea birds make white sorghum production less viable although it might the most suitable crop for the climate - Semi-arid climate helps to highlight the importance of adaptation

1.5 Conceptual Framework for Analyzing the Baseline Scenario

The IPCC's framework for analysis of vulnerability is premised on the understanding that vulnerability to climate change is a function of exposure, sensitivity and adaptive capacity (Equation 1):

V=*f* (Exposure, Sensitivity, Adaptive Capacity)

Equation 1: Determinants of Vulnerability

Exposure is represented by patterns of hazard eg. drought or predicted change in temperature and rainfall by a certain time period such as 2050. *Sensitivity* is the degree to which a system is affected, either adversely or beneficially by climate change stimuli whereas *adaptive capacity* is represented by wealth, technology, availability of infrastructure and institutions, potential for irrigation and literacy rate.

The Sustainable Livelihoods Framework (DFID, 2004) suggests that adaptive capacity can be illustrated by assessing five livelihood assets of financial, human, natural, physical and capital (Fig 1.4).

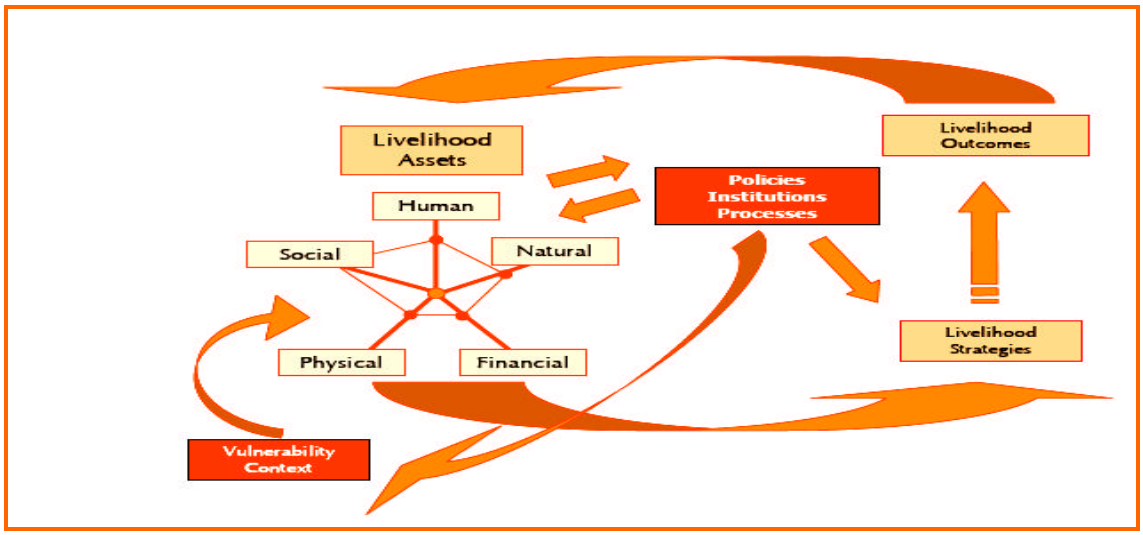


Figure 1.4: Sustainable Livelihoods Framework (DFID, 2004)

Against this background, the UNDP has proposed a framework for analysis of adaptation projects (Figure 1.5). Based on this framework, indicators will measure the success of the project in achieving:

1. **Coverage**: the extent to which project engages stakeholders
2. **Impact**: the extent to which project deliver the intended results or bring about change in behaviour that support the project's objectives
3. **Sustainability**: the ability of stakeholders to continue to adapt beyond the project lifetime
4. **Replicability**: the extent to which experiences, results and lessons are captured and disseminated for broader benefits.

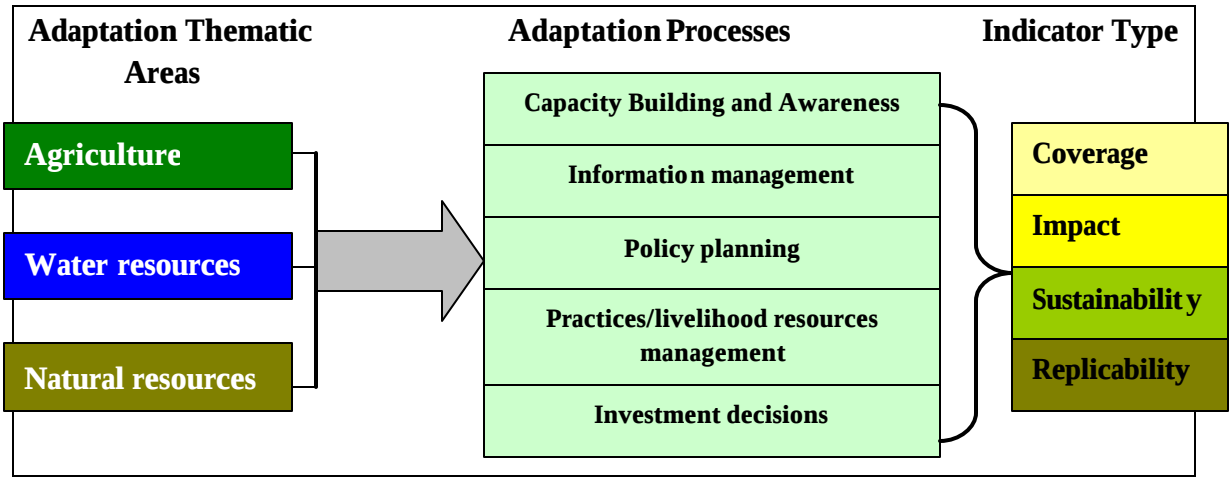


Figure 1.5: UNDP Framework for Analyzing Adaptation Projects

From these conceptual frameworks and the project Log frame, potential indicators for the Coping with Drought and Climate Change project Monitoring and Evaluation framework are outlined in Table 1.2.

Table 1.2: Potential Indicators for the CwDaCC Project

Coverage	Impact
➔ Number of households by gender aware of viable adaptation options ➔ Number of households by gender using adapted farm management practices ➔ Number of households using new technologies ➔ Number of households by gender using new livelihood mix ➔ Number of smallholder farmers by gender in pilot site consistently using climate information for decision support ➔ Number of service providers in Chiredzi district using climate information for in operational practices ➔ Number of requests for demand driven forecast products from Chiredzi service providers to Meteorological Services ➔ Number of policies, plans, programmes, projects introduced, or adjusted to incorporate climate change risks ➔ Number of risk reducing practices/measures implemented to support adaptation of livelihoods and or resource management	➔ Percentage change in quantitative development outcomes (agricultural productivity, household income, food security, water resources, health, livelihood asset base) ➔ Percentage change in number of vulnerable rural communities using viable adaptation measures ➔ Level of climate change risk awareness among farmers and service providers ➔ Number of climate risk oriented operational practices among service providers ➔ Percentage change in stakeholders' capacities to manage specific climate change risks (e.g. conduct vulnerability assessments, communicate climate change risks, disseminate information or make decisions based on high quality information) ➔ Percentage change in stakeholder knowledge of risk reducing measures ➔ Level of mainstreaming of climate change concerns in national development processes and programmes ➔ Change in national institutional, legislative and policy frameworks in the agriculture and water sectors

Sustainability	Replicability
➔ Number of stakeholders involved in capacity building for implementing specific adaptation measures, policy planning processes, decision support tools or enabling activities; ➔ Availability of skills and resources necessary to continue adaptation after conclusion of project ➔ Stakeholder perception of adaptation sustainability	➔ Number of lessons learned codified ➔ Number of relevant networks or communities with which lessons learned are disseminated

In developing this baseline, the CwDaCC Project will have a basis to answer the following questions:

1. How do we know that heterogeneous communities have increased their adaptive capacity or reduced their vulnerability to drought and climate change?
2. How do we know that we have raised local awareness of future climate risks?
3. How do we know that adaptation projects meet community needs?
4. How do we use M&E as a tool to inform ongoing project implementation to reflect changing community priorities?
5. How can we measure this to communicate our progress to external stakeholders?

Key Challenges to Monitoring and Evaluating Adaptation include:

1. Selecting appropriate adaptive capacity and reduced vulnerability indicators for a given system;
2. How to aggregate results from project to programme level;
3. How to predict in the context of future changes;
4. Taking into account the fact that climate change risks compound the effects of other non-climate related stressors;
5. How robust are inferences in a future changed climate;
6. Climate related hazards that affect development outcomes are changing (moving baseline). How do we evaluate successful adaptation in a dynamic temporal and spatial context?
7. To what extent can improved adaptive capacity or impact be attributed to the project given presence of other organisations, effects of a moving socio-economic baseline, etc?
8. How is the impact of other drivers of vulnerability, other than climate change, taken into account considered in the M&E system?

2 Data and Approaches

In the previous section, a conceptual framework for conducting a baseline analysis for the CwDaCC project was presented. Data requirements for the baseline comprised both quantitative (crop yields, incomes, livestock performance, human development criteria and relevant control variables, time series data (for examining dynamic change)) and qualitative (community dynamics, perceptions, attitudes, practices, coping strategies, gender considerations). The sections that follow describe these data, data collection methods and analysis tools used to develop the baseline.

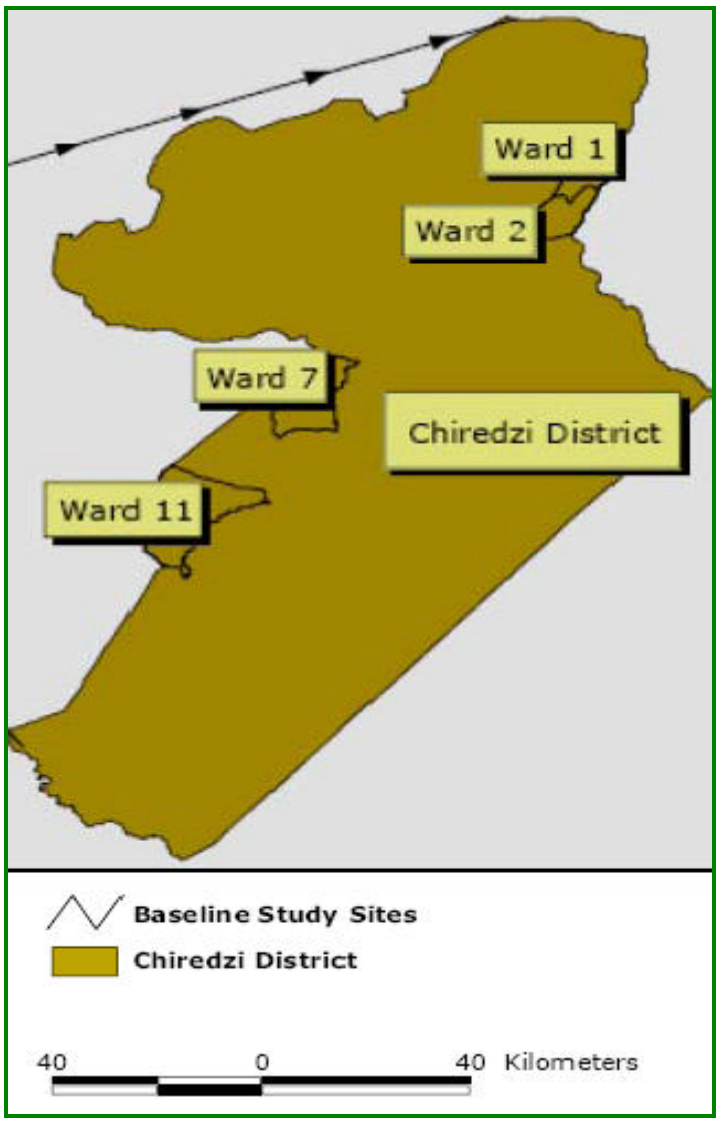


Figure 2.1: Map Showing Project Baseline Study Sites

2.1 Sampling and Data Collection Methods

Four Wards were selected after consultations with the district leadership for the baseline study (Table 2.1). A multi-stage sampling strategy was then used to identify target villages from which respondents were randomly selected. Within each Ward, three villages were sampled based on the criteria of rainfall amount received and predominant agricultural and economic activity.

Within each Ward, effort was made to interview proportional numbers of men and women. The sample had 60% women and 40% men. Because of the high migration of men presumably in search of employment in neighbouring South Africa, fewer men than women are present in the area. However, of the interviewed households, 77% were male-headed and 23 female headed. 27% of the household interview respondents were at least 50 years of age. Average household size for the sampled communities was 7.53 people. 70% of the respondents interviewed had been staying at the project site for at least 21 years except in Ward 7, which is a newly established resettlement.
The sampled wards and villages are given in Table 2.1:

Table 2.1: Wards Sampled for Baseline Study

Communal Area	Ward	Number of Households in Ward	Number of households sampled	Village
Sangwe	Ward 1	1341	22	Gambura, Musindo, Musarevana
	Ward 2	1967	26	Chimene, Mutapurwa, Majanyana
Matibi 2	Ward 7	1836	29	Lisimati, Mukungulushi, Joyce Mujuru Irrigation Scheme
	Ward 11	2263	25	Chikombedzi, Haisa, Malikangwe Irrigation Scheme
Total		7407	102	

2.2 Data Collection Tools

A cross design of qualitative and quantitative methods and tools for primary and secondary data collection and analysis were developed. Different tools complimented, triangulated and verified data, thus enhancing quality of data collected.

2.2.1 Primary Data

Household Questionnaire: The household questionnaire was developed using the Sustainable Livelihoods Framework. The questionnaire (Annex 2) had five key sections (1) household demographic information; (2) household socio-economic/livelihood asset status; (3) crop and livestock productivity; (4) food security status and drought coping strategies; (5) climate change perceptions, indigenous and contemporary climate forecast information and coping strategies.

Focus Group Discussions: Focus group discussions (FGDs) were conducted with targeted local communities to explore in more depth key issues relevant in understanding the baseline scenario. For each of the sampled Wards, two FGDs (one for men and another for women) lasting about 1 ½ to 2 hours each, were conducted. Age and wealth status specific responses were captured.

Key Informant Interviews: At the inception phase stakeholder mapping was conducted to identify suitable individuals and institutions from which expert views and data on indicators identified from the project Logframe () could be extracted. Key informants were identified at community, district and national levels and included village heads, councilors, extension officers, staff in NGOs, CBOs, and various Government departments, programme managers and policy makers. A semi-structured interview guide was used to focus these discussions.

2.2.2 Secondary Data

Review and Analysis of Relevant Documents: Relevant baseline statistics at district and national level were collected and analysed. Data collected included demographic, human development, agricultural productivity, climate data and other relevant project indicators. Key data was also obtained from vulnerability assessment reports, baseline and evaluation studies, and food supply assessment reports conducted in Chiredzi. Multiple sources were used to extract this data.

2.2.3 Consent

Permission to conduct fieldwork was sought from local leadership that included the rural district council chief executive, district administrators, ward councillors, and village heads(). Consent was also sought from both FGD and household questionnaire respondents before proceeding with the discussions or taking photographs.

2.2.4 Training and Fieldwork

Research assistants were oriented on the scope of the project and trained on data collection to ensure consistency in the data collection process. Translation and pre-testing of the questionnaire were done. To control quality, individual questionnaires were checked daily by the Consultant and any unclear details clarified.

2.2.5 Data Analysis

Trained clerks undertook data coding, entry and cleaning. Analysis of household data collected was performed using Statistical Package for Social Scientists (SPSS) while qualitative data was analysed through constant comparative technique that groups like data to come up with major themes. Issues that came up frequently were highlighted as emerging issues.

2.3 Limitations of the Study

- The study was conducted during the peak of the lean season characterized by high food and income insecurity levels. In expectation of food assistance, the truthfulness of some of the responses received could have been compromised.
- Such exercises as wealth ranking have been extensively used by development organizations to inform targeting processes. Although the objectives of the study was explained, respondents were generally hesitant to discuss in particular how much livestock they owned, in fear they could be omitted from the planned intervention.
- Lack of reliable and up-to-date statistics. Data from the Central Statistical Office is available up to 2002 only.
- Logistical arrangements, particularly fuel unavailability in Chiredzi reduced the size of the sample that could be interviewed for the household questionnaires.
- High staff turnover in some of the sampled organizations meant that the project team interviewed staff with limited experience in working with the target communities. In some cases interviews had to be conducted with junior staff.

To minimize the impact of these shortcomings on the final results, triangulation, particularly use of data from secondary sources, has been used.

3 Findings

This section presents findings on the baseline scenario in the project site. The findings are organized into six sections. Section 1 describes the demographic situation in the project site. Section 2 presents the vulnerability baseline while Section 3 covers the exposure and sensitivity baseline. The adaptive capacity and policy baseline are outlined in Sections 4 and 5, respectively.

3.1 Demographic Baseline

Chiredzi District has a total population of 234 020 of which 208 171 is rural (CSO, 2002). Of this population, 51% is female and 49% is male. The total number of households is 47 244 (67.98% male headed, 32.02% female headed). In 2002, the average household size was 4.39. Indicators of population growth show a natural rate of increase of 1.90; Crude Birth Rate (per 1000 of the population) was at 32.19 (compared to the provincial average of 28.77) and the Crude Death Rate (per 1000 of the population} was at 13.76 (compared to the provincial average of 18.51) (CSO, 2002). Table 3.1 summarises the key demographic characteristics of the district that may influence the pace of adaptation to climate change in the district.

Table 3.1: Demographic Indicators for Chiredzi (Source: CSO, 2002)

Indicator	2002 Status
Adult literacy rate (15years+)	96%
Primary school enrolment	71.13%
Secondary school enrolment	21.87%
Tertiary school enrolment	0.64%
Population aged 3-24 who never attended school (%)	19.11
Infant mortality (per 1000 live births)	71.89
Maternal mortality (per 100000 live births)	1246
General fertility rate	128.65
Households without electricity access	85%
Households dependent on wood as energy source	91.24%
Household without toilet facility	41.54%
Households collecting water >1000metres	15.75%
Communal farmers as % of employed persons	58.94%

3.2 Vulnerability Baseline

Indicators of vulnerability to drought and climate change include: agricultural productivity, food sufficiency and income levels,

3.2.1 Crop Productivity

Mean yields for the 1990-2000 period for Chiredzi were at 0.55 t/ha (maize), 0.52/ha (sorghum), 0.60 t/ha (millet), 0.41 t/ha (cotton), 0.31 t/ha (sunflower) and groundnuts 0.28 t/ha (Table 3.2). In comparison, irrigated maize yields average 4.0 t/ha. From 1980-1995, the national average maize yield was 5.0 t/ha for rainfed commercial agricultural plots.

Table 3.2: Chiredzi Rural Crop Productivity Trends (1990-2000 averages) t/ha

Indicator		Baseline (1990-2000)	Benchmark (World Average)
Maize (t/ha)	Rainfed	0.55	2.8
	Irrigated	4.0	4.52
Sorghum (t/ha)		0.52	1.8
Millet (t/ha)		0.60	0.73
Cotton (t/ha)		0.41	
Sunflower (t/ha)		0.31	
Peanuts (t/ha)		0.28	1.3
Sugar cane (t/ha)		90	61.8
Water Use Efficiency (%)		33 (SSA) 1997/99	44 SE Asia
Source: Agritex			

For the 2007/8 season the mean yields at ward and district level for the three major crops are given in Table 3.3.

Table 3.3: Mean Crop Yields for Chiredzi 2007/8 Season (Source: Agritex, 2008)

Location	Mean Maize Yield (ton/ha)	Mean Cotton Yield (ton/ha)	Mean Sorghum Yield (ton/ha)
Ward 1	0.5	0.8	1
Ward 2	0.5	0.8	1
Ward 7	1	0.6	2
Ward 11	1	0.6	2
District level	1	1	1.5

The baseline scenario is characterised by declining agricultural productivity levels as a consequence of multiple stressors prevailing at national and household level. The impacts of this decline have been felt more by livelihoods dependent directly on rainfed agriculture.

Poor rainfall was identified as a major limitation to agricultural productivity, with most farmers viewing crop production outside irrigation as uneconomic. In the project onset year, Zimbabwe faces critical shortages of essential agricultural inputs. Both seeds and fertilizer are scarce on the formal market but available at unaffordable prices on the black market. For example, in Chiredzi 10kg of maize seed was being sold at between US$25 and US$35.

3.2.2 Duration of Harvested Food Availability

The high food insecurity levels immediately before harvesting tended to promote consumption of green mealies, such that no grain could be stored. Harvested grain from own production lasted less than 1 month for 37% of households; less than 3 months for 32% of households; up to 6 months for 18% and more than six months for 13% of households..

3.2.3 Livestock Productivity

The predominant livestock classes owned (of at least a single livestock unit) by household are goats (51%); cattle (46%); donkeys (12.7%) and sheep (5.8%). Poultry was owned by at least 54% of all households. Table 3.4 summarises the productivity of beef cattle in the district.

Table 3.4: Livestock (beef cattle) Productivity for Chiredzi

Indicator	Baseline	Benchmark (Commercial)
Livestock calving rate (%)	42	60
Livestock mortality (%)	1-3	5
Livestock off-take rate (%)	4.4	15-20
Source: District Veterinary Office (Chiredzi)		Source: FAO (2004)

The predominant breeds for cattle are various Brahman crosses and a smaller proportion of the Mashona type. For goats, Persian and indigenous breeds are more common. In both cases, farmers' perceptions are that these breeds of livestock are adaptable to the harsh climate conditions of heat and drought that characterises the

project site. However, heat stress is significantly reducing livestock productivity, particularly in cattle and poultry. There is currently no formalised breed improvement programme in Chiredzi; most of the livestock breeding work is conducted at Makoholi and Matopos Research Stations, which offer opportunities for technology transfer.

Farmers' **perceptions** on livestock productivity is that it has fallen in the recent years mainly as a consequence of poor livestock disease management, declining pastures and poor availability of water for both drinking and dipping. Key indicators of declining productivity identified were:

- Lower calving rates across livestock classes
- Reduced milk yield
- Increased livestock mortality rates

3.2.4 Main Challenges to Livestock Production in Chiredzi

Across all wards, livestock diseases were identified as the main challenge to livestock production (41.8%), (Table 3.5). Pasture quality was variable between wards, and overall poor pastures contributed 31.9% of all cases. Lack of water for livestock drinking and dipping was the main challenge for 12.8% of all farmers. In ward 11, stock theft was very rife. One farmer interviewed actually lost 30 cattle to rustlers. It is suspected that the market for these stolen cattle is Mozambique.

Table 3.5: Main Challenges to Livestock Production

		What is the main challenge in livestock production?							Total
		Inadequate water for drinking	Inadequate water for dipping	Poor grazing/ browsing	Livestock diseases	High cost of feed	Lack of labour	Theft	
Ward number	1	11.8%	.0%	41.2%	29.4%	5.9%	.0%	11.8%	100.0%
	2	.0%	.0%	16.7%	50.0%	.0%	33.3%	.0%	100.0%
	7	13.3%	6.7%	13.3%	66.7%	.0%	.0%	.0%	100.0%
	11	18.2%	.0%	54.5%	18.2%	.0%	.0%	9.1%	100.0%
Total		10.9%	1.8%	30.9%	41.8%	1.8%	7.3%	5.5%	100.0%

The following drought and heat stress effects were identified on livestock:

1. Reduced quality of pasture and lack of adequate feed as stover availability is reduced by low cereal crop productivity.
2. Constrained water resources availability compromises disease control through reduced dipping frequency.
3. Higher incidence of animal diseases like liver fluke disease.
4. Inadequate water availability reduces total milk yield and quality and condition of stock. Prolonged drought implies that animals have to travel longer distances to access water thus diverting energy from growth and development
5. Changes in species diversity in both rangelands and managed grasslands reducing livestock productivity. Some poisonous species like Slangop (*Eugenia sangonium*) remain green in spite of drought, and are targeted by livestock.
6. Increase in temperature will lead to increased plant lignification resulting in reduced digestibility and degradation of livestock feed
7. Reduced livestock genetic diversity and capacity to breed for desirable traits like drought resilience due to the twin effect of high demand of meat on the market and reduced feed and water availability
8. Lower calving rates

3.2.5 Prevalent Livestock Diseases and Management

Table 3.6 presents some of the most important livestock diseases that affect livestock production in Chiredzi.

Table 3.6: Prevalent Livestock Diseases for Chiredzi

Disease	Description and impact
Liver fluke disease	A common cause for loss of livestock and livestock productivity in Chiredzi. During drought the concentration of liver flukes in the livestock's system is increased to toxic levels when infected water is consumed. The liver flukes lead to liver damage, digestion disturbance, weight loss, swelling below the jaw "bottle jaw". This reduces the affected animal's productivity.
Anthrax	High rainfall, and particularly floods, exposes Anthrax spores and this increases the risk of Anthrax on livestock with hooves. The 2005 Anthrax outbreak which claimed an approximate 2000 animals in the game park in Chiredzi followed heavy rainfall.
Foot and Mouth Disease (FMD)	Outbreaks of FMD have serious economic implications at household and national economy levels. Typically sores occur on mouth and feet of infected animals. Symptoms include loss of appetite, fever and lameness. Low capacity to move or feed reduces the livestock's productivity. Cattle, sheep and pigs are all affected. In cattle, milk production is reduced and teats may be sore. Younger stock may die. Culling animals is the best control policy.

Lumpy skin disease	This is an economic disease prevalent in wet summers. The vector is the biting flies, which is more common during wet months. Lumpy skin disease causes morbidity in 4-45% of cases, and mortality in 10%. It leads to permanent damage to hides, prolonged debilitation, and temporary to permanent cessation of milk production due to mastitis, temporary to permanent infertility due to orchitis. 10% of infected animals abort.
Redwater Heartwater ,Gall sickness, Theleira	These are tick borne diseases common during the wet season because of the higher tick population.
Newcastle disease	Affects chicken. Losses recorded have been very high. Most households lost their entire bird stock, in one case over 50 birds were lost. Suspected that cross border chicken trading with Mozambique may be responsible for disease spread. Some households have diversified into ducks and guinea fowls given the high magnitude of Newcastle disease, temperature and heat stress impact.

- Chiredzi has 91 dips across the district, with varying degrees of working order. Animal health centres are located in Chikombedzi, Malipati, Muteyo/St. Joseph wards.
- Lack of veterinary chemicals is a critical challenge to routine dipping. In winter, poor water supply due to high proportion of non-functional boreholes constrains dipping frequency.
- The Veterinary Services Department charges Z$180,000 (R120) per animal for dipping. This is figure is very expensive for most households. To pay for dipping, farmers usually select a few animals to sell and pay for dipping costs.
- Individual farmers may alternatively purchase the acaricide (dip chemical) and apply using knap sack sprayer or as a pour-on.
- Dipping effectiveness is lower during the rainy season due to dilution of the dip chemical and subsequent loss of the dip from the animal upon rain drenching.
- Climate forecast information is currently not being used to inform the dipping routine, but rather there is a pre-set dipping schedule in place.
- The Food and Agriculture Organisation (FAO), CIRAD and the Government of Zimbabwe are implementing a dip tank rehabilitation programme and supporting dip chemical procurement. The programme also supports vaccination for chickens as well as management of FMD, rabies and anthrax.
- Proximity to Gonarezhou National Park increases livestock exposure to such diseases common within animal classes (FMD can be easily transmitted from buffaloes (natural carriers of FMD) to cattle, while rabies could be transmitted to dogs from jackals). Livestock have been attacked by wild animals from the game park.
- Livestock movement across the Zimbabwe-Mozambique border is seen as a key entry point for livestock diseases into Zimbabwe.

3.2.6 Food Insecurity

In 2008/9 consumption year, 59% (137000 people) of the Chiredzi rural population needed urgent food assistance because of drought impacts on food production. In 17 of the 24 wards, mean cereal deficit based on own production was estimated at 7-9 months (CSFAM, 2008). The food security status at ward level is shown in Figure 3.1.

57% of households in the baseline sample had exhausted food stocks and did not have money to buy food by the time the field data collection was undertaken in October 2008. 41% of households although food insecure could still manage to purchase food with cash or in kind payment earned through various livelihood coping strategies. Only 1% of the households still had adequate food to last until the next harvest. Farmers in irrigation schemes were generally more likely to have food stocks than those relying totally on dryland farming.

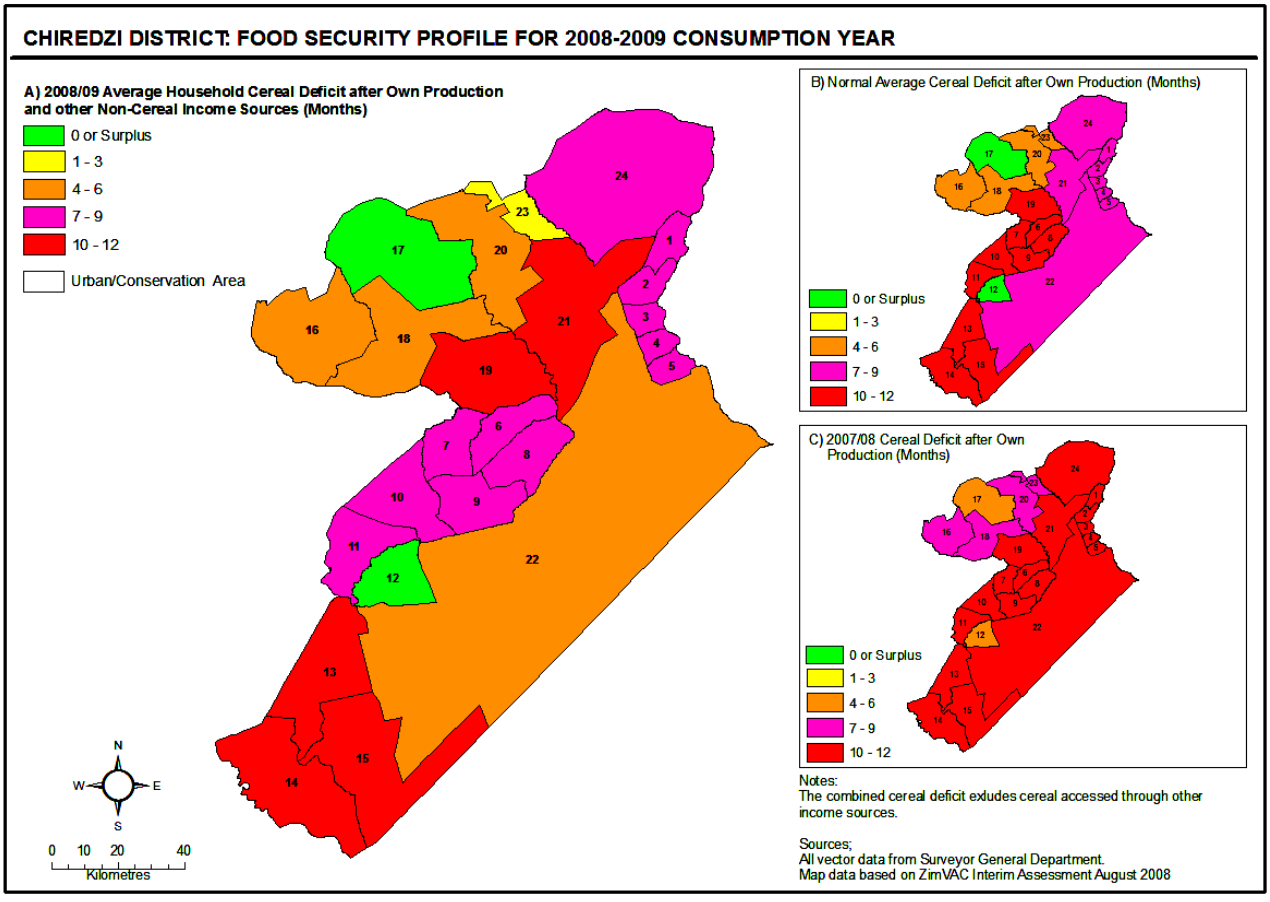


Figure 3.1: Chiredzi District: Food Security Profile for 2008-2009 Consumption Year (Source: ZimVAC Report, 2008

Table 3.7 lists households identified as most vulnerable to drought and with the least coping and adaptive capacity.

Table 3.7: Households most vulnerable to drought impacts (ZimVAC, 2005)

Female headed households Households with orphans Households with chronically ill head Households with low education level Widow headed households Elderly headed households Households with limited access to information and understanding of climate risk and management options Households without access to productive resources, including technology Households in degraded areas Households furthest from urban centres	Households with small fragmented plots Households without irrigation Households with large families Households with limited skills base Households without livestock Households that depend soley on maize production and consumption Households with poor community leadership Households in areas of poor entrepreneurship Households in areas of poor communication network

3.2.7 Key Drivers of Food Insecurity

- Low agricultural productivity capacity due to erratic rainfall, shortage of seed, labour, timely draught power access, and ineffective post-harvest storage practices.
- Lack of food on the local market, thus pushing high the prices of food even higher.
- Where food is available, prices are pegged in foreign currency. Local communities receive payment for sale of labour, craft products, firewood and other goods and services in local currency.
- Absence or limited access to food assistance from Non Governmental Organisations and Governmental programmes. GMB deliveries are very low relative to the demand for grain.
- All the four wards sampled are generally poorly serviced with transport. Local supermarkets have closed down as shop owners fail to move products to their establishments. On the other hand, people are restricted by very high transport costs for moving around in search of food.
- Theft and livestock diseases are reducing sources of income for food purchasing. Many households have lost entire chicken stock, up to 50 birds in one case died from Newcastle disease.

3.3 Exposure and Sensitivity Baseline

This section presents the climate conditions of Chiredzi and the historical and estimated future sensitivity of cropping systems to climate variability and change.

3.3.1 Climate Conditions

The baseline climate for Chiredzi is summarised in Table 3.8.

Table 3.8: Summary Climate Statistics for Chiredzi

Mean annual rainfall	608 mm (1970-2000)
Annual rainfall range	130 - 1120 mm (1966-2007)
Annual evaporation	1800 mm
Mean Annual Rainfall Coefficient of variation	40%
Mean annual temperature	22.5°C
Soil moisture regime	Aridic
Drought frequency	1-3 every 10 years

3.3.2 Sensitivity of Cereal Yields

Agricultural systems particularly dryland farming in Chiredzi are sensitive to variability in temperature and rainfall. Figure 3.2 shows maize yield response to rainfall for the period 1990-2000. Cereal crop yields in the present climate average 0.6 t/ha with a range of 0.1 to 1.8 t/ha for smallholder farmers. According earlier crop impact assessments a warming of 2-4°C leads to a cereal crop yield reduction of 10-30% in this region. Therefore, with climate change household food insecurity for rural households would worsen.

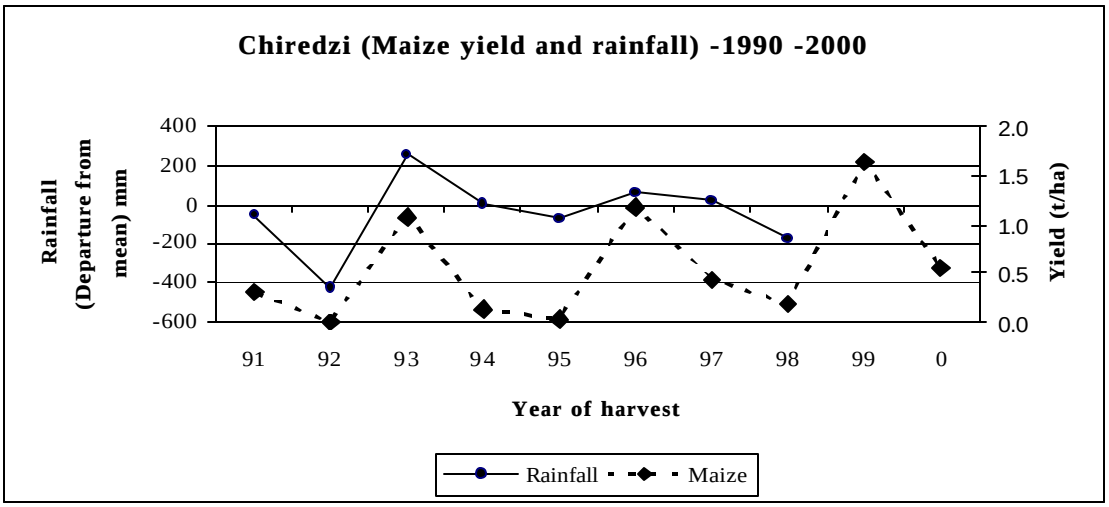


Figure 3.2: Chiredzi Maize Yield and Rainfall (1990-2000)

3.4 Adaptive Capacity Baseline

The adaptive capacity baseline is illustrated using indicators of livelihood assets at household and community levels (based on the Sustainable Livelihoods Approach); awareness, knowledge and attitudes as well as responses to drought.

3.4.1 Livelihoods Profile

Livelihoods in Chiredzi District are predominantly dependent on rainfed agriculture (41%) encompassing maize, sorghum and millet production; remittances from relatives in the urban areas and diaspora (27%); market gardening (13%); off-farm employment (13%); agricultural casual labour (11%) and small income generating activities (5%). Important sources of cash income also include firewood sales, cross-border trade and permanent work on sugar estates (ZimVAC, 2005).

A study conducted by IOM (2007) ranked 57% of households as poor, 30.8% very poor and 5.6% and 6.5% as better off and moderate, respectively. When subjected to drought stress, livelihood sources have tended to shift, with middle and high-income households having a higher adaptive capacity through dependence on livestock sales (Fig. 3.3). The poor rely more on casual agricultural labour, with falling cash or in-kind incomes as food insecurity intensifies. Given low and falling agricultural productivity and wide wealth inequities, household food insecurity is relatively high. Ranked community development priorities also reflect the desire to overcome household food insecurity.

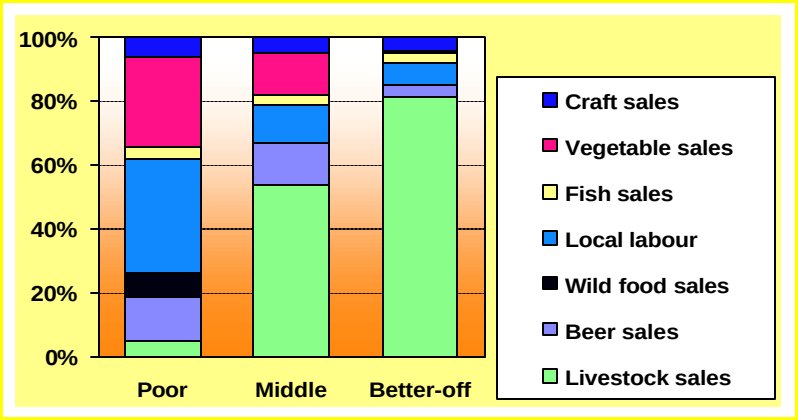


Figure 3.3: Livelihoods during drought (Source: ZIMVAC, 2005)

3.4.2 Livelihoods Analysis

For the sampled population, crop production is the main livelihood source (28%). Casual labour for cash or in-kind income (18%), selling firewood (13%) and market gardening (13%) are the other important livelihood sources while cross border trading with South Africa and Mozambique and remittances constituted 5% and 3%, respectively. Livestock production accounts for 7% and the formal sector, which is declining in importance due to falling salaries, contributes to 6% of all households' income. Handicrafts were the main income source for 6% of households, hunting 2% while other livelihood sources contributed 1%. From focus group discussions, respondents identified households with higher number of alternative income sources, especially non-agricultural, as less vulnerable to the impacts of drought and more likely to be food secure. The livelihoods profile for the whole province of Masvingo is shown in Figure 3.4 for comparative purposes.

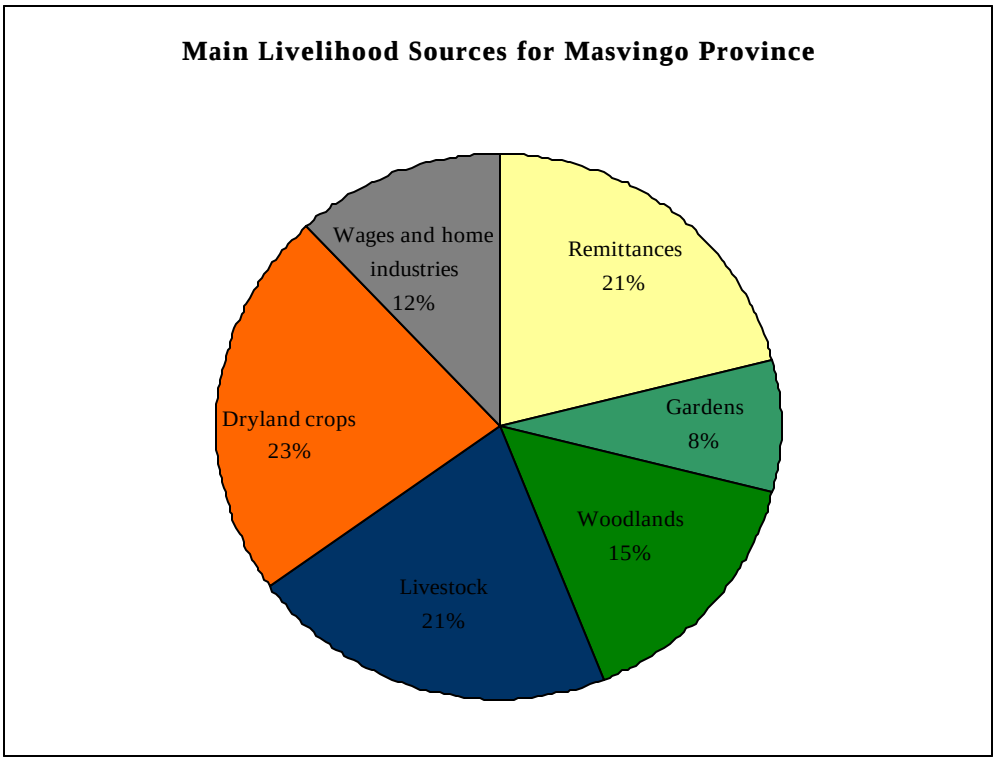


Figure 3.4: Major income sources for Masvingo province (World Resources Institute, 2005).

3.4.2.1 Major Crops

The main crops under dryland production are sorghum, maize, pearl millet, groundnut, bambara nut, sunflower, cotton and cowpeas. Under irrigation, the main crops are wheat, maize and beans. Farmers with irrigation access are also involved in market gardening, producing green leafy vegetables and tomatoes. The proportion of farmers growing the main cereal and grain legumes in the 2007/8 season is given below:

Table 3.9: Proportion of Farmers Growing Crops in 2007/8

Cereals	**% of farmers growing crop**
Sorghum	97%
Maize	74%
Finger millet	7%
Pearl millet	2%
Grain legumes	**% of farmers growing crop**
Groundnuts	13%
Roundnuts	8%
Cowpeas	7%

Source: Survey Results

The mean number of crops grown under irrigation was 4, compared to 2 for rainfed farming.

3.4.2.2 Seed Type

65% of maize planted was hybrid; mostly short season varieties (SC401, SC501) and 35% Open Pollinated Variety (OPV) (ZM421 and ZM521) provided through NGO and Government input assistance programmes. Maize seed was barely saved by farmers, given the high food insecurity levels. Only 37% of farmers felt that the maize seed variety they were using was suitable in terms of drought tolerance.

The dwarfed white sorghum (Marcia) was identified as the most preferred for taste and colour, although more vulnerable to quelea birds attack. 77% of respondents were using hybrid sorghum, mainly saved from previous season. 78% of sorghum farmers identified current seed type as suitable under drought stress. The figure was 28.7% for maize; 50% for groundnut; 62.5% for roundnut and 80% for cowpeas.

The mean amount of seed used for the main crops is given on Table 3.10:

Table 3.10: Seed Use by Crop

Crop	Seed (kg/ha) Dryland	Seed (kg/ha) Irrigation
Maize	46.5	21.3
Wheat		146.7
Sorghum	16.8	
Pearl millet	17.3	
Cotton	40.5	
Beans	11.6	145.3
Groundnut	27.2	
Round nut	21.1	
Finger millet	41.5	

The main sources of sorghum seed were saved, neighbours and relatives. Farmers relied more on own saved seed for grain legumes (groundnut and roundnut) than maize. Most saved seed was converted to grain and consumed given high food insecurity levels.

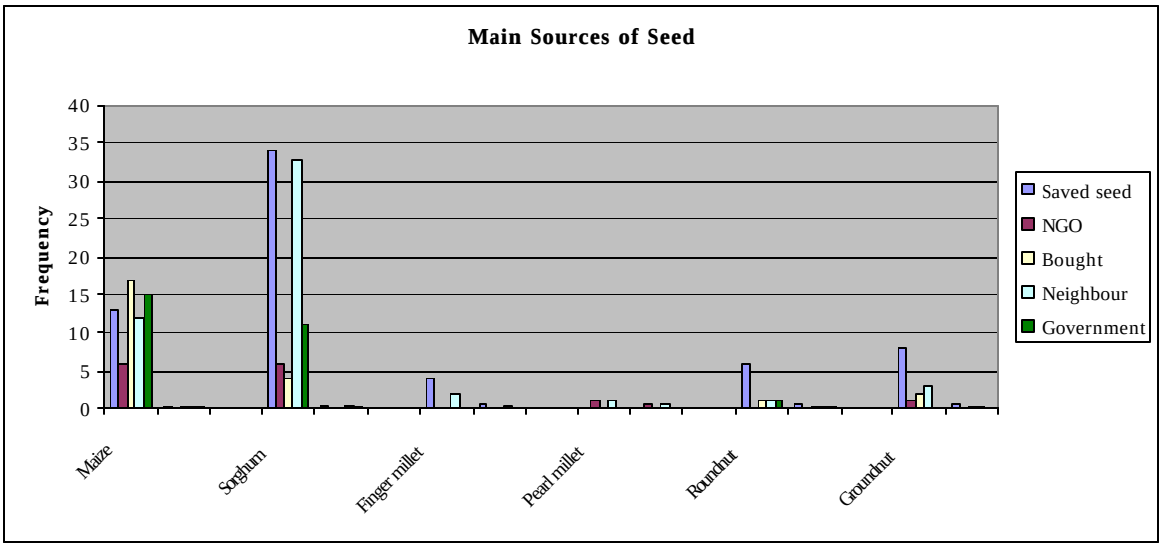


Figure 3.5: Main Sources of Seed

3.4.2.3 Diversity of Crops

Female headed households had higher crop diversity compared to male headed households. Households where decisions were made jointly had a higher mean that the former cases.

Table 3.11: Crop Diversity by Gender of Decision Maker

		Total number of crops grown under dryland farming						
		1	2	3	4	5	6	Total
Gender of decision maker	Male	8 21.6%	22 59.5%	5 13.5%	1 2.7%	1 2.7%	0 .0%	37 100.0%
	Female	10 32.3%	12 38.7%	6 19.4%	1 3.2%	2 6.5%	0 .0%	31 100.0%
	Both	8 23.5%	11 32.4%	8 23.5%	3 8.8%	3 8.8%	1 2.9%	34 100.0%
Total		26 25.5%	45 44.1%	19 18.6%	5 4.9%	6 5.9%	1 1.0%	102 100.0%

Farmers with access to irrigation had a higher mean number of crops (4 crops) compared to those relying only on dryland farming (2 crops).

3.4.2.4 Potential Crops

1. **Cassava (*Esculentum manihot*)**

- Introduced three years ago for processing to supply feed producers.
- Initially resisted for consumption, but now grown mainly for household food consumption. Number of farmers very few in district.
- Cassava adaptable to drought, recovers well from prolonged drought spell.
- Yield potential for Chiredzi is 45-50 ton/ha. Current yield levels are 20-30ton/ha. Area under cassava is still relatively low.
- Mealy bugs main challenge to production

2. **Sweet Potatoes (*Ipomoea batatas*)**

- Yield potential is 30ton/ha for Chiredzi. Farmers under a project providing virus free planting material are harvesting 15-20 ton/ha
- Seedlings are multiplied in gardens
- High food and income benefit realized by targeted households
- Weevils are the main challenge, incidence depends on the state if cleanliness of the field

3.4.2.5 Fertilizer Use

Inorganic fertilizer use outside irrigation is very low since the basaltic soils are very mineral rich making additional application uneconomic. The main reason for non fertiliser use was that the soils are fertile (73%), high risk of fertiliser burning crop given moisture stress (13%), non availability on the market (8%) and lack of money to buy (6%).

Only 17.6% of the farmers use fertiliser, and this is mainly on irrigated plots. Farmers interviewed in irrigation schemes were using the Agritex recommended rates of 150-200kg per hectare for maize. Compound D and Ammonium Nitrate are the most commonly used fertilisers for basal and top dress application.

3.4.2.6 Number of Livelihood Sources per Household

Households tended to rely on a mixture of livelihood sources of income as a measure to increase opportunities for food and income security. Table 3.12 indicates that on average, a single household would earn income from at least three livelihood sources.

Table 3.12: Number of income sources of the household

Number of Income Sources	Frequency	Percent	Valid Percent	Cumulative Percent
1	11	10.8	10.8	10.8
2	30	29.4	29.4	40.2
3	48	47.1	47.1	87.3
4	13	12.7	12.7	100.0

Livelihood mix varied by gender of decision maker and breadwinner for particular household. The number of men and women as a percentage of all respondents by gender were recorded and tabulated as given on Fig. 3.6.

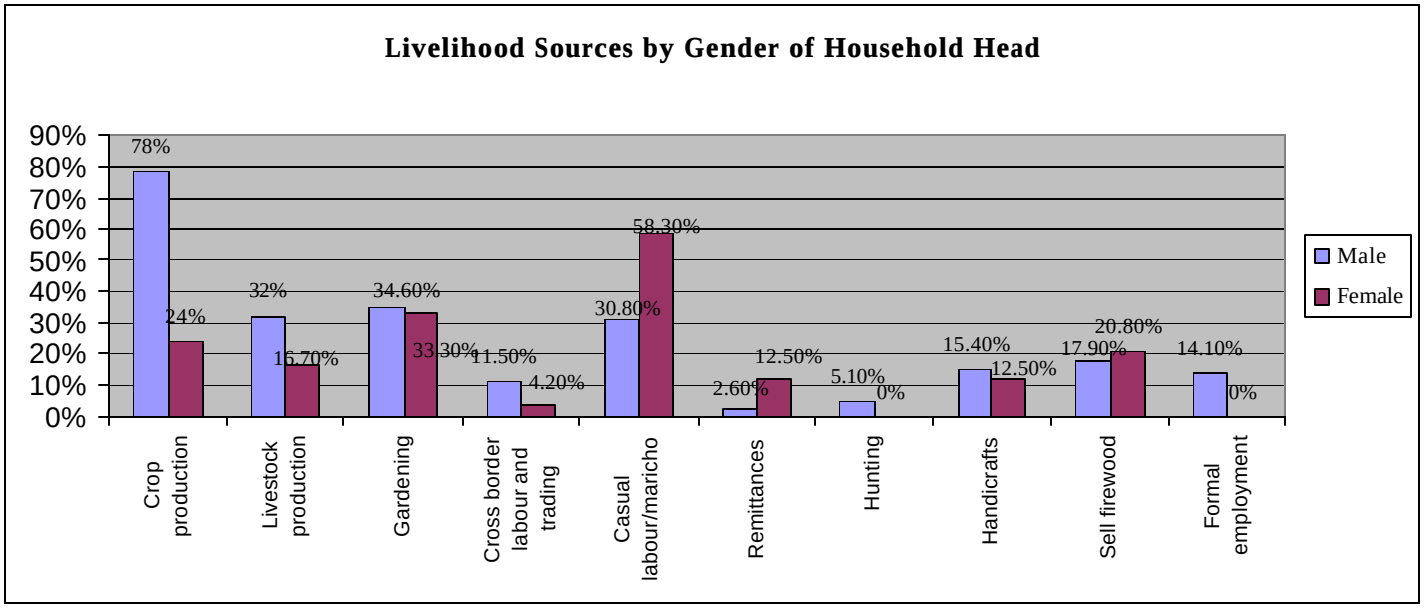


Figure 3.6: Main Livelihood Sources by Gender of Household Head

The diversity of income sources by gender is given on Table 3.13. It indicates that households headed by women tended to have a higher livelihood mix relative to those headed by males. For example, 54% of females had at least three livelihood sources compared to 45% for males.

Table 3.13: Number of Livelihood Sources by Gender of Household Head

		Number of income sources of the household				Total
		1	2	3	4	
Gender of Household Head	Male	10 12.8%	21 26.9%	35 44.9%	12 15.4%	78 100.0%
	Female	1 4.2%	9 37.5%	13 54.2%	1 4.2%	24 100.0%
Total		11 10.8%	30 29.4%	48 47.1%	13 12.7%	102 100.0%

3.4.2.7 Main Reason for Change in Livelihood Source

The main sources of livelihoods at household level have changed over the last five years, and in most cases, away from agriculture. Statistics for 2005 indicate that rainfed agriculture contributed 41% of livelihoods; remittances from urban and diaspora workers (27%); market gardening (13%); casual labour (11%) and small village industries (5%) for Chiredzi District.

At the time of the survey, 42.2% of the households were earning most of their incomes from livelihoods sources different from new livelihoods sources, mainly gardening and remittances. Formal employment has had the largest decline, from 19.8% five years ago to 5.9% of all households in 2008. The main reasons for change in livelihood source are given on the figure below:

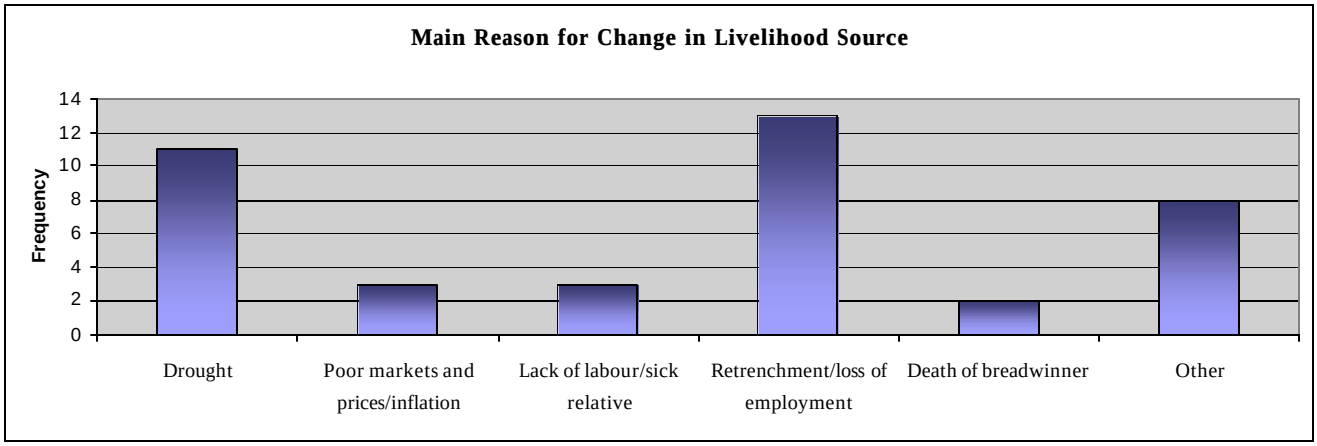


Figure 3.6: Main Reason for Change in Livelihood Source

3.4.3 Livelihood Assets

In line with the Sustainable Livelihoods Framework (SLF) livelihood asset ownership at household and community level are discussed under five capital asset classes: financial, human, social, natural and physical.

3.4.3.1 Financial Capital

Household Income

The gender of the household head varies with per capita income of the household. 85% of households interviewed earned less than US$50 per month, 13% earned incomes within the US$51 to US$100 range while 2% of the households received incomes higher than US$100 (Fig. 3.7).

Household income depends on gender of head of household. Households receiving more than US$101 per month were all male headed. The income level is related to ownership of livestock, including availability of draught power. 85% of male headed households owned at least a livestock unit compared to 58% for female headed households.

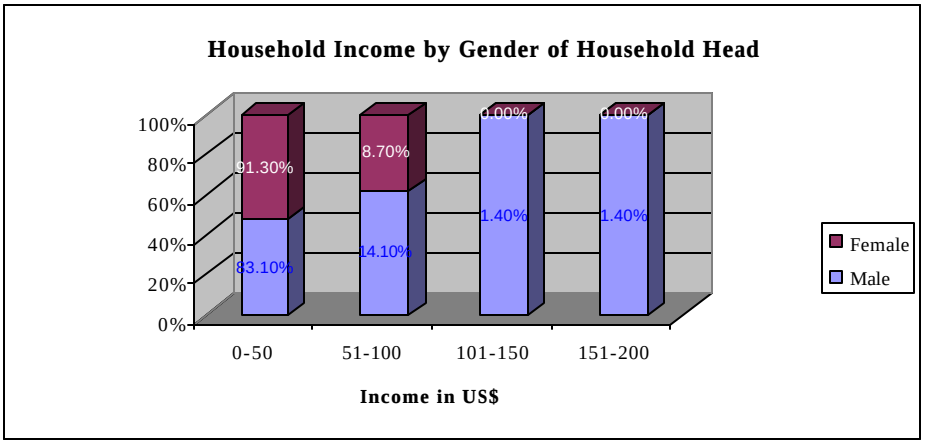


Figure 3.7: Household Income by Gender of Household Head

Reliability of income sources, especially remittances, was highly variable. 60% of the respondents had received incomes in cash or kind within the last month, 19% last received income two months ago, while 21% had last received their incomes over three months ago.

Table 3.14: Amount (in USD) of Income normally earned per Month by Ward

		Amount of income normally earned per month (US$)				
		0-50	51-100	101-150	151-200	Total
Ward number	1	21 95.5%	1 4.5%	0 .0%	0 .0%	22 100.0%
	2	21 87.5%	3 12.5%	0 .0%	0 .0%	24 100.0%
	7	21 84.0%	4 16.0%	0 .0%	0 .0%	25 100.0%
	11	17 73.9%	4 17.4%	1 4.3%	1 4.3%	23 100.0%
Total		80 85.1%	12 12.8%	1 1.1%	1 1.1%	94 100.0%

Table 3.14 indicates that higher incomes were received in Wards 7 and 11, compared to Wards 1 and 2. Among other determining factors was the presence of active irrigation schemes in Wards 7 and 11.

Income expenditure for households was in the order given below:

Table 3.15: Expenditure Patterns

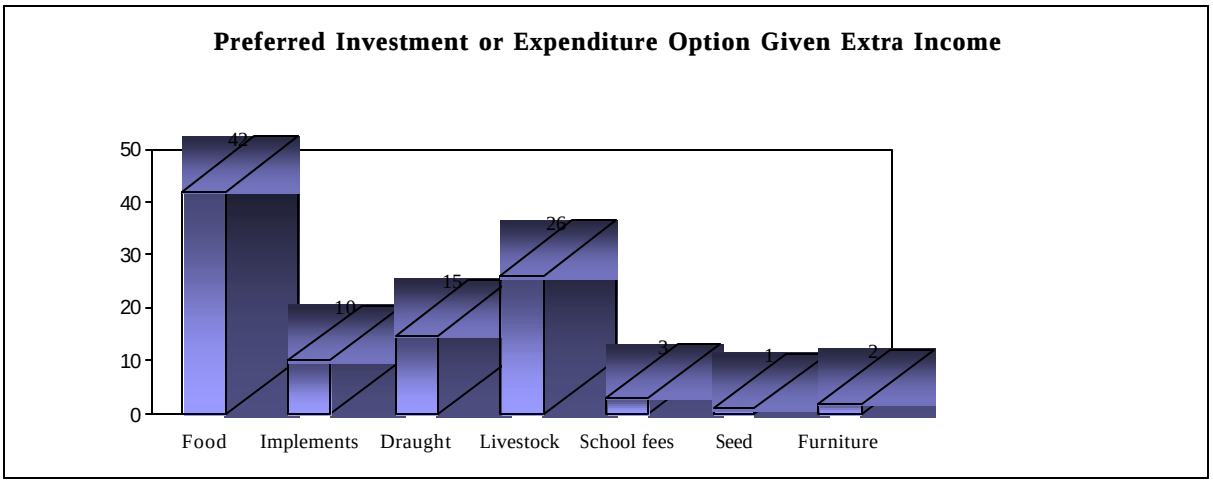
Expenditure Item	**Percentage of Income**
Food	94%
School fees	3%
Agricultural implements	2%
Agricultural inputs (seed, fertilizer, etc)	1%

Low crop harvests are stimulating increased expenditure of income on food to complement own production.

Preferred Expenditure with Higher Income

To identify the most important investment or expenditure option, as a proxy probabilistic marginal propensity to invest in increased adaptive capacity, respondents were asked what they would invest in given an extra cash injection.

41% of respondents would prefer using extra income to purchase food, while 26% of respondents indicated preference for purchasing of livestock, other than draught



power. Cattle then goats were the preferred livestock option. 15% of respondents would purchase draught power, 10% on farming implements and 3% would spend extra income on clothes.

Figure 3.8: Preferred Investment or Expenditure Option Given Extra Income

Preferred investment or expenditure option given a higher income is gender sensitive. Women tend to spend in food acquisition than men, which conforms to gender specific cultural roles of men and women, with the latter being more involved in ensuring household food availability.

Figure 3.9 indicates that households where women were responsible for decision making were more likely to invest extra income in draught power and other livestock compared to households where men made decisions. FGDs argued that women do most of the farming than men, and would invest in items that would make their roles in land preparation and water collection easier. Women were more likely to save seeds (especially legumes) and therefore purchase less than mean.

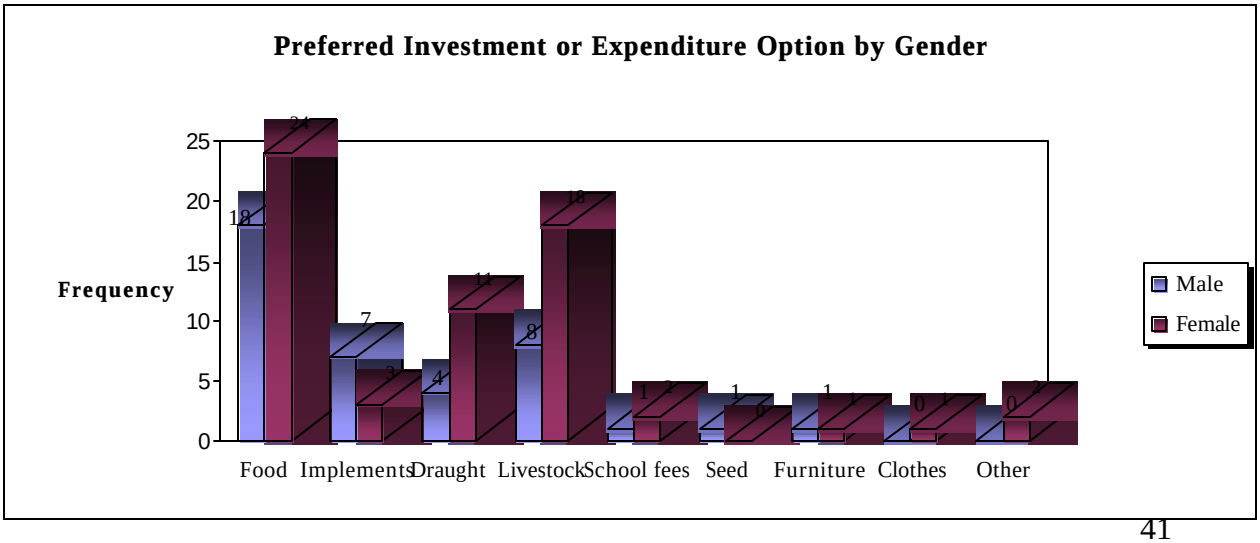


Figure 3.9: Preferred Investment/expenditure Option by Gender

Access to Credit

Access to credit provides an income smoothing effect, enhances opportunities for purchasing materials (e.g. appropriate seed) required to cope with or adapt to drought and other climate change impacts as well as an avenue for diversifying livelihoods from drought susceptible sources. Sources of credit and access to credit were variable across wards and income-production levels.

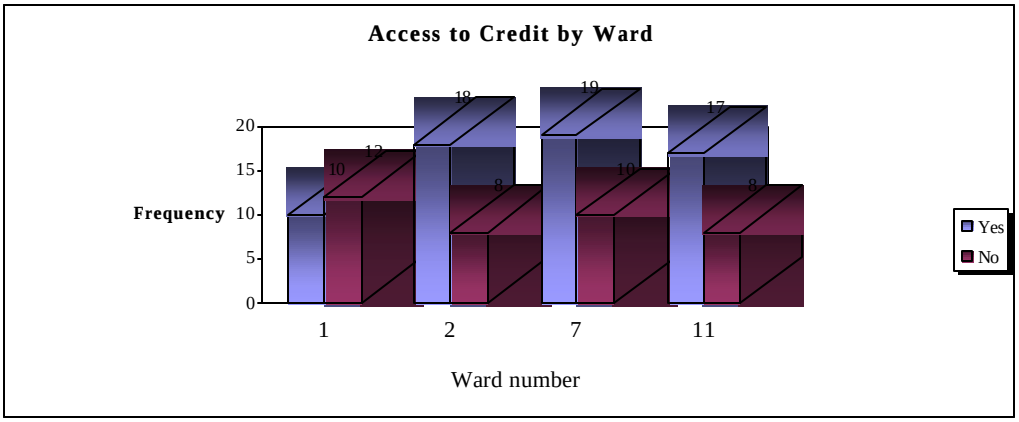


Figure 3.10: Access to Credit by Ward

Of the households which had access to credit, 61% sourced it from neighbours. Credit was often in kind (e.g. mealie meal) or relatively small amounts of cash to purchase mainly food or pay for transport. Government programme involved seed and fertiliser loans from the Grain Marketing Board, payable upon harvest. This credit line was mainly available for irrigation schemes. Agribank was the main financial institution providing credit to farmers.

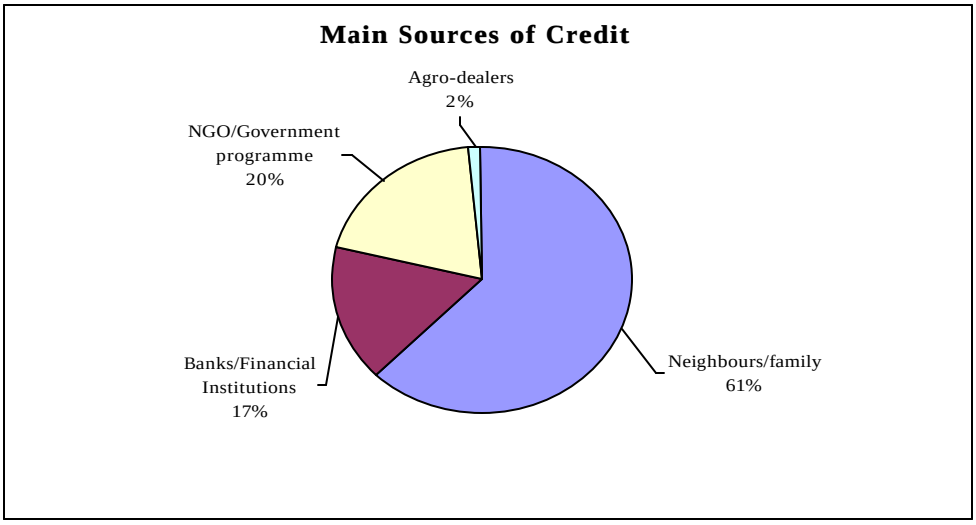


Figure 3.11: Main Source of Credit

The main reasons for obtaining credit were for purchasing of food (49%) and buying seed and fertilizer (36%). Other reasons for obtaining credit were for purchasing livestock medicine (4%); start up a small income generating project (4%), pay hospital bills (3%) and buy farming implements (1%).

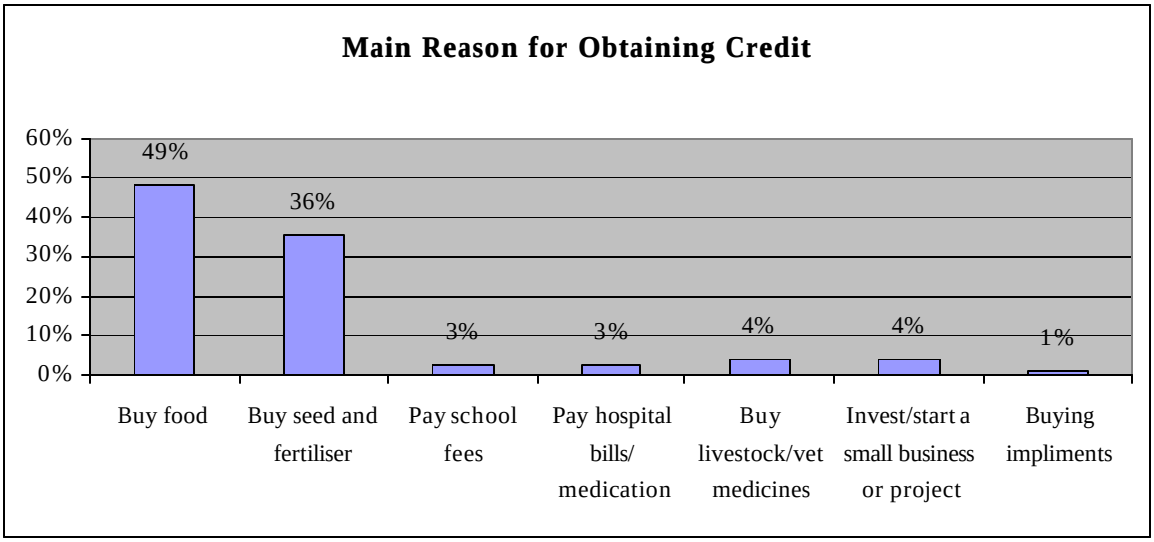


Figure 3.12: Main Reasons for Obtaining Credit

Livestock Ownership

Livestock ownership across all wards is skewed (Fig. 3.13). 47% of all households interviewed do not have at least one head of bovine (cattle) although the mean number of cattle per household unit is 1.6. 46% of households had no goats at all, 92% had no sheep, 42% did not own any form of poultry, while 92% did not own pigs.

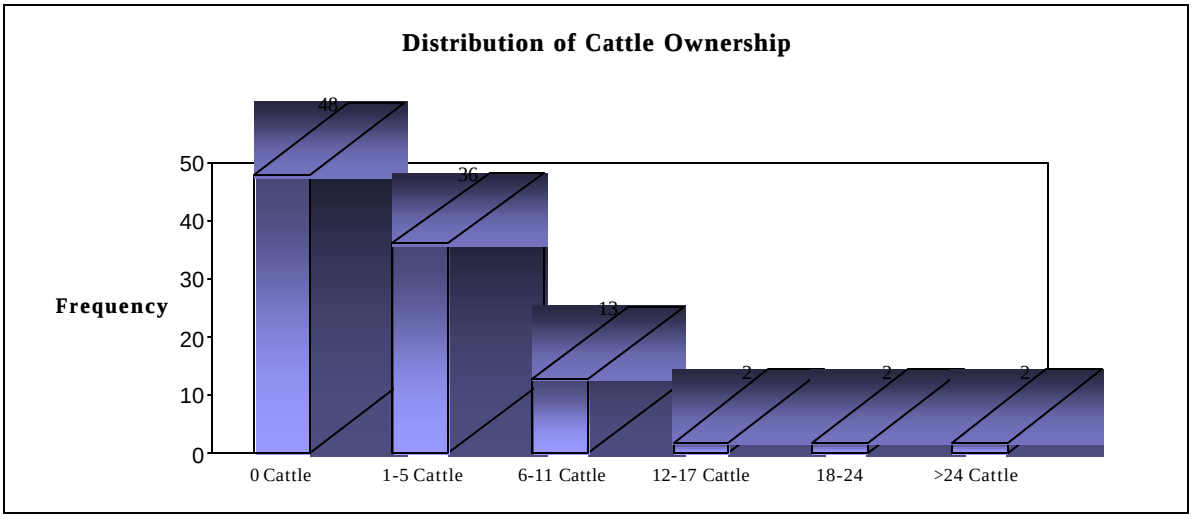


Figure 3.13: Household Cattle Ownership

Cattle ownership was related to gender of household head. 75% of female headed households did not even have a single bovine unit compared to 38%. 41% of male headed households had between 1 and 5 cattle compared to 17% for female headed households.

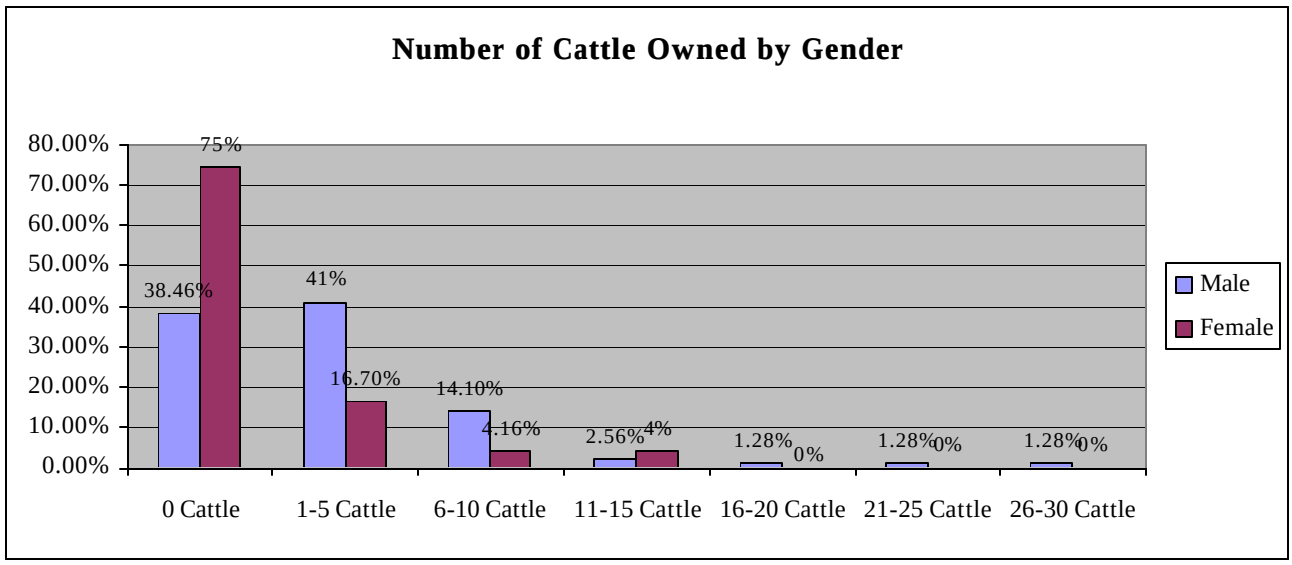


Figure 3.14: Number of Cattle Owned by Gender of Household Head

38.5% of male headed households did not own a single goat unit compared to 66.7% for female headed households, while 84.5% of male headed households did not have a single donkey unit versus 95.8% for female headed households.

Livestock Sales

There are currently no formal livestock fares being conducted in the area. Sale of livestock is predominantly informal, with reasons for sale varying with the class of livestock. Gender differences were reflected in the choice of livestock class sold given drought. Across both genders, cattle were the first choice for liquidation given intense drought. 47.5% of men and 30.6% of women surveyed selected cattle on the rationale that in the event of a drought, grain availability is compromised and selling a single beast would cover most of the food and income security gaps, compared to selling more units of smaller stock. Moreover, cattle were seen as more vulnerable to intense drought than goats and other smaller stock and their condition, and hence market value, tended to decline faster.

26% of respondents identified poultry as the first form of livestock they would dispose given intense drought. Demand for poultry is often high and options for liquidation,

e.g. exchange for grain, groceries, or cash, are wider. Donkeys were the last livestock to be sold (1%), a figure much lower than goats (24%), pigs (9%) or sheep (2%).

The determinants of choice of livestock to sell were:

1. Low replacement value (41%)
2. High market value (22%)
3. Most vulnerable to drought and disease (21%)
4. Not a source of draught power (14%)

These factors often operate in tandem, rather than independent of each other.

The main reasons for selling livestock were purchase of food (70%); payment of school fees (21%); transport and medicine for sick relative (6%) and purchase of seed and fertiliser (3%).

FGD participants concurred that intense food shortage tended to decrease the income (cash or grain) received per livestock unit bartered or sold. However, households with livestock were significantly more likely to have capacity to purchase food in a drought year.

3.4.3.2 Human Capital

Household Labour Availability and Land Utilisation

Female headed households own less land (2.72ha) compared to male headed households (4.26ha). Of the land owned, 57% of respondents used all of it in the 2007/8 season. The main reason for non-utilisation of all the land owned was lack of draught power (37.5%). The other important determinants of land use intensity were access to farming implements (32.5%) and lack of labour (20%). Poor rainfall season and dysfunctional irrigation system accounted for 7.5% and 2.5% for non-utilisation of owned land. Lower acreage and delayed planting in polygamous households resulted from the expectation of both spouses working on husband's field prior to own.

The household is the **main labour source** for 89% of households. Migration to South Africa is the main limiting factor to labour access. Food insecurity also limits labour availability as household members look for food during periods of high labour demand as ploughing and harvesting. 4% of households pool labour with neighbours and 7% depend on hired labour.

Low draught power access (43%) when coupled with low labour availability further constrain capacity to plant in time. Hiring labour was more common for households with access to irrigation. Payment for casual labour was often in-kind. The amount of maize paid per day worked decreased with intensity of household food insecurity. In October, up to two days' work may be equivalent to one bucket of maize compared to a single bucket for a day's work in June. The amount paid also depended on task given.
Although pooling of labour is common across all wards, draught power pooling is even more common given low draught power ownership.

Institutional Support

Each ward has at least an Agritex extension officer who provides technical advice to farmers. Extension officers have backgrounds in agronomy, livestock production, or both, but further training could be required in specific interventions.

None of the extension officers interviewed has been previously trained on issues relating to communicating climate forecasts, collecting weather data or on conducting monitoring of projects. However, extension officers in the four wards sampled had moderate to high level of awareness on environmental issues.

Engaging Agritex staff in monitoring interventions would require considerations for transport and staff retention for continuity.

Community Organization

Organisation at community level is through Village Development Committees (VIDCO) upscaling to Ward Development Committees (WADCO). These are the primary entry points, with village heads and councillors being the principals.

In irrigation schemes, management committees have been established to provide organisational and operational oversight and decision making on affairs relating to these schemes e.g. procurement of diesel for the pump engine, repairs of equipment and irrigation scheduling. Training for transformation has not been provided for both VIDCO and WADCO. There is scope for training in such key areas as weather forecast use and irrigation scheduling.

Membership to Social Groups

Membership to community social groups provides social protection mechanisms essential in cushioning households against various shocks. Important social groups are

the Church (52.9%); garden groups (19.6%); home based care (7.8%); and group saving/lending scheme (5%). Women dominated social groups. Garden groups had 65% women membership. The main benefits of membership to social groupings were cited as psychological support (64%), income support (13%) and food (22%).

3.4.3.3 Physical Capital

Productive Asset Ownership

In FGDs, ***access to draught*** power emerged as a proxy for household adaptive capacity. The rainfall regime is highly variable such that those with draught power are better resourced to respond to the rainfall pattern by land tillage. Resource poor farmers tended to delay planting as they awaited their turn to access draught power, in exchange of labour or cash, from their richer neighbours.

57% of households interviewed do not own any livestock for draught power. For the households with draught power livestock ownership, 91% had cattle while the remainder 9% was split equally between households with donkeys and those using both donkeys and cattle for traction.

Quality of draught power tended to decline as the dry season progressed and both pastures and water supply became poorer such that at land preparation most livestock would not be in good form to provide draft power.

To boost vigour and enhance draught power productivity, animals are fed on a local bulbous plant called *Zhombe*. The plant is dug out, diced into pieces and dried before being fed on animals. This plant may be very toxic if eaten by other animals or human beings. When consumed, animal gains vigour, is de-wormed, attains higher strength, and is more effective for farm operations. Farmers also believe that this plant also controls ticks and boosts milk production.

64% of households with no draught power relied on neighbours and relatives, 27% depended on hand ploughing. Social associations and the Government through the farm mechanisation programme benefited 5% and 4%, respectively, with the latter being more important in irrigation schemes where tractors were made available.

Hand tillage was constrained by hardness of soil and lack of adequate labour, often translating to delayed land preparation.

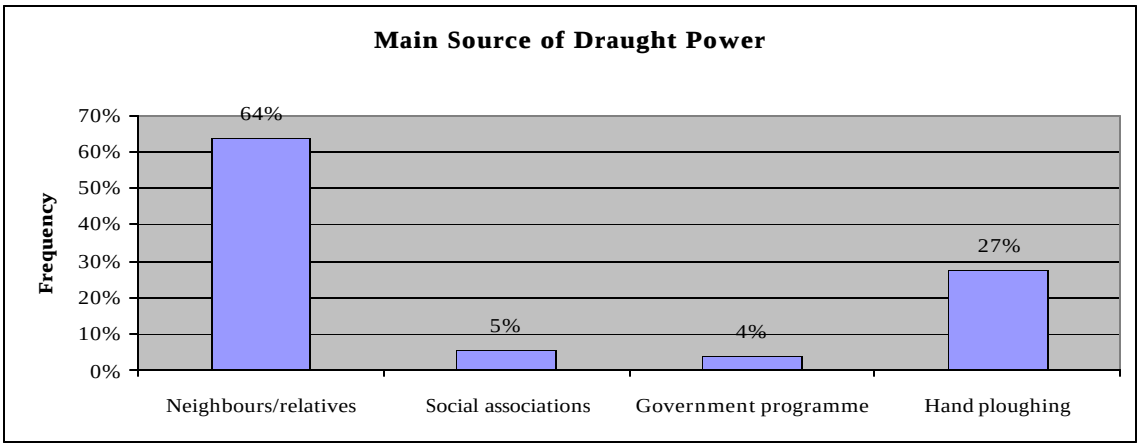


Figure 3.15: Main Sources of Draught Power

FGDs identified capacity to plough with first effective rains as a proxy for climate change adaptive capacity. 60% of households were affirmative that they could prepare land in time for planting given a rainfall event.

Farmers tended to be less willing to till land without confirmation of seed availability.

Table 3.16 indicates that households with higher draught livestock ownership had higher levels of preparedness to plant given climate forecast information.

Table 3.16: Preparedness for Land Preparation and Access to Draught Power

		If adequate rains were to be received tomorrow would you be able to organise and plough your field in time to catch the first rains?		Total
		Yes	No	
Do you own livestock for draught power?	Yes	38 88.4%	5 11.6%	43 100.0%
	No	24 40.7%	35 59.3%	59 100.0%
Total		62 60.8%	40 39.2%	102 100.0%

Ownership of farming implements determines capacity for timely execution of field operations. 46% of households had ploughs; 98% owned hand hoes, and 11% had cultivators. Only 27% of households owned scotch carts.

Access to Water, Quality and Reliability

Boreholes are the main source of water (46.1%) for household use and animal drinking. This is higher than the national average of 38% (DHS Report, 2007). Maintenance of boreholes is poor due to absence of water point committees or lack of funds for maintenance. For example, of the 20 boreholes in ward 7 only 2 are functional. This increases dependence on other alternative sources like rivers (20.6%) or increases the distance to collect water.

Table 3.17: Main Source of Potable Water

		What is your main source of potable water?				Total
		Borehole	Protected well	Unprotected well	River	
Ward number	1	9 40.9%	3 13.6%	0 .0%	10 45.5%	22 100.0%
	2	25 96.2%	0 .0%	0 .0%	1 3.8%	26 100.0%
	7	10 34.5%	5 17.2%	4 13.8%	10 34.5%	29 100.0%
	11	3 12.0%	15 60.0%	7 28.0%	0 .0%	25 100.0%
Total		47 46.1%	23 22.5%	11 10.8%	21 20.6%	102 100.0%

94% of all households are within 2 kilometres from the main water source. The target communities are bordered by large river systems and underground water is available, though exploitation is low. As drought stress intensifies, the distance to access water increases for both livestock and people.

Table 3.18: Distance of Water Source from Household

		How far is this source from your homestead?				Total
		Within homestead	Less than 100m	Less than 2km	More than 5km	
Ward number	1	2 9.1%	4 18.2%	14 63.6%	2 9.1%	22 100.0%
	2	0 .0%	4 15.4%	20 76.9%	2 7.7%	26 100.0%
	7	2 6.9%	8 27.6%	17 58.6%	2 6.9%	29 100.0%
	11	9 36.0%	10 40.0%	6 24.0%	0 .0%	25 100.0%
Total		12 11.8%	26 25.5%	57 55.9%	6 5.9%	102 100.0%

Water collection is done mainly by women and girls, with the latter being more important after school or over school holidays.

However, the water table is receding in some areas, and seasonal water shortages are experienced particularly in September and October. This time also coincides with peak water shortages for livestock drinking. Perceptions on reliability of water sources are given on the Table 3.19.

Table 3.19: Reliability of Source of Household Potable Water

		How reliable is this water source for household use throughout the year?		Total
		Never dries up	Dries up sometimes	
What is your main source of portable water?	Borehole	38 80.9%	9 19.1%	47 100.0%
	Protected well	18 78.3%	5 21.7%	23 100.0%
	Unprotected well	8 72.7%	3 27.3%	11 100.0%
	River	18 85.7%	3 14.3%	21 100.0%
Total		82 80.4%	20 19.6%	102 100.0%

Poor water quality was cited in Ward 1 where rivers form the main source of water (45.5%). Diarrhoea incidence is high throughout the year with higher incidence around October when other alternative water sources dry up. The majority of households are currently not treating water from most sources. Underground water in Chiredzi is hard or salty

Access to, and quality of water is a big challenge in Mutapurwa village of Ward 2. Villagers rely on Save River, which is within 3 kilometers from their households, but this water is very dirty and collection is risky. The woman on the foreground had her leg bitten off by a crocodile as she tried to collect water from Save. Although there is a borehole at school, the borehole is at least 6 kilometers from the furthest household. Men do not collect the water; it's only the women and girls who do that task. If a man is seen collecting water, he is viewed socially as "dominated" by his spouse. With a borehole drilled within the village, the burden of drought for both livestock and people would be lessened.

Priority needs identified are rehabilitation of boreholes and drilling of new ones.

Rainwater harvesting complemented existing water sources for 61% of households. Use is mainly restricted to washing dishes and clothes and is not considered seriously as an important water source.

Access to toilets is very low especially in Wards 1 and 2 where the bush system is very common. In Ward 2 less than 40% of households own a latrine.

Irrigation Infrastructure

Chiredzi is predominantly irrigation based, with small to large schemes supporting sugar cane, cereal and market crops. Irrigation plots average 0.25hectares/household. Flood and sprinkler irrigation are the common methods.

Table 3.20. shows the main irrigation schemes in Chiredzi District

Table 3.20: Major Smallholder Irrigation Schemes in Chiredzi District

Major smallholder irrigation schemes in Chiredzi District (Source: Irrigation Department and Agritex)				
Scheme	Size (ha)	Number of Households	Technology used	Current Status
Manjinji	52	150	Boreholes and surface irrigation	Three out of five pump sets are working
Malikango	50	180	Pumping from Mwenezi River to high point and then surface irrigation	50% operational due to inadequate pumping capacity
Rupangwana	150	61	Pumping from Save river to high point and then surface irrigation	Old scheme of 7.5 hectares had canals reconstructed and extended to 12 hectares and is now operational. Works underway involving Government and communities to extend the existing scheme to 150 hectares.
St Joseph	100	78	Pumping from Save river to high point and then surface irrigation	The existing scheme of 14 hectares is not functional as canals have been broken and pump station washed away by 2002 cyclone. Project has received some funding in 2006 budget to rehabilitate the 14 hectare project and extend it to 100 ha.
Tshovani	300	120	Pumping from Save river to high point and then surface irrigation	Operating far below capacity as the existing pumps are too old to the extend that they now require replacements

The potential for expanding area under smallholder irrigation and deriving increased benefit of growing a wide variety of crops is high, given the availability of water.

South Africa and Mozambique offer a potential market, facilitated by a fair road network and railway line.

The planned Runde-Tende Dam has a potential capacity to irrigate 10000 ha. According to the Lowveld Development Strategy (2005), the potential for irrigation based on Tokwe-Murkosi Dam is in excess of 25000 ha distributed as given on Table 3.21.

Table 3.21: Potential irrigable land from Tokwe -Mukorsi Dam

Hippo Valley Estates	6 700 ha
Triangle (Mutirikwi Sugar Company)	5 800 ha
Magudu Ranch	800 ha
Nuanetsi Ranch	7 200 ha
Matibi (Communal Lands)	4 500 ha
Total	**25000 ha**

Key challenges limiting productivity of smallholder irrigation schemes are:

- Lack of fencing material due to failure to raise adequate money to purchase or theft.
- Irrigation equipment was damaged by Cyclone Eline floods in 2000 and these schemes have not been rehabilitated since then.
- Engines are either not functional, or work is disrupted by power cuts. Power surge has led to permanent damage of some engines.
- Limited technical capacity combined with poor design of some schemes has led to ineffective irrigation scheduling.
- Poor planning of siting may lead to salinisation in some parts.
- Diesel availability for pumps is erratic thus disrupting operations.

The case study below summarises typical smallholder irrigation scheme set-up.

Joyce Mujuru Irrigation Scheme in Ward 7

The Joyce Mujuru Irrigation Scheme was established in 2005. It comprises of 28 households, each with a hectare of land on which maize and wheat, the main crops in this scheme, are grown in rotation.

Although the potential yield for wheat exceeds 3 tonnes per hectare, given good seed and fertilizer, this year (2008), an average of 200kg per hectare was harvested. The main limiting factor has been the constant break down of the engine. On a number of occasions, the engine has burnt down due to power surge. Members of the scheme thus end up contributing money for repairs, which becomes very expensive since charges are payable in foreign currency. On some instances, some households have had to sell their livestock to contribute the maintenance fees. More over, power cuts have meant that scheduling of irrigation has been disrupted severely, sometimes members have to wake up at 2a.m. to irrigate. Moisture stress has been significant at key growth stages, hence falling yields.

The canals are old and not optimally designed to facilitate water movement, thus starving the crop of water in some instances. The scheme has yet to fundraise to buy cement for building proper canals.

Boreholes in the area are broken down and some households depend on water sourced from a nearby river. The main challenge with maintenance of boreholes is the high cost, given that spares have to be imported.

Households pool labour for on-farm work and frequently additional labour is hired from outside the scheme with payment made in kind (mostly grain). The scheme also receives advice from an extension officer, but climate forecast information is not often the key subject.

The soils in the scheme are black, deep and heavy. Fertiliser use, on Government support, is significant. Both Compound D and Ammonium Nitrate at rates of between 150-200kg/ha are used.

The scheme is managed by a committee. Members of the scheme also own additional plots outside the irrigation scheme. These are under dryland farming.

Based on interview with Mr. Edison Chauke, Chairman for Joyce Mujuru Irrigation Scheme.

Other Infrastructure

Road infrastructure is poorly developed thus raising transport costs and reducing access to major markets. Most produce from irrigation plots is often sold far below market value at the farm gate as a consequence. Small grocery shops have closed down due to the poor road networks and high transport costs.

Flooding along major river systems locks off communities from the rest of Chiredzi. Wards 1 and 2, bordered by Mkwasine and Save Rivers, would prevent access to schools, health care, food from markets and other services late in the rainy season.

Changing rainfall regime predicted is likely to increase incidence of flush floods. Investment in infrastructural development would promote effective adaptation to drought and climate change.

Most ***granaries*** have not been used in the last few years due to low yields harvested as a result of, among other factors, drought. As such, the state of granaries is generally not ideal for post-harvest storage of grain, given low usage of chemicals for post-harvest pest management.

3.4.3.4 Natural Capital

Natural Resources

Deforestation is occurring at an estimated rate of about 1.6% per annum (Forestry Commission) and Chiredzi's natural resource base and ecological environment is deteriorating[1] . Water resources depletion, siltation, soil erosion, and destruction of protective vegetative strips alongside water bodies, poor on-farm soil and water management practices, and prolonged periods of below-average rainfall, frequent and severe droughts are key challenges. Cultivated area has increased from 11% in 1992 to 26% in 2003 (Agritex).

Soil classification is Aridic indicating that the soils cannot maintain adequate moisture retained from rainfall to sustain crop production other than for drought tolerant crops like sorghum and pearl millet. Moisture conservation emerges as an important drought mitigation intervention. Conservation farming and tied ridges are being used by farmers.

Natural vegetation for Chiredzi is *Colophospermum mopane* open tree savannah much of which still exists with scattered belts of acacia in the lower Runde Valley and woodland savannah in the Save-Runde controlled hunting area. Mopane is associated with deep, well-drained alluvium soils. Woody vegetation survives better for longer periods than non-woody vegetation and often yields more biomass with a higher nutritional value, at the critical dry times of the year thereby supporting livestock production. Mopane worms *(macimbi)* thrive in the area with two peaks in November-December and April-May. The natural vegetation of the area is well adapted to the low rainfall conditions. The grass cover is predominantly annual, low in succession and giving sparse ground cover. There has been widespread denudation

[1] State of the Environment Report 1998.

of indigenous woodland and many areas now suffer a shortage of timber for fuel, building, fencing, medicinal purposes and fruit.

Forests and Wildlife Management

The South East Lowveld covers an area of approximately 50000km^2. Communal lands cover 22 161km^2, followed by commercial farm land (5575k m^2. Wildlife as a land use covers 17500 km^2 (35%).

The Communal Area Management Programme for Indigenous Resources (CAMPFIRE) has contributed to livelihoods through safari hunting leases and sale of trophy animals in communal lands. The decline in tourism receipts after 2000 has had negative impacts on wildlife based incomes. Key challenges arise from policy conflict between rural development options involving agropastoralists and wildlife based tourism opportunities. The impending Great Limpopo Trans-frontier National Park which would cover large areas of the Gonarezhou National Park complicates the potential benefits of wildlife management. In spite of perceived benefits, animal diseases like foot and mouth disease (FMD) carried by the buffalo, and *Trypsomiasis* transmitted by the tsetse fly to which many wild ungulates are generally resistant while livestock are often susceptible, are a concern to farmers. In addition, lions and leopards prey on livestock, while elephants raid fields and gardens.

In terms of financial feasibility of wildlife ranching in the South East Lowveld (Bond 1993, Child 1988, du Toit, 1992, Jansen *et al*, 1992, Kreuter and Workman, 1997, Price Waterhouse, 1994) and spreadsheets analyses of the influence of farm size and rainfall on gross returns from safari hunting indicate that gross returns from wildlife based enterprises are likely to be in the region of US$6-8per ha. This translates to a return of 10kg of maize meal per hectare or enough to support three to four people /km^{2}year or supporting one household of six people on 200ha . For financial viability incomes would have to be four to five times higher for it to be considered. Moreover, there are social and cultural implications of attempting to switch from an agro-pastoral to wildlife based economy.

3.4.4 Use of Climate Forecast Information

About 31.7% of farmers used climate forecast information in the 2007/8 farming season compared to 35% in the 2005/6 season. Use of climate forecast information varied with gender of farm decision maker, being highest in household where males made farming decisions (43% in 2006/7; 41% in 2007/8) versus 34% and 27% for the same timeframe for households where women made farming decisions (Fig. 3.16).

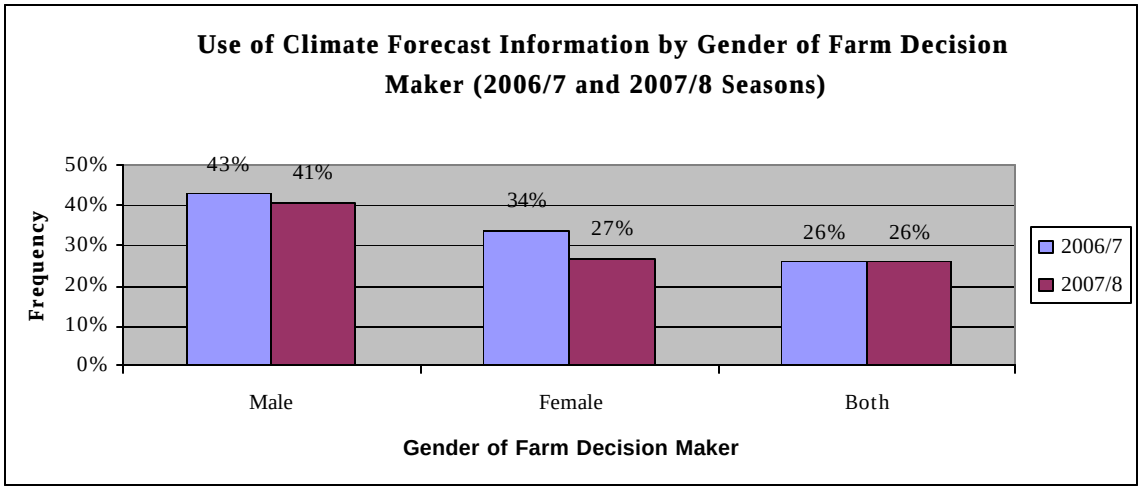


Figure 3.16: Use of Climate Forecast by Gender of Farm Decision Maker

3.4.4.1 Main Reasons for Non Utilisation of Climate Forecast Information

- Lack of access to climate forecast information (76%)
- Information inadequate to inform decision making (6%)
- Climate forecast information was received late and could not be used (3%)
- Poor previous history of use of climate forecast information (15%)

High climate variability over short distances (e.g. withi n wards) reduced utility value of forecast information especially where provided at District level.

3.4.4.2 Main sources of Climate Forecast Information

The radio was the main source (73%) of climate forecast information in the 2007/8 season. For households where the radio was the main source of climate forecast information, the highest proportion (76%) had males as main decision makers. Women, however, were more likely to share the information with their neighbours than men.

8% of farmers received climate forecast information from the local Agritex Officer. The farmer: extension worker ratio is very poor (1 extension officer per 2000 households) hence limited coverage given mobility constraints. 16% of farmers who used the climate forecast information had received it from neighbours, while 3% sourced it from newspapers.

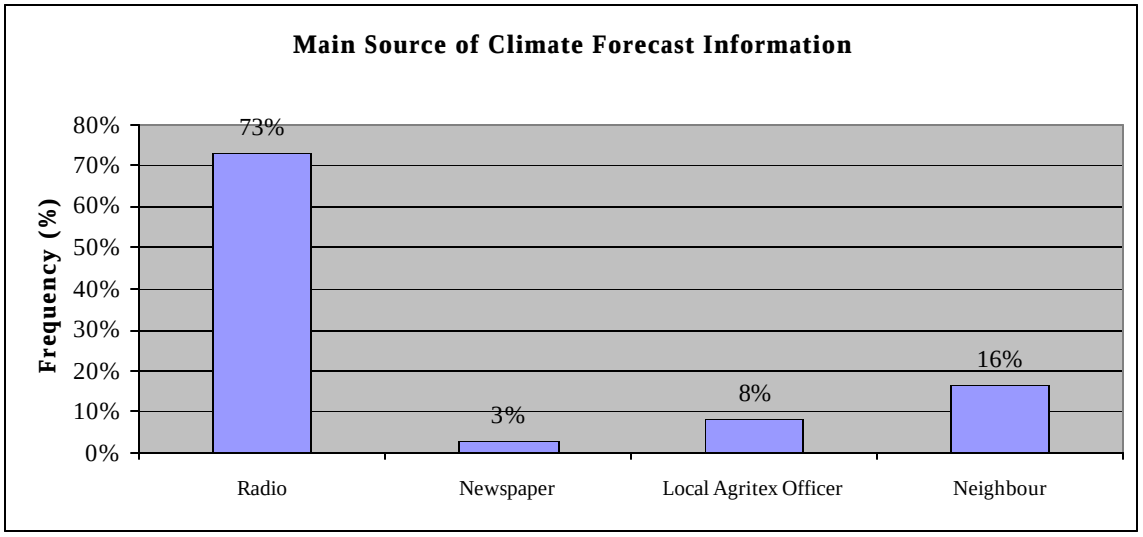


Figure 3.17: Main Sources of Climate Forecast Information

28% of households own either a radio. Low climate forecast information may thus also be explained by limited radio access, given that most of the farmers who used the forecast had received it from the radio. Alternative communication media could be a strategic entry point to forecast information sharing in future.

Table 3.22 shows proportion of farmers with ownership of radio.

Table 3.22: Ownership of Radio

Do you own a radio?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	28	27.5	27.5	27.5
	No	74	72.5	72.5	100.0
	Total	102	100.0	100.0	

3.4.4.3 Preferred Source of Climate Forecast Information

The most preferred source of climate forecast information was the local Agritex extension officer (60%). Respondents felt that the local Agritex officer, by being

resident and also farming in their wards better understood the local context of agriculture and would tailor make the forecast information to make it relevant to local farmers. Interviews with local extension officers indicated that they were currently not receiving any official forecast information, but would generally make blanket recommendations in promotion of short season varieties, drought tolerant crops, early planting and dry planting to mitigate against irregular rainfall regime, based on knowledge of area.

Table 3.23: Demand for and Preferred Source of Climate Forecast Information

		How would you like to receive this information?				
		Local Agritex officer	Radio/ TV	newspaper/bulletin	village head/chief	Total
Would you like to receive weather and climate forecast information?	Yes	60	33	1	5	99
	No	0	0	0	0	3
Total		60	33	1	5	102

3.4.4.4 Desired Climate Forecast Information

Respondents identified as most preferred (46%) information on the rainfall regime (**onset, amount and seasonal distribution**). Choice of crop and variety to use on given season was mentioned in 31.4% of survey cases. Climate information was more important for crop than livestock production as respondents ranked crops as more vulnerable and with a higher drought impact index than livestock. 15% of the sample analysed indicated requirement for climate forecast information to assist decision making in the livestock component of the predominantly mixed farming systems of Chiredzi. Although drought was acknowledged as a significant limitation to farming in the project site, respondents concurred that even in years of erratic rainfall there was usually adequate rainfall for livestock drinking. In seasons of very low rainfall amounts, livestock herders tended to travel longer distances for water and pastures.

For farmers who used climate forecasts in the 2007/8 season, 77% mentioned that they found the climate forecast information useful for their farm decision making. However, this was in contrast with focus group discussion findings which indicated a

general discontent on the quality and packaging of climate forecast information received in the past.

3.4.4.5 Use of Traditional Indigenous Weather and Climate Prediction Practices

47% of farmers used or made reference to traditional knowledge systems for climate prediction in the past two seasons. The custodians of this knowledge are the elderly, traditional healers, prophets and herbalists who interact with forests in their trade.

Common Traditional Indicators for Climate Forecasting

1. **Plant Based Indicators**

The use of plants in predicting seasonal rainfall is based on the understanding that plants' physiological processes are driven by meteorological variables, thus flowering, leaf shedding or fruiting.

2. **Animal Based Indicators**

It is believed that animal behaviour may be shaped by climatic factors. Thus certain animal behavioural patterns may be useful in predicting weather and climate patterns.

Table 3.24 summarises the key indicators for climate forecasting used in Chiredzi District:

Table 3.24: Plant and Animal Based Indicators for Chiredzi

Plant based indicators
• Abundance of Mopane pods than leaves indicates good rainfall season.
• Appearance of first green leaves on Mopane is a sign of planting season start.
• Presence of sweet sugary deposits on Mopane leaves indicates high rainfall expected.
• Abundance of wild fruit (*Makwakwa, Svosvote,* and other fruit like mangoes (*Mangifera indica*) symbolizes a poor season.
• Sprouting and flowering of such tree species as Tsangilanguva, Mvere, Mhuji and Mundzinde, indicates season onset.
• Good fruiting of Amarula (*Sclerocarya birrea*) is a sign for good rainfall season.
The closing of spiders' nests indicates the onset of the rainy season.

Animal based indicators

- Higher proportion of boys than girls born in a year indicates poor rainfall season.
- High caterpillar population indicates a good rainfall season.
- Cries and singing of certain birds communicate season status. When the *Haya* bird cries more frequently especially in the morning, then rains are near and people should make ready draught power and seed.
- The sound of the *Dendera* bird singing in the morning often culminates in rain cloud development and eventual rains in the later day.
- The *Nhengure* bird has a cry that mimics the words "wake up and go to the fields". When this sound is heard, farmers know its time to start tilling the landing preparation for the planting season.
- The presence of the *Zvikovera* birds on the fields indicates that the rains are going to be good and a good crop will be harvested.
- The appearance of larger birds often signified an impending drought.
- An eagle flying high and giving a crying sound is an indication that the rains are about to come.
- Initial emergence of flying ants *Ishwa* corresponds with the start of the rainy season.
- The absence of frogs and toads indicates a dry season.
- Black ants and termites carrying food indicate a heavy rainfall or drought, depending on community.

Other Traditional Indicators

- Excessively high temperatures around the normal expected dates for onset of rainfall season often indicate high likelihood of a rainfall event.
- When a ring forms around the moon at night, it symbolises a good rainfall season ahead. When this is not observed often a dry season is experienced. This ring is called "*dziva remvura*".
- The movement of winds gives indication of likelihood of rainfall events. When a certain consistent wind direction is achieved, chances are higher. On the contrary, when the prevailing wind direction is not clear, then likelihood is lower or delayed.

3.4.4.6 Challenges to Use of Indigenous Weather and Climate Forecasting Systems

1. Weak knowledge transfer or documentation across generations.
2. High urbanisation rates and high death rate among youths reduce opportunities for learning and transfer of these indigenous knowledge systems.
3. Key plant species have disappeared due to deforestatation.
4. Community trust on the functionality of complimentary activities like rainmaking has declined over generation.
5. Higher literacy and education levels, religion and increased knowledge of science coupled with failure of rainmaking ceremonies to generate rain required for agricultural use conversely reduces trust and use of other traditional tools as climate prediction based on indigenous indicators.
6. There is no organised system for collecting, discussing and sharing climate forecast information based on indigenous knowledge.
7. The elderly, who are the main custodians of indigenous knowledge, play a very minimalist role in the households where they are resident. Moreover, traditional story-telling has been replaced by the radio and television and as such opportunities for knowledge transfer have been reduced significantly. Traditionally, the elderly played a role in predicting impending calamities and sounded horns and drums to disseminate early warnings for managing disasters.

3.4.4.7 Response Capacity Given Forecast Information

Capacity to adapt farming systems given climate forecast information was related to wealth distribution. For most of the poor households interviewed, even with detailed climate forecast information they were unable to implement recommendations provided.

Factors reducing adaptive capacity given climate forecast information identified were:

- Non availability of recommended inputs (e.g. short season seed, drought tolerant crop seed) on the market. Where available, farmers had a low purchasing power.
- Seed acquired through Government and NGO programmes is often delayed, although it constitutes a high proportion of total planted seed. Seed provided through these programmes is often not the most suited for the area and no information is provided on variety performance (season length, drought hardiness, etc).
- Lack of adequate labour and traction delays farm operations for resource poor and vulnerable households. Vulnerable household receive seed and traction (in

exchange for labour) late into the season, and are thus more likely to miss the first effective planting rains.

For the 2008/9 season, 60.8% of farmers were affirmative on their capacity to mobilise traction for land preparation in time to ensure they would plant with the first effective rains.

Table 3.25: Preparedness for Land Preparation with first Rains

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	62	60.8	60.8	60.8
	No	40	39.2	39.2	100.0
	Total	102	100.0	100.0	

Farmers in FGDs indicated that there is increased difficulty in determining whether the season had in fact started or the initial rains would be a false start. Timeliness of operations at this point tended to determine yield potential for farmer.

3.4.4.8 Perceptions of Climate Patterns

Perceptions of change in rainfall and temperature varied with age of respondent (Table 3.26).

The main perceived changes in rainfall patterns were delayed onset of the rains (48%); increased length and intensity of the mid-season dry spell (21%) and early season cessation (15%). Farmers observed that the late season onset and early cessation translated in a shortening of the growing season with implications on availability of appropriate seed varieties to fit into the season.

Table 3.26: Perceptions on Climate Change by Age of Respondent

		Do you think the climate in your area has changed?		Total
		Yes	No	
Age of respondent	Below 21 years	4 50.0%	4 50.0%	8 100.0%
	22-35 years	25 75.8%	8 24.2%	33 100.0%
	36-49 years	27 87.1%	4 12.9%	31 100.0%
	50 years and above	25 89.3%	3 10.7%	28 100.0%
Total		81 81.0%	19 19.0%	100 100.0%

2% of respondents identified an unclear start to the season as the main climatic change observed. Moreover, variability in rainfall amount received over short distances has increased significantly in the past few years. This means that crop and livestock productivity levels would tend to vary widely even within wards. A drought hotspot within a ward may be masked by high productive capacity in other neighbouring villages.

Respondents showed awareness of the drought cycle in area. Major droughts are expected in 10 year cycles, but each decade is likely to have between 1 and 3 droughts. 1982, 1992 and 2002 were viewed as the driest years in the past three decades. In focus group discussions, 1992 was identified as the worst drought ever experienced. There was a tendency to confuse food shortage due to low production as a consequence of exogenous factors (seed, fertiliser and draught power) with drought.

The good season cycle may be expected every 5-6 years, and up to 7 for some areas. Unlike with drought, the pattern was not very clear for the project site. The year 2000 was identified as the best season. Other good seasons identified included 1980, 1986, 1990/1, 1996/7, 1999/2000 and 2005/6 seasons.

In terms of temperature, FGD respondents argued that there was no significant change in temperature. On the contrary, 65% of respondents felt that the area was now much warmer.

Table 3.27: Major Perceived Changes in Temperature

Major perceived change in temperature					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Warmer	66	64.7	65.3	65.3
	Cooler	12	11.8	11.9	77.2
	No change	8	7.8	7.9	85.1
	N/A	15	14.7	14.9	100.0
	Total	101	99.0	100.0	
Missing	System	1	1.0		
Total		102	100.0		

3.4.4.9 Attitudes

Attitudes towards drought are diverse within the target communities. Some farmers identified drought as a permanent feature of the local climatic regime, and *one they had little control over*. Social protection mechanisms, particularly *food assistance*

programmes to supplement own cereal production, were viewed as feasible interventions to mitigate the impacts of drought by this group. However, some respondents opted for *strengthening of drought coping mechanisms* through expansion of area under irrigation, improvement in accessibility of appropriate seed; protection of seed through seed saving, livelihood diversification and reliable climate forecast information availability.

Farmers perceived forecast information as having greater value in years of high predicted and actual rainfall than in drought years. Forecast information was less likely to have utility value in rangeland management; farmers indicated that even on a predicted drought year willingness to de-stock was low even though destocking would improve pasture availability for livestock. As such, climate forecasts followed by recommendations to sell livestock would not be considered by farmers.

There is a strong sense of unreliability of scientific forecasts based on previous history. Respondents felt that the frequency of correct forecasts was very low, thus reducing the economic gains of using such information. Moreover, forecasts generated for broad geographic locations were seen as having limited use to farmers due to wide variations between and within districts.

3.4.4.10 Practices for Adaptation to Drought

For **crop production**, a number of practices in response unreliable rainfall and frequent droughts have been developed and practiced by farmers at the project site. The most common drought coping strategies are listed:

- Early planting
- Dry planting
- Staggering planting
- Drought tolerant crops like sorghum and millets
- Use of wetland to extend growing season length
- Livelihood diversification into non agricultural activities
- Non use of fertilizer
- Conservation farming
- Early ploughing for moisture conservation
- Drip irrigation
- Supplementary livestock feeding

The practices listed are often used in combination and their effectiveness in ensuring agricultural productivity is variable depending on household specific variables like livelihood asset ownership.
Farmers interviewed indicated that with or without climate forecast information they were most likely to use short season varieties of common crops like maize. This practice as a risk mitigation measure translates to a high opportunity cost when season length is long and could support long season varieties which could offer higher yields.

For **livestock production** the following strategies are practised:

- Harvesting crop residues (stover) and keeping it for the dry season.
- Collecting water for livestock drinking
- Feeding cattle and goats on *Zhombe* and *Mopane* leaves
- Cane tops and molasses have been used, especially during the 1991/2 drought

Farmers were less willing to de-stock even under drought, thus exacerbating the magnitude of the drought impact. Supplementary feeding or improvement of stover quality is currently not being practiced.

3.4.5 Strategies for Coping with Food Insecurity

A number of strategies for coping with food shortage were identified. The reliability of the data is moderate to low, given the expectation of food assistance by some of the respondents interviewed. Exchange of labour for food was the predominant coping strategy (31%). Other important coping strategies included begging from friends and relatives (29%); reduced number and quantity of meals (14%); depending on food aid (14%); barter trade (mainly exchange of firewood for grain) (9%) and sale of livestock to purchase food (1%).

Further description on these copping strategies are given on Table 3.28 overleaf.

Table 3.28: Table 3.28: Food Shortage Coping Strategies

Reduced food consumption	The number and size of meals has been reduced in most households. Depending on the severity of food insecurity, in some households only a single meal is consumed per day, while in others only children can eat everyday while the elder household members may eat once in two to three days. Wards and within them households with irrigation access tended to have a much shorter lean season than their counterparts relying totally on rain fed farming.
Exchange labour for food	Labour exchange for food was common across all wards. In Ward 7 farmers under irrigation provide work for external communities and pay with grain. Some of the labour is from as far as Zaka district. Depending on the tasks, a labourer may earn up to a bucket of maize for a day's work. In other wards, cotton field clearing, although seasonal, is an important labour for food opportunity. Other chores done in exchange for food are building homes, flooring and constructing kraals (Ward 11).
Exchange livestock for grain	Livestock provide an extra income to purchase food from local markets. Initially household dispose chickens (about R40 or 1 bucket of sorghum grain), and move up to larger stock. A large goat is exchanged for 3 bags of maize. In Ward 11 a beast may be exchanged for up to 6 bags of maize (300kg). In Ward 2 where food insecurity was more intense, a cow was exchanged for 3 ½ bags of maize.
Exchange firewood for grain	In Ward 2 communities are exchanging firewood for grain with neighbouring settlements. 3 carts may be exchanged for a single 20kg bucket of maize grain. This strategy is speeding up deforestation in the ward and adjacent Save Conservancy.
Consumption of wild fruit	Wild fruits are collected from the forests and processed into various food and drink forms. Juice is extracted from the reed (murara) and consumed. Wild fruits identified included Bhubunu, amarula, and some wild leaves were also eaten. Flies on Mopane leaves are also eaten during the lean season. Deforestation has reduced reliance on forests as a coping strategy. Some households are eating soil, which is sweet, and then drinking water through the day.
Begging and borrowing	The frequency of begging and borrowing food between households increases as the lean season progresses. Reliability of this strategy was limited, given that most households excerpt those with external support systems like remittances, at about the same time.
Theft	Sugar cane was being stolen in dire situations especially for consumption by children mainly as an energy source. This was viewed as a very risky strategy.
Poaching	Communities in Wards 1 and 2 resort to poaching for game within conservancies to supplement their food requirements. Meat may be exchanged for grain. Respondents were aware that this was illegal and thus a risky coping strategy.

3.4.5.1 Perceived Barriers to Adaptation

A number of factors constrained capacity to adapt to and cope with drought, translating to falling agricultural productivity, food and income insecurity. Key barriers to adaptation are given on the table below:

- Limited access to credit
- Limited access to irrigation
- Limited access to social protection mechanisms
- Limited access to climate information
- Gender of decision maker
- Limited access to draught power
- Reliance on monocrops
- Reliance on maize production
- Weak institutions
- Poor access to communication infrastructure
- Markets and policy failure

3.5 Policy and Institutional Baseline

In recent droughts experienced in Zimbabwe, the Government and civic society responses have been focused on short term emergencies than on strengthening preparedness and coping strategies. Local government authorities lacked capacity to react to these disasters; hence the Government's realization of the need to develop appropriate action plans to counter both short and long term effects of drought through development of institutional capacity and investing resources to meet the needs of the most vulnerable population groups.

3.5.1 Key Policies for Drought Management

Key policies relevant to management of drought developed by the Government include the following:

- National Policy on Drought Management
- Agriculture Policy
- Environmental Policy
- Civil Protection Policy (for disaster management)
- Food Security Policy
- Water Policy and Strategy
- Livestock Development Policy
- Poverty Reduction Strategy

The National Policy on Drought Management (NPDM) approved in 1999 discusses general drought management issues and reviews government capacities and structures to deal with drought preparedness, mitigation and response issues. Special emphasis was placed on developing sustainable livelihoods for those populations most at risk to drought-induced shocks. The policy states that these activities should be integrated with other developmental programmes and projects and that they should form an integral part of all district-, provincial- and national-level development policy and planning processes.

The NPDM emphasizes long-term drought mitigation measures, such as the harvesting and efficient utilization of water, increased agricultural productivity in both commercial and communal areas, land use planning and proper management of national resources and the environment. This paradigm emphasizes forward planning, preparedness, prevention, mitigation response, recovery and rehabilitation. The policy is designed to facilitate the sharing of risk between Government and farmers,

while building the capacity of individuals and communities at household level to plan and undertake activities that utilize household resources efficiently and effectively. Livelihood sustainability is premised on a balance between economically efficient and ecologically sound options for households to make a living and cope with the short- and long-term impacts of drought.

Strategies under the NPDM include the following:

- Facilitating sustainable management of natural resources;
- Encouraging: crop production only in those areas that are climatically and topographically suitable for particular crops, proper mechanical and biological precautions versus soil loss, good land use practices through educational awareness campaign, and research into promotion of drought-tolerant food crops;
- Ensuring correct stocking rates of domestic livestock and establishment of grazing schemes;
- Supporting current policies and programmes on reforestation;
- Ensuring and enforcing correct protection and management of water catchment areas, construction of more dams, and sustainable exploitation of underground water;
- Accelerating rural industrialization;
- Promotion of small-scale enterprises;
- Reducing land pressure through resettlement and proper land use practices;
- Introducing appropriate water resources management and irrigation development schemes.

Zimbabwe's agriculture policy also recognizes that the country is susceptible to recurrent droughts. The Ministries of Lands and Agriculture, Public Service Labour and Social Welfare and Local Government coordinate the development of policies and strategies to minimize the effects of drought. The thrust of the government's agriculture policy is to reduce the current emphasis on the provision of food aid in favour of a broad approach involving the development of sound strategies and schemes that help families to cope with the effects of drought. The strategy involves an improvement in water availability through the expansion of irrigation schemes, water harnessing by construction of dams, and the equitable distribution of water for irrigation. The policy also highlights the need for intensive research on improving the tolerance of staple food crops to drought and diseases.

3.5.2 Policy Gaps

3.5.2.1 Agricultural Marketing and Pricing Policies

The ability of farmers to adapt to climate variability and change depends on market and institutional signals. Government policies may act to either promote or hinder adaptation to climate change. The current marketing and pricing systems in Zimbabwe are controlled, regulated and administered by the Government. Marketing and trading of maize for instance is controlled and regulated by the Grain Marketing Board. The pricing system is characterized by subsidies to consumers and taxation of domestic producers in maize and small grains. These policies hinder implementation of adaptation measures to climate change.

3.5.2.2 Water Management and Land Policy

Government policies pertaining to land and water resources, which represent the basic foundation for agricultural production, should be more explicit in having the implementing agencies give due consideration to the possible impacts of climate change. Water is subsidized, encouraging over-use which draws down existing sources and discouraging conservation measures, which may well be elements of future adaptation strategies. Lack of security of tenure to the newly resettled farmers poses another challenge. The full productive potential and sustainable use of natural resources and environmental management of resettled lands will be realised only when farmers are guaranteed of security of tenure. At present participants in settlement schemes in Zimbabwe enjoy precarious tenure under the '99-year Lease' permits.

3.5.3 Institutional Capacity for Climate Change Adaptation

The institutional baseline scenario is characterised by weak capacity to implement policies and strategies related to climate change adaptation. Climate change and climate forecast information is currently not being factored into policy formulation and programme implementation across all sectors, including agriculture. Skills migration coupled with limited financial resources in Government department and research institutions has limited research and extension in climate change adaptation. Specialist skills in climate change research across key sectors of health, water and natural resource management are lacking, as is the capacity to generate same through the national tertiary education system.

- Level of awareness of sectoral climate change impacts low across various stakeholders. At both policy and programme planning levels, climate change risks are not mainstreamed.
- At baseline, there is no coordinated climate change information dissemination strategy. No educational and awareness programmes, fliers or posters are being implemented or circulated.
- Level of awareness on the linkages that exist between drought and climate change and the interventions implemented by various organisations and institutions operating in Chiredzi is generally low.
- Sector specific impacts of climate change could not be identified by over 75% of the respondents interviewed.
- No training programme on climate forecasts, climate change risk or vulnerability assessment, mainstreaming climate risks, or issues related to climate change has been conducted in Chiredzi.
- The subject of climate change is generally viewed as "scientific and technical" and therefore not very relevant to project planning and management.
- Project staffs at NGO and CBO level have varied training backgrounds, some of which have limited links with the environment and agriculture. As such, contextualising climate change information presents a technical challenge in some cases.
- Climate change was perceived as irrelevant to current work and links between climate change and focus areas not clear.
- At individual level, the strongest view identified was that climate forecast information provided by Meteorology Department was not packaged in forms that could be useful for various sectors besides agriculture.
- There is a very low demand and utilisation of climate forecast related information by the sampled institutions. The Meteorology Department identified only three institutions in Chiredzi as regular users of its weather and seasonal forecast information. These institutions are ARDA and Hippo Valley Estate (mainly evaporation rates, rainfall, and temperature) and Buffalo Range airport (receives an hourly update on the weather). Linkages with Agritex appear to be weak at district level.
- Although some of the interventions implemented were agricultural in nature, respondents interviewed mentioned that drought and climate change were not purposively and deliberately mainstreamed in the project logical framework as risks to project success and thus no drought mitigation plan could be developed.
- There is low capacity and low level of utilisation of climate forecast based decision support tools, simulation and optimisation models. For the organisations interviewed in Chiredzi, there was no staff members identified as trained in the practical use of these tools.

3.5.3.1 Priority Areas for Capacity Building

Based on interviews held with individuals, organisations and institutions operating within and beyond the pilot project site, the following strategies and focus areas were identified as relevant for capacity building:

1. Development of an extension dissemination strategy for effectively communicating climate forecast information to farmers and other users.
2. Mainstreaming climate change in education curricula in schools, colleges and universities to enhance awareness and knowledge.
3. Mainstreaming climate change and drought risk in programme and policy planning and management to ensure higher impact levels are attained.
4. Developments of adequate capacity at organisational level to identify relevance of climate forecast information to operations and formulate risk management strategies.
5. Development of a coordinated disaster preparedness plan at organisational and systemic level across sectors.
6. Identification and development of adequate research and extension capacity in key institutions, to facilitate participatory (with rural communities) development of strategies that could enhance community climate change and drought coping and adaptation capacity.
7. Develop technical skills in analysing the socio-economic impacts of drought and climate change. This should mainstream the gender and poverty dimension of climate change and inform policy on what could work to reduce vulnerability and enhance adaptive capacities.

3.5.3.2 Barriers to Capacity Building for Adaptation

The effectiveness of strategies to build adequate capacity at individual, organisational and institutional level will be constrained by a number of factors:

1. Migration of trained professionals in pursuit of higher incomes in regional and international markets thus reducing human resources available to conduct the training or be trained in the various key areas.
2. Lack of coordination of activities relating to adaptation to climate change leading to possible duplication of roles and challenges in targeting programme beneficiaries. Some interventions promoted could, in fact, be mal-adaptation practices that increase community vulnerability to climate shocks, and weaken livelihood strategies.
3. Some key institutions are very thin on the ground. Agritex, though based at ward level, have limited capacity to travel and monitor due to lack of transport

given sheer sizes of wards. The Meteorology Department in Chiredzi has only four staff members. Communities interviewed argued that the climate forecasts provided are at district level, and as such, may not be relevant for their decision making since there is such high variability in climate even over short distances.

4. Lack of adequate funding to finance operations.
5. Weak linkages exist between various institutions in terms of climate information sharing to enhance farmer decision making capacity.

3.5.3.3 Systemic Capacity Challenges

At national policy planning, implementation and management level, the following capacity challenges were identified:

1. Although Zimbabwe has ratified the UNCCC (and UNCBD, UNCDD, among other environment conventions), there is currently no clear national strategy on implementation of these conventions.
2. Significant progress at national level has been made in setting up the Civil Protection Unit. However, the Unit is generally more responsive to disasters, than proactive. Meetings are ad hoc.
3. Lack of capacity to identify links between climate change and various social and economic sectors translates in dimate risks not being mainstreamed in national policy, budgets, Government and other organisational programmes and plans. Climate change, although indirectly and directly linked to community level vulnerability to food insecurity and poverty, is not often seen as an area of priority.
4. Some of the current policies and programmes actually constrain climate change adaptation. These are covered in the policy analysis section.
5. Absence of a unit for coordinating activities related to climate change adaptation.
6. High staff turnover especially in Government departments leads to loss of capacity, especially in instances where staff trained in areas related to climate change adaptation migrates to external destinations.
7. General weak funding capacity by Government.
8. The media has limited capacity to report on such technical subjects as climate change and communicate these effectively to communities.

3.5.4 Climate Change Communication

- There is limited media coverage and capacity to report on climate change and raise awareness. Coverage is centred on short term climate hazards like floods, droughts, hurricanes. Linkages of such calamities with climate change low.
- There is lack of clarity on appropriate technology amongst stakeholders. A consensus on the terms climate variability and climate change should be reached within the research and development sectors to enable effective communication.
- Information on climate change is not available in formats and language that is appropriate for various stakeholders like policy makers, industry and commerce, extension officers, NGOs and donors, and farmers.

4 Conclusions and Recommendations

4.1 Conclusions

This study has developed the "without" project baseline for the Coping with Drought and Climate Change project site of Chiredzi district. The baseline scenarios covered: drought vulnerability, adaptive capacity indices, awareness, attitudes, knowledge and current climate risk management practices, policy and organisational capacity for sustainability indicators.

The project site is **vulnerable to drought** mainly as a consequence of reliance on rain-fed agriculture. Female headed households, households with no access to irrigation and those with weak livelihood asset base were the most vulnerable.

Farming systems are **exposed** to frequent droughts, aridic soils and a high mean annual rainfall coefficient of variation (40%). Given weak adaptation mechanisms, **sensitivity** to drought is very high particularly for dryland agriculture.

Current **adaptation mechanisms** are centred on timing of planting and use of drought tolerant crops and varieties. Seed availability is in short supply as a result of shortage in the market systems and failure to save seed from own production. For livestock farmers, providing feed and water to animals was the main strategy used. There is limited **diversification** away from agriculture. Level of knowledge of adaptation options is moderately high, but resources for implementation are scarce.

The use of both **traditional and scientific forecast** is generally low. Challenges are centred on previous history of unreliability of forecasts, lack of access or inadequate information for decision making. Climate forecast information is not tailor made for target communities, hence low relevance to farmers.

Farmers' **perceptions** indicate a change in climate. Changes observed are related to late season start and early cessation, as well as a prolonged mid-season dry spell. Variability of rainfall within short distances was also cited. **Awareness of climate change risk** and links with various sectors was very low among various Government and NGO institutions and at policy level. Climate risk is currently not directly mainstreamed in projects and policy. The agricultural commodity marketing policy is constraining of adaptation methods, while economic stressors worsen vulnerability.

4.2 Recommendations

The following recommendations are proposed for the CwDaCC Project:

i. Results from this study were constrained by the failure of the study team to sample at least 10% of households in the sampled Wards because of travel challenges. It is recommended that more field data collection be carried out during the early stages of pilot projects implementation to strengthen the baseline understanding.
ii. The project should focus on indicators which are most likely to be the most robust and easy to access.
iii. The project should consider developing a monitoring and evaluation framework that specifies monitoring and data collection frequency based on identified indicators. Training of field monitors and a budget allocation to support data collection may be considered.
iv. Community determined indicators for monitoring and evaluation should also be considered. This strengthens ownership (hence sustainability) and lowers transaction costs in monitoring.
v. Key indicators and evaluation questions are summarised in the proposed evaluation framework.
vi. Future research should explore further issues covered in this study but on a larger scale. The various plant and animal species used for indigenous climate forecasting should be documented, and where appropriate, recommended for protection by law. Stakeholder engagement should be prioritised across levels through the project cycle.

5 ANNEXES

5.1 Annex 1: Terms of Reference for Project Baseline Study

Terms of Reference of National Consultant

CwD01: Preparation of Project Baseline

I. Background to the project

Climate change is an additional constraint to sustainable socio-economic development in Zimbabwe. The increasing frequency and severity of droughts and floods, the shift in onset of the rains, and increasing intensity of mid-season dry spells in the last 50 years have been identified in the Initial National Communications (1996) and the IPCC Third Assessment Report (2001) as a major consequence of climate change. The IPCC fourth assessment report (2007) concludes that climate change will impede nations' abilities to achieve sustainable development and the Millennium Development Goals, and that Africa will experience increased levels of water stress and reduced agricultural yields by up to 50% by 2020. Livelihoods of the poor, particularly women who are highly dependent on climate-sensitive sectors like agriculture, are likely to be impacted by climate change in various ways.

Within this context the GoZ through the Environmental Management Agency (EMA) and the UNDP are implementing a Medium Size five year project "Coping with Drought and Climate Change" within the agriculture sector and focussing on Chiredzi District as a pilot site. The primary goal of the project is to contribute in enhancing the capacity of agriculture based livelihood systems in Zimbabwe to adapt to climate variability and change. The project is being implemented with financial support from the Global Environmental Facility (GEF) Special Climate Change Fund over the period 2008-2012. Ethiopia, Kenya and Mozambique are each implementing a similar project.

The project comprises four main components as follows: (i) increasing capacity of local institutions to develop a knowledge base that supports adaptation to climate change impacts, (ii) piloting a range of policy oriented adaptation measures for agriculture based livelihood systems, (iii) promoting the use of climate early warning systems to strengthen adaptation measures and (iv) upscaling successful practices through policy changes.

Rationale of baseline study

Efficient project monitoring and evaluation will not be possible without baseline data. Baseline studies serve as a reference point or benchmark for later comparison or impact studies to assess how well the original project objectives have been achieved. A collection of baseline data should be conducted before the project is implemented, and this data collection will constitute the beginning of the M&E process. It should contain both qualitative and quantitative information, and generally be based on the indicators identified in the project Logframe matrix. The baseline study should be conducted in partnership with communities as a way to increase community buy-in.

II. Objective and scope of Consultancy

The purpose of this baseline study assignment is to determine in a quantitative and qualitative manner the current situation of the Chiredzi rural communities engaged in rainfed and irrigated agriculture and assess the people's perceptions, levels of awareness, knowledge, attitudes and practices (AKAP) by gender related to climate change adaptation. The study will also document indigenous knowledge systems for seasonal climate forecasting and current community drought coping strategies.

The baseline will be conducted in close cooperation with the Environmental Management Agency, Chiredzi RDC, Agritex, Department of Irrigation and local communities at the district level.

Scope

The baseline will be done in Chiredzi District. It will cover rural communities of Sangwe. The household will be the unit of study at community level. At least 10% of households segregated by gender, social and economic status will be covered in the survey. All relevant stakeholders from local authorities including community leadership, government departments and NGOs/CBOs active in the area will be interviewed.
Findings from the baseline study are expected to generate data at three levels:

- Community level

- Level of support organisations (awareness, current practices, capacity, etc)

- Systemic level (policy and institutional frameworks)

III. Specific tasks

- Develop a conceptual framework and work plan in consultation with the Project Manager.
- Do a literature review of baseline data collected by other related projects and studies in the project area
- Do an over view of relevant macro-statistics related to the project objectives
- Do a survey of relevant institutions, policies and legal indicators relevant to the project's objectives
- Develop tools to collect data on the indicators chosen to evaluate the impact of the project and indigenous knowledge systems for seasonal climate forecasting and drought risk management.
- Develop a methodology for implementing the survey including formation of teams, training, data collection and analysis.
- Translate the questionnaire into local language (preferably Shangani/Shona) and pre-test.
- Undertake the baseline survey in selected communities of Chiredzi district.
- Interview District Authorities, local support organizations, any NGOs/CBOs working with these populations in the district for assessing policy and financial environment and procedures.
- List all NGOs and CBOs working in the target districts, identifying the area of work and potential for community mobilization.
- Data processing, analysis and report writing of the baseline survey
- Presenting baseline findings to the project team
- Completing the assignment within 10 weeks and submitting the final report with the soft copy of the data file.

IV. Methodology

The Study will employ a variety of methodologies and will include both qualitative and quantitative methods, as follows:

1. Desk review (review of existing documentation and materials, identification of stakeholders, their activities, good practices, etc.);
2. Consultations/interviews with key informants at district and national level;
3. Preparation of baseline report and its presentation to the project team.

At community level the household will be the unit of study. The study should be able to cover at least 10% of households (depending on local circumstances, logistics and budgetary constraints) within a specific setting. The sample selection should reflect gender, social, cultural and economic diversity in the given community. It is therefore important that an appropriate sampling method be used and a selection could be made from: simple random sampling, systematic random sampling, stratified random sampling and cluster sampling. The justification for the choice of sampling method must be clearly stated.

Data collection tools will include structured questionnaires, rapid rural appraisals, key informant meetings, focus group discussions and workshops where necessary. The literature review will be used to identify and assess existing situation and matters of policy and institutional frameworks.

The data and information collected will be archived in a database system to be agreed, then analysed and synthesized into project performance monitoring and evaluation baseline.

It is recommended that data archiving and analyses be done using SPSS.

V. Expected outputs

The main expected output is a comprehensive Report on the Baseline Study in English, including relevant annexes with detailed data. Also, a power-point presentation should be prepared on the report that could be used for its' presentation with national stakeholders. The final Report by the Consultant should contain, but not restricted to, the following:

- **Executive Summary**

This should not exceed 2 pages and should contain a summary of the major findings of the study and their significance as well as a summary of the recommendations.

- **Introduction**

This should contain the following sections:

- Background to the study and why the study;
- Where and when the study was conducted;
- Who conducted the study;
- What methods were used, how the sample was selected and why?;
- Practical problems or limitations encountered;
- Reliability of results.

- **Presentation of Findings**

This section is the heart of the report. It should point out the findings of the study and their implications to the purpose of the study. This is where the tables and graphs appear and they should be explained with text. Do not repeat the content of the tables and graphs in the text; instead show the reader the importance of the findings and relate these to the issues under discussion.

- **Conclusions and Recommendations**

This is another part of the report that people who are in a hurry tend to read. This means that it should be given a lot of thought before it is written. No unsupported claims should be made since many readers use the quality of this section as a yardstick for measuring the whole work. Do not assume that the conclusions and recommendations are cast in stone. They should be seen as the starting point of discussions and even debates on the line of action to be taken to address the issues revealed by the study.

- **References**

List the publications consulted for preparing the study.

- **Annexes** (TOR, abbreviations, persons met, statistics, etc.).

VI. Management arrangements

The Consultant(s) will work under the guidance and direct supervision of the Project Manager of the Coping with Drought and Climate Change project.

VII. Requirements for Consultants

The Lead Consultant should have proven practical experience in carrying out complex surveys; good contacts with national stakeholders (including government and NGOs), excellent writing, and communication and research skills.

The basic requirements for the National Expert are listed below:

- Past experience of undertaking household surveys and institutional analysis in the last 2 years.
- Knowledge of SPSS
- Advanced university degree in a relevant social science discipline
- Proven track record in carrying out complex surveys
- Proficiency in English language
- Excellent presentation and communication skills

Proposals should consist of:

- Cover letter addressing the requirements stated
- Detailed CVs of experts
- Description of methodology to clearly address the criteria and content of these Terms of Reference
- Other supportive material such as samples of previous work
- References/contacts (pls. provide at least 3 organizations that employed you for similar type of services).
- Budget (the budget should include the full costs of field visits, if any, including transport, accommodation and meals).

VIII. Deliverables with payment schedule

1. Inception report and Work plan with time line (within 2 weeks of signing of the contract) 10% of total payment.

The consultant(s) is/are expected to join a kick-off workshop in Harare late July/early August. During this workshop the consultant(s) will introduce the general approach and expected results from the work, and to collect feedback from the stakeholders. The consultant will finalize the methodological framework for the work after the workshop. However, the consultant should be as specific as possible on the data, models and expected results in the submitted proposal documents. The consultant shall only proceed to the next phase of the work once the methodology – including the choice of models, data, and indicators as appropriate – have been discussed with relevant stakeholders and cleared by the Project Manager. To be delivered 2 weeks after signing the contract (20% of total payment)

1. Literature review and draft questionnaire (at the end of 3 weeks of initiation) 20% of total payment.
   This deliverable will include complete datasets of information from literature and will form an interim product. To be delivered 2 weeks after Deliverable 1.
2. Draft report (at the end of 8 weeks) 40% of total payment

This deliverable will include complete datasets of SPSS, tabular and graphical information detailing the project indicators from field surveys.

3. Final report (at the end of 10 weeks) 20% of total payment

IX. Proposal Submission

Please submit proposals by 25 July 2008 to:

The Project Manager

Coping with Drought and Climate Change Project

cwd@ecoweb.co.zw

5.2 Annex 2: Reviewed Project Logical Framework

Intervention Logic	Indicators	Means of Verification	Assumptions
Goal: To enhance the capacity of agricultural and pastoral systems in Zimbabwe to adapt to climate variability and change			
Project Objective: To demonstrate and promote adoption of a range of gender segregated approaches for adaptation to climate change among rural communities currently engaged in agriculture in vulnerable areas of Chiredzi District as a national model.	- Increase in adoption of adaptation measures by vulnerable rural communities - Increases in agricultural productivity - Increases in household income. - Change in livelihood asset base		- Generally positive socio-economic environment

Outcomes: • National institutions have capacity to improve knowledge base to facilitate climate change adaptation	- Level climate change risk awareness among farmers and service providers - Number of climate risk management oriented operational practices among service providers - Number of updated locally produced climate change materials	- Monitoring and evaluation reports - Internal and/or external evaluations	- Sufficient human and organization capacity
• **Livelihood strategies** and resilience of vulnerable **farmers/pastoralists** in the selected pilot sites **improved and sustained to cope with drought**	- Number of households by gender aware of viable adaptation options - Number of households by gender using adapted farm management practices - Number of households by gender using new technologies - Number of households by gender using new livelihood mix		
• Use of climate early warning systems by vulnerable communities in pilot sites increase and drought preparedness improved	- Number of small-holder farmers by gender in pilot site consistently using climate information for decision support. - Number of service providers in Chiredzi district using climate information in operational practices - Number of requests for demand driven forecast products from Chiredzi service providers to Meteorological Services - Community level drought preparedness plan		
• Farmers/pastoralists outside the pilot site replicate successful approaches to cope with drought	- Awareness of lessons from project site among decision and policy makers - Change in national institutional, legislative and policy frameworks in the agriculture and water sectors - Level of mainstreaming of climate change concerns in national development processes and programmes		

5.3 Annex 3: Glossary of Key Terms

Adaptation: Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Adaptation assessment: The practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency, and feasibility.

Adaptive Capacity: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Baseline: The baseline is any datum against which change is measured. It might be a "current baseline", in which case it represents observable, present day conditions. It might also be a "future baseline", which is a projected future set of conditions excluding the driving factor of interest.

Carrying Capacity: The number of individuals in a population that the resources of a habitat can support.

Climate Change: Climate change is a change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Climate Variability: Climate variability refers to the variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

Drought: The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

Exposure: The nature and degree to which a system is exposed to significant climatic stimuli.

Maladaptation: Any change in natural or human systems that inadvertently increase vulnerability to climate stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead.
Mitigation: An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.

Resilience: Amount of change a system can undergo without changing state.

Sensitivity: Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate related stimuli. The effect may be direct (e.g., change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to a sea level rise).

Vulnerability: The degree to which a system is susceptible to, or unable to with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

5.4 Annex 4: Relevant Local and International Level Environment Laws and Policies

Act/Policy	Relevant Elements	Implementing Authority
Environmental Management (CAP 20:27)	The act requires: i) EIAs to be undertaken for the prescribed activities under section 97 (1). The projects listed in the first schedule must not be implemented unless in each case: a) the Director General has issued a certificate; b) certificate remains valid; and c) any conditions imposed by the Director General in regard to the issue of the certificate are complied with; ii) preventing and controlling atmospheric pollution; and iii) controls he transportation, storage, trade and disposal of substances classified as hazardous. A registration certificate is required before any activities that will emit gases defined as noxious of offensive are undertaken. The certificate is issued on condition that measures are put in place to control the emission of noxious or offensive gases.	Ministry of Environment and Tourism
Water Act Number 31 of 1998	Act regulates the planning and development of water resources, and provides a framework for allocating water permits. The water (Waste and Effluent Disposal) Regulations of 2000, associated with this Act, specify what quality is acceptable in terms of effluent released into rivers.	Ministry of Rural Resources and Water Development
Forest Act, (1949,CAP 19:05)	Act provides for demarcating forests and nature reserves, conserving timber resources, regulating trade in forest produce, and regulating the burning of vegetation	Ministry of Environment and Tourism
Parks and Wildlife Act (1975, CAP 20:14)	Act establishes national parks, botanical reserves and gardens, sanctuaries, safari areas and recreational parks; provide for the conservation and control of wildlife, fish and plants; and designates specially protected animals and indigenous plants	Ministry of Environment and Tourism
Communal Land Forest Produce Act (1988, CAP 19:04)	Act controls the use of wood resources within communal lands. Such resources in communal lands should be used for domestic purposes by residents only	Ministry of Environment and Tourism
Rural District Council Act (1989, CAP 29:13)	Act allows for the establishment of Rural District Councils responsible for initiating and regulating development in the rural areas	Ministry of Local Government
Fertilizer, Farm Feeds and Remedies Act (1953, CAP 8:12)	Act provides for the registration of fertilizers, farm feeds, and sterilizing plants. It also regulates the importation and sale of fertilizers and farm feeds	Ministry of Agriculture

Relevant International Conventions to Climate Change Adaptation for the Coping with Drought and Climate Change Project in Zimbabwe

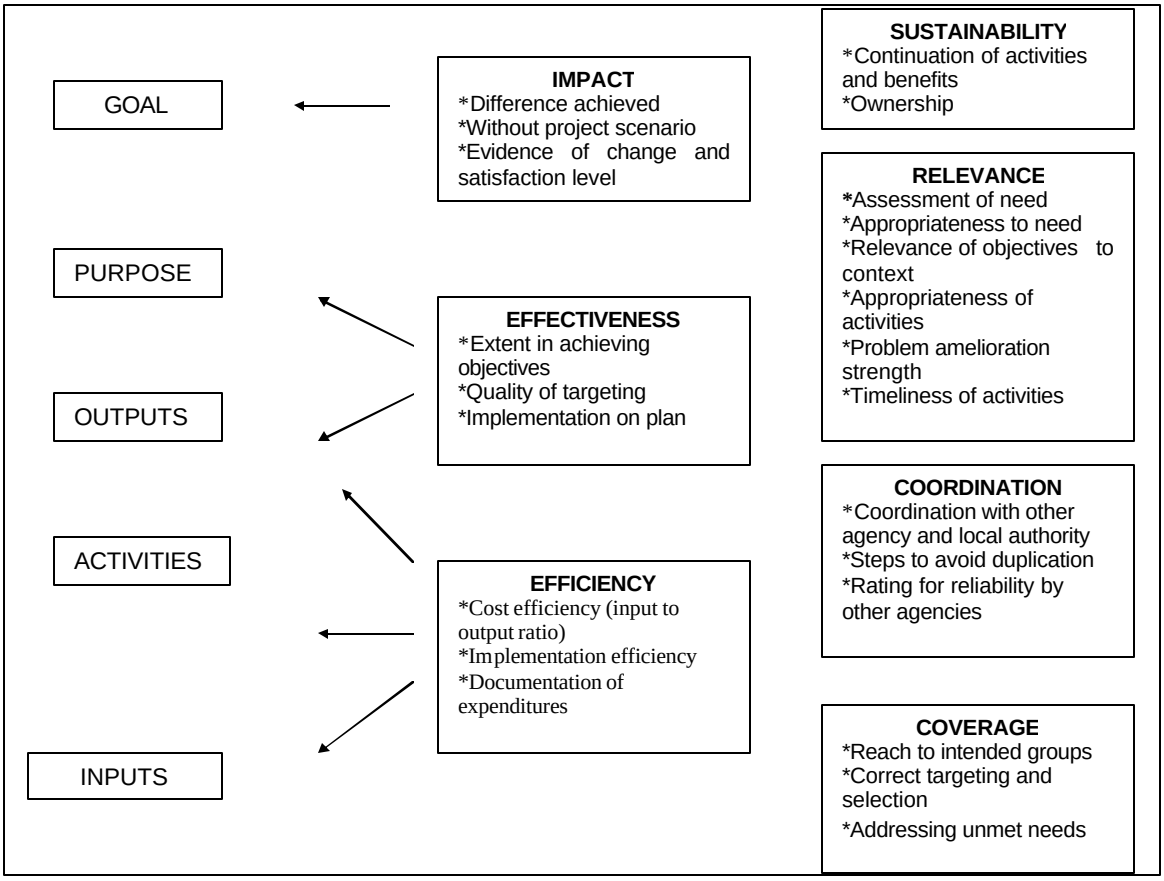
Intervention	Relevant Elements	Ratification Status
United Nations Convention on the Biological Diversity (1992)	Convention establishes biological diversity, sustainable use of natural resources, identification in Situ and ex Situ conservation, research and training including public education and awareness and EIA of activities tat are likely to affect biodiversity.	*
United Nations Convention to Combat Desertification (1994)	Convention aims at combating desertification in countries that experience serious drought and or desertification, especially in Africa.	*
United Nations Framework Convention on Climate Change (1994)	Convention requires signatories to take precautionary measures to antic ipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be reason for postponing such measures, taking into account that such measures to deal with change in climate should be cost effective to ensure global benefits at the lowest possible cost.	*
Ramsar Convention (1971)	Convention on the protection of wetlands, their sustainable utilization with the view to prevent the progressive encroachment on the prevention of their loss now and in the future, encouraging their ecological features and economic, cultural, scientific and recreational value.	Still under consideration by Parliament

Ratified by Zimbabwe

5.5 Annex 5: Project Monitoring and Evaluation Protocol

Evaluation Criteria

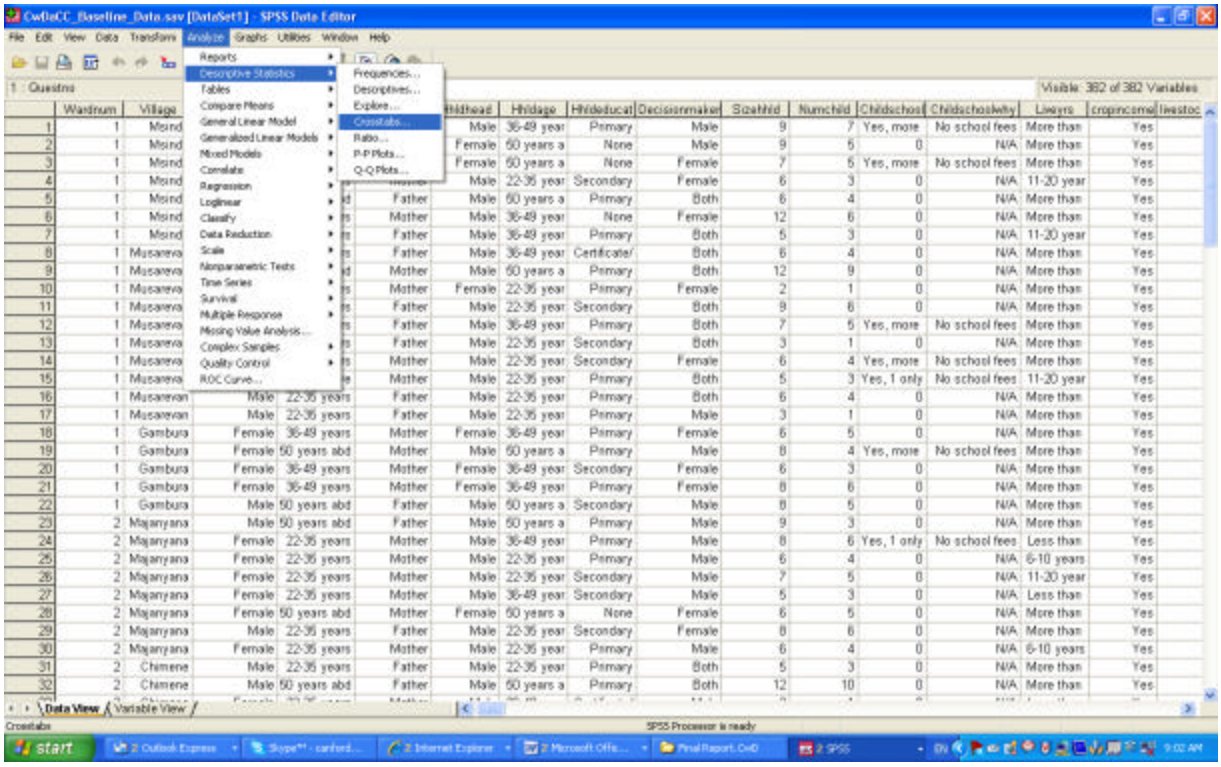
The following criteria are proposed for the evaluation of the CwDaCC project:



Evaluation Criteria	Key Evaluation Questions
Impact	1. What changes have happened as a result of the project? 2. What real difference has the activities implemented made to the beneficiaries? 3. How many people have been affected by the project? 4. What could have happened without the project?
Effectiveness	1. To what extent were the objectives achieved? 2. What were the major issues influencing the achievement or non-achievement of the objective? 3. Were there shared goals between different implementing agencies (coherence)? 4. Was there evidence of coordination issues influencing achievement of the objectives?
Relevance	1. To what extent are the objectives of the project relevant? 2. Are the activities and outputs of the project consistent with the overall goal and the attainment of the objectives? 3. Are the activities and outputs of the project consistent with the intended impact and effects? 4. Are the activities appropriate interventions? 5. Is there adequate coverage, by activity, of the targeted population? 6. Should the project have been terminated earlier or should it have been extended?
Sustainability	1. To what extent did the project continue after funding cessation or external support? 2. What factors influenced achievement or non achievement of sustainability of the project? 3. Was the sustainability issue broadly addressing issues of environmental, economic or social sustainability?
Efficiency	1. Were activities achieved at the least cost? 2. Were objectives achieved in a timely manner? 3. Was the project implemented in the most efficient way compared to alternative ways? 4. Were there any responses that raised unit costs? 5. Was input material purchased locally/ 6. Were local tenders sought?

5.6 Annex 6: Household Survey Database

A soft copy version of the household survey database has been submitted on Statistical Package for Social Scientists (SPSS). The outlook of the database is shown below:



5.7 List of Key Informants Interviewed

Name	Institution	Position	Contact details
Dr Ngere	Ministry of Heath	District Medical Officer	
Mr Zvarevashe	FACT Chiredzi	Youth and Information Coordinator	031-3375 0912 752908
Mr Nyede	Local Government	District Administrator	
Tendai	HELPAGE	Projects Officer	031-3415
Mr Kauma	ZINWA		031-3514
Mr Chimanya	Rural District Council		0912 409 562
Mr Chigura	Department of Irrigation Chiredzi	District Irrigation Officer	039-265081
Machisi-Moyo, T	SEVACA Home Based Care	Director	031-3491 0912 408 906
Makwangudze, K.J., Dr	Veterinary Services Chiredzi	Principal Veterinary Officer	031-4171
Mudefi, M. C.	Ministry of Agriculture	Acting District Agricultural Extension Officer	
Ms. Masaisai, R.	Department of Meteorology	Officer-in-Charge	011 612 376
Ms. Moyo-Mhlanga, K.	UNDP/GEF-SGF		700938
Mr. Mugodi, P.	Environmental Management Agency	District Office	011866783/ 031-2698
Mr. Muusha, M.	Environmental Management Agency	Provincial Manager	039-262776/ 262058
Ncube, S. Dr.	Department of Veterinary Science, University of Zimbabwe	Resident Veterinary/Lecturer	023 890 462
Rubaba, K.J.	Ministry of Education, Sport and Culture	Acting District Agricultural Extension Officer	
Tamirepi, M	Plan International	District Food Aid Manager	

5.8 References

Cooper, P.J.M., Dimes, J., Rao, K.P.C.., Shapiro, B., Shiferaw., and Twomlow, S. 2008. Coping better with current climatic variability in the rain- fed farming systems of sub-Saharan Africa: An essential first step in adapting to future climate change? *Agriculture, Ecosystems and Environment 126 (2008) 24-35*. Elsevier.

CSFAM.2008. FAO/WFP Crop and Food Supply Assessment Mission to Zimbabwe. 18 June 2008. FAO. www.fao.org/docrep/010/ai469e/ai469e00.htm

CSO. 2002. Provincial Profile: Masvingo. Harare. CSO.
CSO. 2007. Zimbabwe: Demographic and Health Survey 2005-06. Harare. CSO.

Elasha, B.O. Sustainable Livelihoods Approach for Assessing Community's Resilience to Climate Variability and Change: *A Case Study from Sudan. Second International Conference on Climate Impacts Assessment (SICCIA).* 2nd-28th July, 2004. Grainau, Germany.

GoZ, UNDP/GEF. June 2008. Medium Size Project: Coping with Drought and Climate Change: Project Inception Report.
IOM.2007. Reintegration Assistance to Returnees: Revolving Livestock Scheme. Baseline and Feasibility Study Report.

IPCC, 2001. Climate Change 2001: Working Group 3: Mitigation. Cambridge University Press, Cambridge. UK.

IPCC, 2001. Intergovernmental Panel on Climate Change. Climate Change 2001: The Scientific Basis. Contribution of the Working Group 1 to the Third Assessment Report of the IPCC. Cambridge University Press. Cambridge. www.grida.no/climate/ipcc_tar/wg1/index.htm.

IPCC, 2007. Climate Change 2007: Impacts, Adaptations and Vulnerability- Contribution of Working Group 2 to the IPCC Fourth Assessment. Cambridge University Press. Cambridge. http://www.ipcc.ch/

IUCN – The World Conservation Union, 2003. Report on Regional Dialogue on Climate, Water and Wetlands in Southern Africa.

UNDP Project Document, UNDP-GEF Medium-Size Project (MSP): Zimbabwe: Coping with Drought and Climate Change Project.

Zimbabwe Vulnerability Assessment Committee. ZimVAC Interim Food Security Assessment: National Report. 30 August 2008.
Zimbabwe Vulnerability Assessment Committee Report, 2005.

5.9 Selected Project Photographs

A household interview in progress

Focus group discussion in Ward 11

Gardening, livestock farming, basketry and craftwork, firewood selling, poultry keeping and dryland farming are some of the main livelihood strategies in Chiredzi

Access to good quality potable water is a challenge in some parts of Chiredzi. Children and women collect most of the water. Livestock have moderate to good access to drinking water.

Mkwasine River is impassable without a canoe during the rainy season

Stream bank cultivation along Mkwasine River

Livestock mortality due to disease is a major cause of livestock loss

Some granaries have broken down due non-use owing to successive poor harvest

Food secur ity coping strategies include consumption of sugar cane normally stolen from sugar plantations.

Wild fruit like Amarula and *Hacha* are important food sources during periods of food deficit.

Only a few boreholes are functional. Most are broken down due to lack of capacity for maintenance

Siltation is a major challenge along major river systems, increasing flood risk during the rainy season

High fruiting is used as an indicator for poor rainfall season. Behind this photograph is the Chiredzi Met Office.

Some tree species are used as traditional indicators for onset and quality of rainfall season.

Part of the equipment at the Met Office in Chiredzi

For most farmers, the 1992 drought is the worst in living memory. This portrait was taken at the District Education Office. Important lessons should be learned from such experiences.