Climate Resilient Livelihoods

IN SOUTHERN ZIMBABWE

GOVERNMENT OF ZIMBABWE

GREEN CLIMATE FUND

UNDP

Baseline Survey for Building the Climate Resilience for Vulnerable Agricultural Livelihoods in Southern Zimbabwe

BASELINE REPORT

RESEARCH METHODS INTERNATIONAL

Dalberg Research

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

AGRITEX	Agricultural, Technical and Extension Services
CAPI:	Computer Assisted Personal Interviewing
DOI:	Department of Irrigation
DR:	Dalberg Research
DRM:	Disaster Risk Management
FGD:	Focus Group Discussion
GCF:	Green Climate Fund
IE:	Impact Evaluation
KII:	Key Informant Guide
M&E:	Monitoring and Evaluation
Mat South:	Matabeleland South
MET:	Meteorological Services
MoLAFWRD:	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development
MSD:	Meteorological Services Department
NGO:	Non Government Organisation
PMU:	Program Monitoring Unit
RA:	Research Assistant
RMI:	Research Methods International
SMS:	Short Message Service
UNDP:	United Nations Development Programme
USD:	United States Dollar
ZimVAC:	Zimbabwe Vulnerability Assessment Committee
ZINWA:	Zimbabwe National Water Authority

EXECUTIVE SUMMARY

INTRODUCTION

This report presents findings from the baseline survey of the "Building the climate resilience for vulnerable agricultural livelihoods in Southern Zimbabwe" project. This is a seven-year project implemented by the Government of Zimbabwe, through the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development (MoLAFWRD), in partnership with UNDP. The project targets 15 districts across three provinces in Southern Zimbabwe; Manicaland, Masvingo and Matabeleland South.The project aims to strengthen the adaptive capacities of vulnerable smallholder farmers, especially women, to climate change induced impacts on their agro-ecosystems and livelihoods. The project is based on interventions that produce results in three strategic areas:

1) Increasing access to water for climate-resilient agriculture through climate-resilient irrigation systems and efficient water resource management,
2) Increasing access to climate-resilient inputs and practices, as well as stronger market linkages and,

improving access to weather, climate, and hydrological information for climate-resilient agriculture. This report is organized in five chapters. Chapter 1 discusses the project background, its objectives, its components, and the areas within Zimbabwe it covers. A summary of the baseline survey objectives is also provided. Chapter 2 details the baseline survey methodology. The baseline survey technical approach, sampling approach, data collection tools used, survey areas, the data collection process and the approach to analysis are covered in this chapter. Chapter 3 presents the key findings following modules of the farmer household survey. Qualitative data is used to provide triangulation and additional insight where possible. Chapter 4 and 5 close out with recommendations and discussion respectively. In the Appendix we have the baseline indicator values, important survey indices.

APPROACH AND METHODOLOGY

To demonstrate that the project is generating the intended impact, a matched pairs design was used. The baseline survey contributes evidence to estimate the programme impacts on beneficiaries (treatment group) in comparison with the control groups and the programme's potential spill over effects.

The baseline survey used stratified random sampling and post-baseline matching. It covered 323 treatment villages selected from the list of project treatment villages, and 162 control villages randomly selected from the project districts.

Key questions for the baseline analysis

1. Is there balance between treatment and control groups at baseline?
2. What is the profile of the project participants?

A total of 4,180 farmer households were interviewed, 1,352 treatment and 2,828 control. Additionally focus group discussions were conducted with selected farmers and key informant interviews done with project stakeholders from various departments of the implementing ministry.

Matching showed balance between the treatment and control groups.

SUMMARY OF FINDINGS

Findings of the study are summarized per section as below

A total of 3078 households (1058 males and 2020 females) of 4080 households surveyed (73.6 percent) had access to a reliable water source throughout the year. Chimanimani and Bikita districts had the highest proportion of households with secure water throughout the year at 86.8 percent and 82.9 percent, respectively, while water security was least in Gwanda (65.2 percent) and Buhera (68.3 percent). Despite differences between districts, the field data from the baseline shows that gender of farmer, there was no significant difference in water access by household treatment type or their household type (treatment, pure control, or control) and age of farmer. For households experiencing water insecurity the main constraints were seasonal fluctuations of the water table causing source to dry up (71.7 percent) and breaking down of equipment (24.3 percent).

At baseline, **AGRITEX understands its mandate/role as the dissemination of advisories rather than the generation of climate information products and services to support decision making in climate-sensitive sectors.** Indeed, AGRITEX being district based had the ability to facilitate that rain gauges managed by farmers were read and data submitted to the responsible institution, MSD. In fact, any training on rain gauges would have to be done by MSD with AGRITEX providing the site-specific context. Further, AGRITEX did not independently generate advice based on MSD analysis of data, but relied on advisories disseminated at district level, and cascaded those down to the ward level. Thus, the baseline concludes that capacity to generate climate information products by AGRITEX is low (20 percent or below)

At baseline 65.6 percent of all households sampled (N=4080) had received climate information in the 2021/22 season. Treatment households (88 percent) had relatively higher access to climate information compared to pure control (55.5 percent) and control (55.2 percent) households. Of the households receiving climate information, 85 percent of them used the climate information provided to make farming decisions. Climate information influenced decisions such as changing planting dates (81.6 percent); change in crop choice (62.7 percent) and change in the variety of crop planted (60.9 percent). Hardly any of the sampled farmers use crop insurance (1.2 percent) or livestock insurance (0.9 percent) due to lack of familiarity and information, perceived cost of such service, and general attitude towards risk.

Using three CSAs as a measure, the baseline found that overall, **the proportion of households using CSA was 94 percent.** The proportion did not vary by gender or age of farmer. At district level, proportions of households using at least 3 CSA practices for responding to climate ranged from 91 percent in Chimanimani to 99 percent in Chivi.

Individual area under climate-proofed irrigation were added to get the total number of hectares from the sample. **At baseline there is a total of 3872 ha under irrigation** across sampled households in the 9 surveyed districts, with Bikita (995ha) and Chipinge (906ha) having the largest share, and Mangwe (87ha) and Buhera (99ha), the least. Measures for climate proofing irrigation used by surveyed farmers included mulching (71 percent); water harvesting (41 percent) and water scheduling (16 percent). Use of climate proofing practice for irrigation varied by location, with 85.7 percent of households in Mat South using at least

one climate proofing practice, compared to 72.1 percent for Masvingo and 41.4 percent in Manicaland.

A total of 3364 hectares drawn from across the survey sample was under a water harvesting and climate resilient water management measure, with Masvingo province contributing the most (1659 ha) followed by Manicaland (1520 ha) and Mat South (486ha). There were statistically significant differences in hectarage across districts, with Buhera (77ha) and Mangwe (83ha) having the least area, and Chivi (869ha), Gwanda (509ha) and Chimanimani (486ha) contributing the most to the project total. Overall, treatment households had the least landholding under water-harvesting and climate resilient water management at 1086ha, compared to control (1468ha) and pure control (1109ha) households. Further, the baseline found some gender inequalities with respect to land with climate resilient water management practices, with male farmers controlling 2229ha and females 1435ha. At least 95.5 percent of households surveyed reported using at least 3 climate resilient water management measures, with treatment households having the highest proportion (98.7 percent), pure control at 94.5percent and control at 93.4 percent.

Using a minimum of any three practices, the baseline counted the number of households that were implementing climate smart agriculture (CSA). **At least 3993 households of the 4180 surveyed (95.5 percent) were using at least 3 CSA practices**. The proportion by district ranged from 91 percent in Chimanimani to 99 percent in Zaka. Age and gender of farmer were not predictors of CSA use among the survey sample.

A total of 2047 of the 4080 surveyed households (49 percent) at baseline were receiving advisory or warning information related to agriculture and water management. Proportions varied by province, being highest in Mat South (54.8 percent) and Masvingo (51.2 percent) and least in Manicaland (44.2 percent). Analysed by district, farmers in Mangwe (33.6 percent) and Bikita (37.6 percent) were the least likely to receive advisory information, while those in Gwanda (71.5percent) and Chivi (59 percent) were most likely to receive advisory and warning information for agriculture and water management. Further, field data shows that more treatment households (67.5 percent) were, at baseline, receiving advisory information compared to their pure control (39.6 percent) and control (40.6 percent) peers. Advisory information covered rainfall events (71.6 percent); dry spell or drought information (68.4 percent); crop pests (65.9 percent) and less so on agricultural markets (21 percent). Most respondents received advisory information from extension officers (85.7 percent); and radio (20.2 percent); lead farmer (18.6 percent) and SMS (17.4 percent) were also important. About 95 percent of those receiving advisory information shared it.

Males dominate irrigation management committees (IMCs) with on average women making up 26 percent of leadership in these IMCs. The baseline found stark differences in women's leadership participation across locations, with Masvingo being the most inclusive province at two fifths of all IMC members being women (38 percent) followed by Mat South (24 percent) and Manicaland being the least (19 percent). Analysed by district, Chivi and Bikita topped the list for inclusion of women in IMC leadership (48 percent, 40 percent, respectively). In contract, Zaka (9 percent), Buhera (13 percent) and Mangwe (16 percent) had the least

proportion of women in their irrigation committee structures. Respondents also pointed that proportional representation did not help much with ensuring that women-specific issues were addressed, because the few males in the IMCs would dominate decisions regardless.

Proportion of women and men trained in financial management, and marketing and business development was assessed. **The baseline established that 7.5 percent of men and women surveyed has received training in the three competency areas.** While there were no statistically significant differences by province, proportions varied substantially by districts, with Mangwe (2.5 percent) and Bikita (2.4 percent) being nearly six time less than in Chivi (11 percent) and Gwanda (15.3 percent). Further, women and men in the treatment group were three times more likely to have been trained (14.1percent) than peers in the pure control (3.7 percent) and control groups (5.3 percent). Gender of respondent was not a predictor of whether the respondent had received training in the three areas.

At baseline only **15 percent of households in the intervention areas have good dietary diversity**. Baseline data shows that 41 percent if household met medium range while a further 44 percent were classified as having low dietary diversity.

At baseline, **37.2 percent of households had experienced little or no hunger; 22.2 percent had experienced moderate hunger,** while the remainder 40.6 percent had experienced severe hunger. Treatment households had the least proportion of households with severe hunger experience (37.9 percent), compared to pure control (39.3 percent) and control (44.5 percent) households.

The **overall asset and livestock ownership score was 6.** Manicaland, which had the least livelihood diversity score, also had the lowest asset score at 6, with the other provinces scoring 7. Female farmers had a higher asset score (7) compared to their male peers (6), as were younger farmers (7) relative to their middle aged and elderly counterparts at 6. Households in the control households had slightly more assets (7) compared to the other two. Only those districts in Manicaland had an asset score of less than 7 (Buhera and Chimanimani, 5; Chipinge 6).

There is very limited range of livelihoods per household, with most households dependent on climate sensitive livelihood activities. At baseline, the **overall livelihood diversity score for sampled households was 2**, suggesting that incomes for the majority of households was derived from two activities. Across the project provinces, Manicaland had the least at 2, while Masvingo and Mat South were more diverse at 3 livelihood sources on average.

The **Livelihood Coping Strategy Index (LCSI) overall for the sample was 2**. Manicaland had a slightly higher score of 3 with other provinces at 2. The baseline did not find any difference in LCSI by sex of farmer. However, on the basis of age, middle aged respondents had a higher index at 3, compared to 2 for the other age categories. Treatment households had a higher LCSI (3) compared to the pure or control groups. Focusing on districts, the baseline found that Chimanimani and Chipinge (4) had a high LCSI, meaning that households in those districts were more likely to experience food insecurity and lack of sufficient income.

Overall, the **shock exposure index for the sample population was 5**, with households in Manicaland (6) and Masvingo (6) having a higher exposure relative to those in Mat South (4). Gender and age of farmer were not relevant predictors of household shock exposure. However, the household type was correlated to the household's shock exposure index. The

shock exposure index for the control households was 6, while the treatment and pure control were both at 5. Districts surveyed had significantly different shock exposure indices, with Chipinge and Mangwe having the highest at 7, followed by Chimanimani and Chivi (6). Zaka and Masvingo had the least shock exposure at 3 and 4, respectively.

Agricultural value chains are weakly developed for the crops and livestock classes that farmers are presently engaged in across the project districts. Contract farming arrangements exist only for 6 percent of the surveyed farmers. Offtake capacity is low for crops and livestock currently being produced

Results show that the average access to finance index is one. Only six households had a score of 4 and 72% of the households had a score between 1 and 2. A total of 20% of the households had a zero score.

RECOMMENDATIONS

Strengthen capacity of water point committees: Water point committees are in existence in most of the targeted communities for this project. However, capacity to maintain water sources in a functional state is often a challenge, linked to factors such as insufficient training and costs. This training could piggyback on irrigation water management training, and could improve water security, including for supporting economic activities that are central to resilient livelihoods, which in turn will contribute towards resilience to climate shocks and stresses.

Training in climate advisories should focus on institutional mandates and community-level roles: Agritex has presence at ward level and is most trusted source of advice by farmers. The Agritex officer has not been trained to generate climate advisories but can share any tailored information to help farmers make decisions, based on analysis by subject specialists at MSD, and passed on to Agritex through its provincial and district structures. If Agritex is seen to be generating the climate advice, then should the advisories be inaccurate, particularly due to climate change influence on predictability of seasonal weather, this would have implications for extension including farmer despondency to any other advisories. Training of Agritex should equip them with the toolkits for use for facilitating community interpretation of climate information

Strengthen capacity for collection of village-level climate data to inform tailored advice: To enhance the relevance and uptake of climate information by smallholders, the GCF should invest in scaling up automated weather stations complemented by village level weather data collection using standard rain gauges. For automated stations, the project will need to identify a viable sustainability plan for internet data- which may include negotiating to have this paid for through devolution funds at RDC level. Farmers collecting rainfall data would need to be trained by MSD on accurate measurement, with data collected sent to the Agritex Officer for onward transmission to MSD. Having at least one rain gauge per village would increase data points for informing farmer decision making.

Use the farmer field school approach for disseminating climate information and other water, climate, and market advisories: The GCF project should build up on existing farmer field schools (FFS) for information dissemination to farmers. Locally generated rainfall data could then be interpreted by the Agritex officer and shared in these platforms.

Capacitate the MSD on areas where gaps exist with respect to the focus of the GCF project: MSD requires training around supporting institutions in mainstreaming climate change adaptation into various economic sectors, as well as on supporting stakeholders with appropriate decision support tools. Agritex and ZINWA both need training by MSD on data interpretation, processing and disseminating tailored climate messages to farmers and other users.

Strengthen capacity of irrigation management committees in water management: The Department of Irrigation in collaboration with Agritex should be capacitated to train and support irrigation management committees to set up and operationalize governance structures, including around management of water within irrigation schemes. A key element of this support would include helping to address past and ongoing conflicts in targeted irrigation schemes and supporting water users to develop and implement by-laws on water management, including use of climate proofing relevant to local area. (Short term)

Rehabilitate wetlands for sustainable access to irrigation water: The GCF project should consider building capacity for sustained irrigation through engaging the Environmental Management Agency (EMA) and local environmental committees in intervention areas to rehabilitate wetlands as a medium-term strategy for ensuring sufficient recharge for local water resources. This will ensure that in the medium to long term the irrigation activities are supported by reliable and sustainable for irrigation.

Strengthen farmer capacity in climate-proofing irrigation: The project should train farmers on climate proofing practices, including on how to harness data from rain gauges to inform irrigation scheduling. Learning from other irrigation schemes within and across districts on what works for climate-proofing irrigation could be facilitated through lead farmer exchange visits and or farmer led research through the farmer field school (FFS).

Sustainably intensify crop production under climate resilient water management through learning for transformation: The majority of farmers are already using climate resilient water management practices yet crop productivity under dry spells and drought stress appears to be low. The project should consider conducting a systematic review of these practices to facilitate learning on what works for increasing production using climate resilient water management practices. Farmer field schools facilitated by Agritex are recommended as platforms for farmer learning around such intensification, and this should be buttressed on learning from other farmers within and across districts, through lead farmer exchange visits, research from national agricultural research stations in different agricultural zones and harnessing this learning to transform practices locally.

Incentivize production of climate-resilient crops through promoting or strengthening offtake capacity for those crops: To encourage a shift in cropping systems in favour of climate-resilient crops, such as the traditional grains, the project should consider facilitating the capacitation of off-takers to get into contract with, and or increase their capacity, to purchase the local-climate smart crops. In a value chain approach, this would mean enhancing processor and aggregator capacity, through linking them more effectively with finance and technical assistance. Through strengthening livestock value chains, such as leather value chain on the back of government support, the project could support some low hanging fruits in ways that will increase household income and enable investment in climate resilient assets, including purchase of appropriate climate resilient inputs.

Use social media and field school platforms to increase capacity to collect data to inform locally relevant advisories: The GCF project should explore opportunities for engaging farmers in making observations and sharing data for informing advisories, for example, through the use of platforms such as WhatsApp and SMS. In addition, these platforms could be used for farmer sharing of market information, including early warning information, to protect farmers from exposure to market shocks.

Mainstream gender in the design, delivery, and measurement of results of this project: The low proportion of women in IMCs is indicative of gaps in awareness and practice of including women as active participants in the development process, especially in decision making. Supporting women without sufficient knowledge of the gender inequalities at the structural level, may inadvertently undermine their resilience and push them towards vulnerability. **Helping communities appreciate the needs of gender equity should precede any transfer of assets, lest this fuels GBV.** Gender should be mainstreamed in this project, along with youth.

The project should prioritize awareness raising on gender issues, including with respect to control of household assets and decision making over the use of household income and farming. Approaches should ensure that gender is actively mainstreamed in all capacity building activities, and throughout all other programmatic activities. Caution should be taken to ensure that women in leadership are not only meeting the quota but are indeed making decisions. This will require supportive infrastructure, including farmer to farmer exchanges between women in leadership across irrigation schemes, and other knowledge sharing events.

Track the participation of women in irrigation: Indicator 14 and 15 both focus on women in leadership in IMCs. Considering that more land under climate-proofed irrigation is under male farmers (2350ha) compared to women (1523ha), the project should monitor the change in women's access to irrigation as an indicator of women's empowerment through irrigation. An increase in the proportion of women owning land under irrigation and owning or accessing other strategic resources associated with irrigation, such as land, water, pumps, would be indicative of progress in gender and social inclusion.

Resource support institutions with appropriate tools for addressing gender issues in the project: In addition to gender awareness and responsiveness training that should be provided, the project should also focus on providing practical tools to support the implementation of project activities in irrigation. The Gender in Irrigation Learning and Improvement Tool (GILIT) can be used to support gender equity efforts in irrigation projects, while the REACH toolkit could provide guidance on how to include women in planning and evaluating irrigation projects. In the mid-term evaluation, the Pro-WEAI tool could be used to measure women's empowerment in irrigation.

Support the participation of young people and men in producer groups and VSLs: The project should consider supporting the participation of men and young people in producer groups and VSLs which appear to be female dominated. In addition, the project should consider integrating income generating activities to support household incomes in ways that will enable households to generate off-farm income that will contribute towards agriculture input costs sustainably. While targeting women's groups already in existence is cost effective and ensures effective efficient implementation, there will be need to understand existing challenges faced by these groups, including around managing for conflicts. Knowledge exchange between these groups should also be considered for enhancing their profitability and exploring possible collaborations.

Build strong and viable offtake capacity to stimulate transition towards climate-resilient value chains. There is evidence of farmers growing traditional grains under contract, but this is very limited with only few farmers engaged. The project should seek partnerships to strengthen the offtake capacity of food processors, including through increasing their access to capital, and ensuring that the legal framework is supportive of grain purchases by millers, as this will generate sufficient demand required to stimulate production of small traditional grains. At present farmers claim that they cannot produce these crops in large quantities as they consume a small portion and have no markets to offload excess. The same applies to livestock value chains, where the markets need to be more structured to allow farmers to sell at the right price as opposed to buyers detecting prices. In the beef and goat value chains, there are prospects for linking the project with the leather value chain programme that the

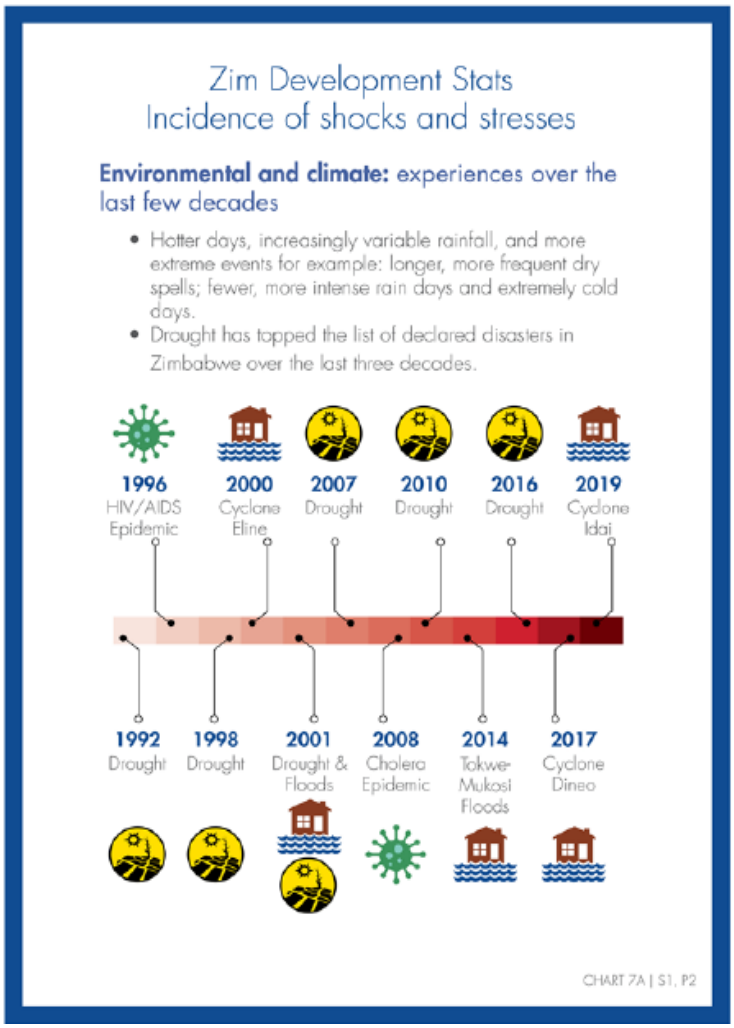
Government recently rolled out with support from donors. When farmers keep their livestock for hide, the quality of meat will improve and therefore, earn farmers more overall.

Strengthen product off-take capacity and broker farmer input schemes to incentivise uptake of promoted practices. It is important for the project to focus resources on learning more about the motivations for uptake of risk mitigating practices and behaviours and use this to inform programming. If off-takers are identified and linked with farmers, and in turn these off-takers are incentivised to provide inputs and extension advice, then farmers could be more forthcoming on technology uptake, leading to a reshaping and structuring of markets.

1. INTRODUCTION

1.1. BACKGROUND AND CONTEXT

Southern Zimbabwe is home to 30% of the country's 14.5 million people and 45% of the country's rural population, including some of the poorest communities in the country, with poverty prevalence across the Southern provinces ranging from 66-74%. According to the 2016 ZimVAC statistics, the highest proportion of food insecure households at peak hunger period can be found in Matabeleland South (44%), Masvingo (50%) and Midlands (48%) provinces.



Climate change and variability have been connected to increased food insecurity in Zimbabwe. According to one report, one of the main food producing regions in the country has shrunk by 49% due to shifting rainfall patterns. On the other hand, one of the dry regions in the country has increased by 22%. Other climate change induced effects that negatively affect food security are temperature increase and increased extreme weather events. The climate change risks in turn lead to greater evapotranspiration, increasing river run-off, more aridity and decreased soil water retention capacity. The impact is changing growing seasons, crop failure, reduced food security and income. As Figure 1 illustrates, climate change and variability plays a leading role in contributing to major shocks and stresses that Zimbabwe has experienced in recent years.

Figure 1: Recent incidence of shocks and stresses in Zimbabwe

In rural Zimbabwe, 80% of the population depends on rain-fed agriculture. For this population, in which women are a significant constituent, adverse climate is a serious threat

to food security and income. In the meantime, Zimbabwe spends an average of USD30 million on food relief every year, with expenditures rising to USD 50 million in 2016 when 4.3 million food insecure people were assisted due to El Niño-induced drought. Addressing the challenges induced by climate change impacts revenues at the national level.

Several barriers and gaps in supporting affected populations have been identified. These are:

1. Limited institutional support capacities and technical knowledge for farmers to adapt their production practices to climate-driven drought and mid-season dry spells;
2. Inadequate financial and technical capacity for climate-proofed irrigation investments and O&M to ensure sufficient and reliable water resources for crop irrigation to cope with rainfall variability and droughts;
3. Limited access to knowledge, markets, and value chains to shift away from subsistence to climate resilient agricultural livelihoods; and
4. Limited generation and dissemination of appropriate climate and weather information to smallholder farmers for climate-risk informed water and agricultural management

The “Building the climate resilience for vulnerable agricultural livelihoods in Southern Zimbabwe” project is designed to respond to these barriers and gaps. It is a seven-year project implemented by Government of Zimbabwe in partnership with the United Nations Development Programme (UNDP). The project receives funding from the Green Climate Fund (GCF). Its outcomes respond to two GCF-level impacts for adaptation: “Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions” and “Increased resilience of health and well-being, and food and water security” with respect to vulnerable smallholder communities in southern Zimbabwe.

1.2. THEORY OF CHANGE

A Theory of Change (ToC) of a project is a description of how and why an intervention will lead to the desired change. In other words, it describes the causal pathway linking the intervention to its anticipated outcomes and impacts. A theory of change analysis for each of the three main components of the project is provided below.

Component # 1: Increased access to water through irrigation and water management

Inputs

Funding for the project activities is provided by the UNDP through the Green Climate Fund (GCF) and the Zimbabwean Government. Funds will be used to undertake infrastructure improvements and hire qualified workforce to implement, monitor, and evaluate effectiveness of
the intervention.

Activities

Key activities include:

i) The revitalization of irrigation systems by climate proofing water infrastructure (through solar pumping, drip and sprinkler systems) that benefit farmers in 137 wards located in the droughtprone Southern provinces of Masvingo, Manicaland, and Matabeleland South
ii) Training local irrigation management committees (of smallholders) how to operate and maintain the climate-proofed infrastructure
iii) Facilitating knowledge exchange workshops between irrigation management committees to improve coordination and scaling up of climate resilient irrigation systems
iv) Training lead farmers on efficient-water use water management such as rainfall harvesting, soil moisture management and related water efficiency practices.

Outputs

Twenty-one community-level irrigation schemes, including delivery and water storage infrastructure, climate-proofed so as to sustainably increase volumes and reliability of water supply for smallholders in the face of increasing climate risks.
Farmers are trained on the use of sustainable irrigation practices using the “lead farmer” training
model. Smallholder farmers are trained on how to operate and maintain the climate-proofed infrastructure.

Outcomes

Successful completion of these activities can be measured by farmers’ access to and use climateresilient irrigation systems and efficient water resource management. Farmers who benefit from the intervention should be more knowledgeable about and willing to apply efficient water management techniques.

Goals

Increased agricultural yields, farm income, crop diversification, food security. The key goal is to reduce vulnerability of smallholder farmers in the three project provinces to the adverse effects of climate change by increasing reliance on climate-resilient irrigation systems and efficient water resource management.

Component # 2: Increased access to climate-resilient inputs and practices, and stronger market linkages

Inputs

Funding for the project activities is provided by the UNDP through the Green Climate Fund (GCF) and the Zimbabwean Government. Funds will be used to supply climate-resilient input packages to eligible smallholder farmers and hire qualified workforce to implement, monitor, and evaluate effectiveness of the intervention.

Activities

Key activities for this project component:

i) Creation of multi-stakeholder innovation platforms (IP) in select agricultural colleges and D&SS research stations to bring together famers, buyers, suppliers, financial institutions and relevant government agencies with the goal of increasing market access and development of value chains for climate-resilient crops
ii) Training AGRITEX and DR&SS staff to lead in local IPs and establishment of a nationallevel IP as a repository for knowledge generating from local IPs and bi-annual meetings over four years to coordinate the IPs
iii) Technical assistance to farmers in the form of legal support, marketing strategies and business planning particularly for women smallholders
iv) Training lead farmers in Farmer Field Schools (FFS) on climate resilient agriculture (CRA) practices and provision of CRA packages.

Outputs

Five multi-stakeholder IPs covering all 15 districts in the target provinces, each developing a specific value chain (horticulture, livestock, small grains).
6,900 lead farmers trained on CRA practices in FFS schools and 69,000 contact farmers trained by lead farmers on CRA practices, for a total of 75,900 trained farmers.
CRA input packages such as soil conservation, seeds, tools, fertilizer, distributed to 5,900 smallholder households.

Outcomes

Farmers who benefit from the intervention should have better market access and should be more knowledgeable about CRA practices.

Goals

More agricultural output produced and sold, easier farm input procurement, production of high value crops such as vegetables and leafy greens, agricultural crop diversification and more farm income.

Component # 3: Improved access to weather, climate and hydrological information for climate-resilient agriculture

Inputs

Funding for the project activities is provided by the UNDP through the Green Climate Fund (GCF) and the Zimbabwean Government. Funds will be used for the equipment to generate weather data and to hire qualified workforce to implement, monitor, and evaluate effectiveness of the component.

Activities

Key activities for this project component are:

i) Installation of rainfall and hydrological gauging stations in select irrigation sites; 12 automatic weather stations and 10 low-cost rainfall stations to improve rainfall monitoring, and 10 water level gauging stations in three catchments
ii) Multiple trainings for MSD & ZinWA and DR&SS/AGRITEX extension agents to strengthen their capacity to collect, analyze and timely disseminate tailored weather forecasts to farmers
iii) Upgrading existing systems and institutional capacities for hydro-meteorological data transmission and processing
iv) Disseminating climate information through mobile phones, community radio, community meetings and local posters and bulletins.

Outputs

Timely dissemination of precise and practical weather forecasts to smallholder farmers primarily by phone text messages.

Outcomes

Smallholder farmers should be able to interpret and use the climate and weather information supplied to them via text messages for improved crop/water management.

Goals

Using climate/weather information packages translated into impacts on water availability for crops to inform crop planting times, varietal choices, application of inputs (e.g. fertilizer), and crop irrigation scheduling.

1.3. Project Key Components and Objectives

Irrigation water access and management, climate-smart inputs, practices and technologies and access to weather, climate and hydrological information are the project's three strategic engagement areas. Its activities are implemented through several departments of the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development (MoLAFWRD). These are Department of Irrigation (DOI), Agricultural Extension Services (AGRITEX), Meteorological Services Department (MSD) and Zimbabwe National Water Authority (ZINWA).

For irrigation water access and management, the project will provide climate proofing irrigation infrastructure and field-based farmer training on rain-fed farms. It will also provide climate-resilient farm inputs and technologies, multi-stakeholder innovation platforms to access information on climate resilient agriculture and markets and field-based training on climate smart practices. Finally, as part of the climate smart engagement area, the project will provide institutional coordination and knowledge management. Under access to information, the project activities comprise installation and operationalization of weather/climate and hydrological observation networks, strengthen capacities of MSD and AGRITEX to develop and disseminate tailored, localized weather and hydrological products and capacity building of farmers and local institutional staff on effective use of weather, climate and hydrological information.

The project outputs along the three areas are:

a) Increasing access to water for climate-resilient agriculture through climate-resilient irrigation systems and efficient water resource management.

b) Increasing access to climate-resilient inputs and practices, as well as stronger market linkages; and

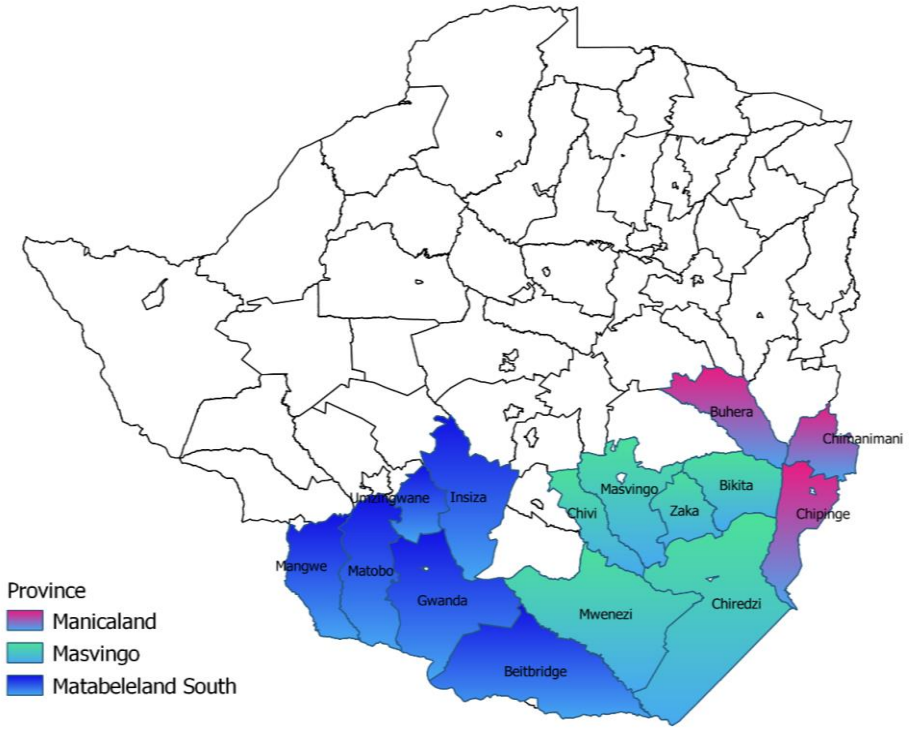
c) Improving access to weather, climate, and hydrological information for climate-resilient agriculture.

The project outcome is to strengthen the resilience of agricultural livelihoods of vulnerable communities, particularly women, in Southern Zimbabwe, in the face of increasing climate risks and impacts. UNDP estimates the project will benefit a total of 2,302,120 people: 543,620 directly and 1,758,500 indirectly.

1.4. PROJECT AREAS

The project is implemented in fifteen districts within three provinces of Southwest Zimbabwe; Manicaland, Masvingo and Matabeleland South. For Manicaland, the districts are Buhera, Chimanimani and Chipinge. For Masvingo, they are Bikita, Chiredzi, Chivi, Masvingo, Mwenezi and Zaka. The districts in Matabeleland South are Beitbridge, Gwanda, Insiza, Mangwe, Matobo and Umzingwane. The project delivery model is to strengthen the capacities of vulnerable smallholder farmers through Farmer Field Schools and peer-to-peer support to scale up climate-resilient agriculture, with access to resilient inputs, markets, and actionable climate information

Figure 2: Project districts



1.5. BASELINE PURPOSE AND OBJECTIVES

The purpose of the baseline is to undertake household data collection for a prospective, rigorous impact evaluation of the project. The baseline study will provide evidence-based information against which monitoring and assessing progress and effectiveness of the GCF project during and post-project implementation will be done. The survey will establish the pre-project conditions against which future changes amongst the target population can be measured.

Specifically, the survey was intended to explore the following baseline questions:

1. What is the status of capacity in design tailored climate information services?
2. Are farmers accessing and using climate information services for decision making?
3. What climate smart agriculture practices are farmers using and with what results?
4. What extent is crop production climate proofed?
5. What is the status of the water security in the project area?
6. What management capacity exists within farmer institutions at the project sites?
7. What is the food security status of targeted beneficiaries?
8. What is the household's risk perception and aversion and formal and informal risk management strategies?

2. METHODOLOGY

2.1. BASELINE SURVEY APPROACH

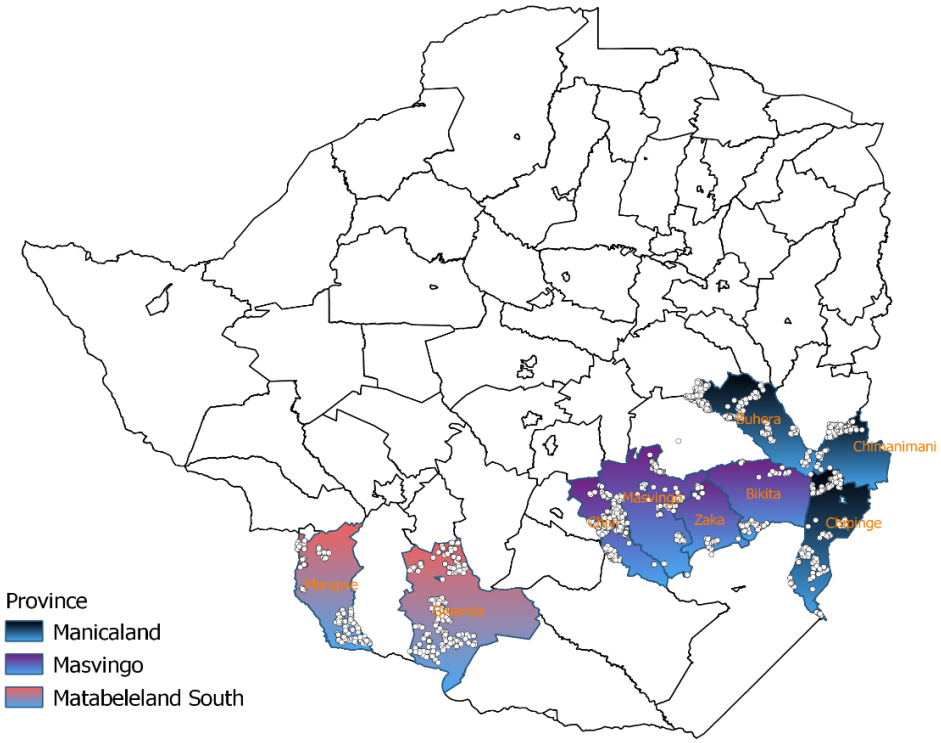
A matched pair's experiment design was used for the baseline. Smallholder farmers were assigned to one of three groups for the baseline survey to detect impact and any spill over effect. Farmers who are GCF beneficiaries were included in the treatment group, farmers in the treated villages and not beneficiaries were eligible to be included in the control in treatment group and lastly, farmers in untreated villages were eligible to be included in the pure control group. A sample was drawn from each of the categories and matched[1]. The baseline survey used a mixed-methods approach. The quantitative survey used a household questionnaire. KII and FGD guides were used to collect qualitative data.

2.2. SURVEY LOCATION AND TARGET POPULATION

UNDP selected 9 out of the 15 program districts for implementation of the baseline. Six of the program 15 districts are currently benefitting from resilience programs under the Zimbabwe Resilience Building Fund (ZRBF). There is substantial overlap in the activities of the ZRBF project and the UNDP project in that both invest in revitalization of irrigation systems, provision of farm inputs, and training farmers on CRA practices. To ensure that control area farmers are not benefitting from programs similar to the interventions of the project, the six districts were excluded from the baseline survey areas. The 9 districts that were selected are Bikita, Chivi, Masvingo, Zaka (Masvingo province), Mangwe and Gwanda (Matabeleland South) and Buhera, Chimanimani and Chipinge (Manicaland). Farmers in each of the three randomization groups (treatment, control in treatment and pure control) participated in the quantitative survey.

[1] See Appendix 3 for a summary of the matching.

Figure 3: Sample districts and households



The qualitative survey was carried out with farmers, IMC officials, community leaders and officials from different departments of MoLAFWRD. FGD's were conducted with youth, male and female farmers. KII's were conducted with district and ward level AGRITEX officers, MSD officers, ZINWA officers, DOI officers, IMC officials and community leaders.

2.3. SAMPLING STRATEGY

Farmer sampling across the 3 treatment groups was based on the frame of programme farmers that UNDP provided. The frame comprised treatment farmers that were listed in the 9 survey districts ordered by village.

To sample the treatment and control in treatment farmers:

1. Firstly, villages with less than 4 treated farmers were dropped. This had to do with efficiency. Visiting a village to do, say, one treated farmer interview would not be the best spend of time and money. This left us with a total of 322 focal villages.

2. The next issue was to figure out how to complete the target 1344 interviews from this focal number of villages; while also respecting the number of treated farmers within each. After trying several number configurations, we realized it was not possible to achieve the proposed 1344. Rather 1343 was attainable through the number configuration explained below.

(a) A sample of 4 farmers, each for the treated and control in treated groups, be selected and interviewed in 283 treated villages and,
(b) A sample of 5 farmers, each for the treated and control in treated groups, be selected and interviewed in 35 treated villages and,
(c) A sample of 8 farmers, each for the treated and control in treated groups, be selected and interviewed in 1 treated village
(d) A sample of 9 farmers, each for the treated and control in treated groups, be selected and interviewed in 2 treated villages
(e) A sample of 10 farmers, each for the treated and control in treated groups, be selected and interviewed in 1 treated village

Sampling of the pure control villages was based on two considerations. First a matching approach meant the number of villages selected should be half of the total number of treatment villages sampled. This calculation directed 161 pure control villages be sampled. The target respondent population in these villages was also a consideration. For example, some villages had fewer than 8 households. Hence, in a manner like what is explained above as having been done for the treatment and control in treatment groups, a number configuration in respect of these 2 considerations and that gives 1343 interviews was agreed. That was:

(a) A sample of 7 farmers in each of 25 pure control villages and,
(b) A sample of 8 farmers in each of 96 pure control villages and,
(c) A sample of 10 farmers in each of 40 pure control villages

Where the number of target treated farmers equalled that of the treated farmers in the village, a census was conducted. Otherwise, random selection was applied to select treated farmers. The control in treatment and pure control sample was selected randomly from the farmers who met the GCF farmer selection criteria.

Gender splits across the three categories were based on the proportions in the list of beneficiaries that UNDP provided. Thus, across the 3 categories, 887 females and 456 males were targeted. This is approximately 66% to 34% and is in line with the gender proportions in the said beneficiary list[2].

The qualitative survey respondents were sampled purposively in respect of their match to the intended profile.

[2] The Training Report produced for this survey provides further detail on quantitative sampling strategy in the "Sampling Strategy" chapter.

2.4. Data Collection Instruments

These were designed based on review of relevant documents shared by UNDP that include Baseline Assessment Report, Beneficiary Selection Criteria, Impact Design Workshop Report, GCF Annual Performance and Quarterly Reports, GCF Project documents as well as M&E plans.

The project M&E Plan and results framework were reviewed to identify indicators for which national and district level data would be required to inform the baseline position. In essence, the project indicators formed the basis for the development of tools for field data collection. We ensured that all the indicators are captured in the relevant tools and in the format and methodology described in the indicator reference sheets for the project.

2.4.1. Household Survey

The household tool comprised of modules that respond to the critical project indicators. These modules include:

- Household social economic Status
- Financial inclusion
- Climate information
- Access to and use of advisory services
- Farmer risk attitude and behaviour
- Crop production practices
- Livestock production
- Food insecurity experience
- Household experience of shocks and stresses
- Agricultural value chains
- Water, sanitation and hygiene
- Farmer capacity building
- Group membership

The tool was refined through internal review, by UNDP and during training and pre-testing by the field team.

2.4.2. Focus Group Discussions & Key Informant Interviews

Qualitative questions were developed based on the quantitative indicators to allow the assessment to gain a more nuanced and comprehensive understanding and description of the baseline scenario.

Two FGD tools were developed and refined in a manner similar to the quantitative tools; one for youth farmers and another for the more elderly farmers. Four KII tolls were developed; one each for AGRITEX officials, MSD officials, IMC officials and community leaders.

2.5. Baseline Data Collection Process

2.5.1. Enumerator selection and Training

Enumerators were selected from RMI's pool of research assistants based on education and research experience. AGRITEX officers were also invited to the training. Since the extension officers have direct links with beneficiaries (smallholder farmers), GCF PMU and MoLAFWRD agreed to involve extension officers in the monitoring and evaluation process of the project to promote capacity building, sustainability and ownership of data. Involving the extension officers helps them in improving their knowledge and skills sharing to the farmers as far as climate resilience is concerned. It is against this background that the consultants requested UNDP to recruit the Extension officers to be part of the enumerators training and field work data collection process.

The training workshop was conducted from March 23 to March 26, 2022; in Masvingo. In attendance were 63 Research Assistants, including 15 AGRITEX officers and 6 staff from RMI (technical and administrative staff). The training was also supported by two UNDP staff members in the monitoring and evaluation department who provided oversight and quality assurance throughout the training and baseline implementation process. The programming lead at Dalberg Research, who programmed the tool, joined virtually to help the participants understand how to use the software and programmed tool on their mobile devices.

The purpose of the training workshop was to give an overview of the project, purpose and objectives of baseline survey, introduce the survey tools to the survey team, train the team on administration of the tools to ensure uniformity in data collection, review and validate the final baseline study tools, prepare the survey team for the baseline survey, and plan for the data collection exercise. The data collection tools covered in the training were the household questionnaire, FGD and KII guides. Informed consent and other ethical principles and standards such as anonymity were also covered in the training. In addition, the training covered the Covid-19 Protocols for the training workshop as well as the field data collection.

The survey team was taken through each survey tool in turn. The process was to go through each tool question by question, explaining what the question was asking and where relevant, providing context and concept definition. Further, each question was in turn translated into the survey languages; Shona and Ndebele. To ensure that the survey team had understood the field process, protocols and tools, the survey team participated in role plays for the household survey and focus group discussions. The exercise provided participants an opportunity to get acquainted with all the questions in the tools, check the framing, flow and the sequence of the questions, assess the ease of comprehension of the questions and accuracy of translations and identify redundant and repeated questions. The accuracy of the skip patterns was also checked. Following the exercise, repetitions, redundancies and other discrepancies in the tools were identified and corrections made after deliberations in the plenary.

The corrected tools were then subjected to a pre-test exercise conducted within Chivi and Insiza districts in Masvingo and Mat South provinces, respectively. The pre-test exercise involved all RAs working in pairs, with the help of ward-based AGRITEX Officers particularly on community mobilisation. All challenges encountered and discrepancies identified following the pre-test exercise were noted and addressed on the last day of the training workshop. The

updated version of the household survey tool was uploaded in the Survey CTO data collection software in readiness for the baseline survey.

2.5.2. Data collection

To ensure proper matching of farmers, research assistants were provided with a list of sampled farmers disaggregated by sex in the treatment group. A breakdown of control farmers in the treatment villages and in the pure control villages was also provided. A list sampled villages in the pure treatment group was also provided stating the actual number of interviews disaggregated by sex to be conducted. Supervisors were provided with a summary to ensure correct matching is done.

Data collection was conducted concurrently in all the 9 districts during March – April 2022. For the quantitative survey, each district had a team comprising 6 enumerators and a supervisor. The AGRITEX officers were assigned across the teams to provide support in gaining cooperation with and recruiting the sampled farmers. The quantitative data was collected using Computer-Assisted Personal Interviews (CAPI). A team of 6 conducted the qualitative data collection across the districts.

A total of 4,180 farmer household surveys were done. 1,352 were done with treated farmers, 1,385 were done with the controls within treatment farmers and 1443 interviews were done with the pure control farmers. Table 1 below summarizes these totals first by number of interviews done by village and by total number of interviews done.

Table 1: Actual sample distribution across villages by household type

	Treatment		Control in treatment		Pure control	
Interviews/Village	Number of villages	Number of interviews	Number of villages	Number of interviews	Number of villages	Number of interviews
1			1	1		
2			1	2		
3	1	3	23	69		
4	275	1100	221	884		
5	42	210	56	280		
6	2	12	9	54	2	12
7			5	35	19	133
8	1	8	5	40	62	496
9	1	9	1	9	29	261
10	1	10			25	250
11			1	11	17	187
12					6	72
13					1	13
19					1	19
Total	**323**	**1352**	**323**	**1385**	**162**	**1443**

323 treated villages were visited. 162 pure control villages were visited. The number of interviews conducted per village did follow, for the larger part, the sample target. In some cases though, the number of target respondents per village fell below the base target number; 4 and 7 respectively for the treated and pure control groups and this was

communicated. Based on this, and to provide a buffer if some cases may be dropped during matching, it was agreed to oversample in several other villages. As a result, a total of 4,180 interviews was achieved against the target 4,029. The target gender split was attained across the 3 household types.

See Table 2 below for this digest.

Table 2: Sample distribution by gender

Farmer Type	Male		Female		Total		
	Actual	Gender %	Actual	Gender %	Actual	Proposed	% Achieved
Treatment	457	33.80	895	66.20	1,352	1343	100.70
Pure control	501	34.72	942	65.28	1,443	1343	107.40
Control	488	35.23	897	66.79	1,385	1343	103.20
Total	**1,446**		**2,734**		**4,180**	**4029**	**103.70**

Two youth farmer FGDs were done: one each in Chivi and Chimanimani. In each of the 9 survey districts, one male farmer FGD was done and one female farmer FGD was done. 14 KII's were done with AGRITEX; 9 at ward level and 5 at district level. 4 KIIs were done with MSD officials, 3 with ZINWA officials and 4 done with DOI officials. 10 KIIs were done with community leaders and 9 done with IMC officials.

2.5.3. Data Quality Assurance

During the fieldwork, the following quality control checks were conducted on an ongoing basis. On top of the hard coded survey tools that control enumerator errors, a team of data quality personal conducted error checks and raised any data quality issues promptly with the project manager who followed up the cases with the field team through supervisors. Un-resolved cases were dropped from the final data used for analysis. Some of the key data quality aspects examined include: quotas, GPS proximity, illogical skip patterns, incomplete surveys and outlier values.

UNDP was also provided access to the data server during fieldwork, should need arise for it or its stakeholders to verify the data.

2.6. DATA ANALYSIS

2.6.1. Quantitative Data Analysis

Quantitative data collected using the mobile devices was downloaded in STATA format for cleaning and analysis purposes. During data cleaning, outliers were be removed, and missing values labelled to ensure accurate data analysis. Analysis conducted comprises of basic frequencies, cross-tabulations, significance testing and regression analysis to ascertain matching of control and treatment candidates. We developed a comprehensive data analysis plan to guide data analysis and ensure that all indicators are thoroughly covered (See Appendix V).

Descriptive statistics included mean and standard deviation for continuous variables and frequency distribution and proportions for categorical and discrete variables. The results from intervention group and comparison group were compared using T-TEST for continuous variables and Chi-Squared test for categorical and discrete variables. The dependent variable was dichotomized and modelled using logistic regression to assess factors associated with the variations in the dependent variable. For all estimates, significance level of 0.05 was used and 95% confidence interval is reported alongside the estimates where necessary. All analysis were done in STATA v17.

2.6.2. Qualitative Data Analysis

Rigour in the analysis of the qualitative data comes from two principal sources. A systematic and structured content and thematic analysis of the FGDs, KIIs and field notes was done manually using a template created on Microsoft Excel. The analysis entailed an in-depth review of the collected data and summarized the unstructured textual content into manageable data relevant to the Evaluation criteria. This process was followed by identifying relevant/important data and its coding, which was then subsequently categorized into common themes. The summarized and analysed data was organized into matrices to extract the merging patterns on different programmatic aspects and perspectives of participants. All key findings were triangulated with secondary sources of information to make valid judgments and conclusions.

2.7. CHALLENGES DURING DATA COLLECTION

The first challenge in identifying a suitable counterfactual for households exposed to the GCF programme was identifying suitable locations from which to draw an appropriate pure control group. The original plan was to search for appropriate control groups from neighbouring villages exposed to similar agro-climatic conditions and risk profiles. Use of the above selection criteria proved to be challenging in some cases. The challenge came about in cases where neighbouring villages are benefitting from interventions like those of this project from other actors such as NGO's. It was decided that selection should focus on the GCF criteria in these cases; and ignore those other programs as their effect may as well be evenly distributed. Relatedly, in selection of control farmers, it was not always possible to find individuals meeting all the GCF eligibility criteria. It was agreed if the farmer met half or more of the conditions, they could be included in the sample. The other challenge encountered was achieving the same number of treated farmers across all villages. This resulted in different number of treated farmers interviewed per village although an attempted to interview uniform number of farmers was made.

2.8. LIMITATIONS OF THE STUDY

Some of the staff in various government department associated with the current project that were interviewed had been on the position for a noticeably short period of time to have sufficient experience and knowledge of the issues under the scope of the baseline. In some instances, strategic level key informants at the district had been assigned to their current positions during the Covid-19 pandemic lockdown and had not had an opportunity to visit any of the wards in their constituency. To address this, the study relied on multiple sources of data, including lead farmers who work closely with Agritex in implementation of agricultural programmes at the local level.

A significant proportion of respondents struggled with recalling financial information due to the currency changes which resulted in the strengthening of value as well as devaluation of the local currency.

There was a strong sense of expectation among respondents that the survey was intended to collect household data to support decision making on targeting of beneficiaries. The purpose of the survey was reiterated as being to collect baseline data for facilitating project monitoring and evaluation. Some respondents may have falsified their household information to appear vulnerable and meet the project's targeting.

3. PROJECT CONTEXTUAL INDICATORS

3.1. HOUSEHOLD DEMOGRAPHIC CONTEXT

Table 3 below shows a summary of household characteristics, across the three treatment groups, at baseline. The analysis presented here, as well as in the following sections of the report, is based on pre-matching data.

Table 3: Table of Demographics across the treated and control households

Household Demographic Characteristics Summary										
		Treatment		Pure control		Control		**Total**		
		%	N	%	N	%	N	**%**	**N**	P-value
Gender of farmer	Male	34	457	35	501	35	488	**35**	**1446**	0.714
	Female	66	895	65	942	65	897	**65**	**2734**	
	Total	100	1352	100	1443	100	1385	**100**	**4180**	
Age of farmer	Youth	25	334	31	443	30	418	**29**	**1195**	0.000**
	Middle age	30	411	22	312	21	289	**24**	**1012**	
	Elderly	45	607	48	688	49	678	**47**	**1973**	
	Total	100	1352	100	1443	100	1385	**100**	**4180**	
Level education	No education	3	36	4	52	4	57	**4**	**145**	0.246
	Primary	45	567	47	638	49	618	**47**	**1823**	
	Secondary	47	594	44	592	41	521	**44**	**1707**	
	Tertiary	1	15	2	23	2	21	**2**	**59**	
	Informal	0	4	0	2	0	1	**0**	**7**	
	ECD	4	52	4	50	4	54	**4**	**156**	
	Don't know	0	2	0	2	0	1	**0**	**5**	
	Total	100	1270	100	1359	100	1273	**100**	**3902**	
Marital status	Married living together	37	390	33	378	38	400	**36**	**1168**	0.017
	Married living apart	4	37	5	59	4	45	**4**	**141**	
	Separated	2	21	1	17	1	12	**2**	**50**	
	Divorced	1	12	2	21	1	11	**1**	**44**	
	Widow or widower	8	89	12	139	10	103	**10**	**331**	
	Single/Never married	48	501	46	533	45	474	**47**	**1508**	
	Total	100	1050	100	1147	100	1045	**100**	**3242**	
Religion	Other	0	5	1	18	0	5	**1**	**28**	0.000**
	Apostolic	42	574	35	510	43	590	**40**	**1674**	
	Christian (all groups)	54	730	60	867	53	728	**56**	**2325**	
	African traditional	3	37	3	42	4	57	**3**	**136**	
	Islam	0	6	0	6	0	5	**0**	**17**	
	Total	100	1352	100	1443	100	1385	**100**	**4180**	
Household size	1-5 members	48	643	62	890	55	757	**55**	**2290**	0.000**
	6-8 members	40	541	33	472	37	514	**37**	**1527**	
	>8 members	12	168	6	81	8	114	**9**	**363**	
	Total	100%	1352	100%	1443	100%	1385	**100%**	**4180**	

Note: ** p-value less than 0.001 denotes statistical significance at 99% confidence interval

Overall, female farmers represent 65 percent of the total sample across the three treatment groups. The greater proportion of farmers in the sample are elderly. For the treatment group, the proportion of elderly farmers is 45 percent.

Most farmers surveyed have primary or secondary level education. The combined total for these two education levels is 92 percent in the treatment group. There is relatively a higher proportion of farmers with primary education as compared to those with Secondary education in Mange (64.2 percent, 29.7 percent) and Chipinge (52.4 percent, 37.0 percent) while the reverse is true in Chimanimani 41.5 percent, 50.1% percent) and Bikita (35.1 percent, 54.9 percent) districts.

In the treatment group, as well as the control and pure control groups, greater proportion (46.5 percent) of the farmers are single farmers; followed by couples who live together (36 percent). Mangwe district has a higher proportion (57 percent) single farmers who were interviewed at baseline as compared to the rest.

Most of the sample, in treatment and the other two categories, follows the Christian or Apostolic faith. And while the majority of treatment group household size is smaller (1-5 members), the proportion of larger families (>8 members) is significant. Households with more than five members account for 52 percent in the treatment group.

Across the province and districts, there was no significant difference in how sampled farmers were selected by gender or household type (beneficiary or non-beneficiary). The proportion of elderly farmers in Mat. South (52.4 percent) was more as compared to Masvingo (45.1 percent) and Manicaland (46.3 percent). By district, Buhera (51 percent), Zaka (53 percent), Gwanda (54 percent) and Mangwe (50.4 percent) districts had more than half of the farmers being the elderly.

See *Appendix IV* for demographic summaries by Province.

Table 4: Further treatment households' identification 1

	Total	Household type		
		Treatment	Pure control	Control
	Average	Average	Average	Average
Household income	214.83	177.93	236.17	228.62
Household expenditure	106.26	102.07	111.66	104.73
Age of a farmer	61	61	61	62
I1: How much land for farming do you have access to (refer to 2021/22 season)	2.29	2.65	2.03	2.20

On average the beneficiary households have a lower income of USD 178 as compared to the pure control at USD 236 and control at USD 229. In terms of expenditure, the pure control households' tend to spend more on average at USD 112 as compared to the control households at USD 105 and beneficiary households at USD 106 (Table 4).

There was no major difference in the age of the farmers across the household types.

Beneficiary household had a greater access to land in the season before the survey at 2.65 ha as compared to household in pure control (2 ha) and control (2.2 ha) (Table 4).

Table 5: Further respodent profile

		Total		Household type					
				treatment		pure control		control	
		N	%	N	%	N	%	N	%
I11: If yes, what measures are you currently using to hedge against climate-related hazards?	Water harvesting	405	14.5	148	14.3	144	16.0	113	13.0
	Mulching	1281	45.7	541	52.3	378	42.0	362	41.8
	Terracing	247	8.8	101	9.8	62	6.9	84	9.7
	Crop rotation	1649	58.9	658	63.6	498	55.4	493	56.9
	No-till/minimum tillage	1410	50.3	534	51.6	464	51.6	412	47.5
	Cover cropping	1234	44.1	512	49.5	348	38.7	374	43.1
	Change in cropping patterns in last 3 years	350	12.5	145	14.0	89	9.9	116	13.4
	Use drought tolerant crops	1509	53.9	647	62.5	410	45.6	452	52.1
	Use drought tolerant varieties	1066	38.1	460	44.4	300	33.4	306	35.3
	Contouring	957	34.2	376	36.3	290	32.3	291	33.6
G2: If YES, how do you receive advisory or warning information for supporting agriculture and water management	SMS	357	17.4	195	21.4	69	12.1	93	16.5
	WhatsApp	250	12.2	135	14.8	53	9.3	62	11.0
	Extension officer	1755	85.7	824	90.3	496	86.7	435	77.4
	NGO staff	270	13.2	151	16.5	48	8.4	71	12.6
	Agro dealer	73	3.6	39	4.3	14	2.4	20	3.6
	Radio	414	20.2	191	20.9	101	17.7	122	21.7
	Newspaper	32	1.6	14	1.5	9	1.6	9	1.6
	TV	35	1.7	17	1.9	9	1.6	9	1.6
	Lead farmer	380	18.6	180	19.7	79	13.8	121	21.5
During the past 30 days did anyone in your household have to engage in any of the following behaviors due to a lack of food or a lack of money to buy food?	Sold household Assets/goods	266	13.9	77	12.8	88	13.9	101	14.8
	Reduced non-food expenses	872	45.5	268	44.4	284	44.9	320	46.9
	Sold productive assets or means of transport	141	7.4	37	6.1	46	7.3	58	8.5
	Spent savings on buy food	1073	56.0	361	59.9	342	54.1	370	54.3
	Borrowed money from a formal lender/bank	400	20.9	130	21.6	129	20.4	141	20.7
	Leased out land to buy food	55	2.9	13	2.2	21	3.3	21	3.1
	Withdraw children from school	280	14.6	81	13.4	95	15.0	104	15.2
	Sold last female breeding livestock to buy food	167	8.7	71	11.8	53	8.4	43	6.3
	Begging to get food	366	19.1	98	16.3	127	20.1	141	20.7
	Sold more animals	169	8.8	67	11.1	44	7.0	58	8.5
Farmer practicing irrigation	No Irrigation	3837	91.8	1227	90.8	1335	92.5	1275	92.1
	Irrigating	343	8.2	125	9.2	108	7.5	110	7.9
Household Hunger Scale	Little to no hunger in the household	1461	35.0	499	36.9	512	35.5	450	32.5
	Moderate hunger in the household	941	22.5	300	22.2	352	24.4	289	20.9
	Severe hunger in the household	1778	42.5	553	40.9	579	40.1	646	46.6
Household Dietary Diversity	Low dietary diversity	1831	43.8	537	39.7	631	43.7	663	47.9
	Medium dietary diversity	1708	40.9	577	42.7	605	41.9	526	38.0
	Good dietary diversity	641	15.3	238	17.6	207	14.3	196	14.2

Beneficiary households were better placed at utilizing mulching, cover cropping and use of drought tolerant crops to conserve water and soil nutrient to increase resilience of climatic hazards as compared to other household types. Extension officers being the common channel of receiving information on sustainable agriculture and water management, the treatment households had a greater access to them at 90 percent as compared to those in pure control (87 percent) and control (77 percent) households.

There was a high tendency to spend on saving to cope against shocks among 60 percent of the beneficiary households as compared to pure control households (54 percent) and control (54 percent).

Though the proportion of farmers practicing irrigation was small (8.2 percent), more beneficiary households (9.2 percent) practiced irrigation as compared to pure control (7.5 percent) and control (7.9 percent).

On household hunger, more households (42.5 percent) across the household types were facing hunger while the food nutrition and dietary was poor across all household with only 15 percent of the households having good dietary.

3.2. HOUSEHOLD SOCIOECONOMIC AND LIVELIHOODS STATUS

3.2.1. Monthly household income by cash sources

To ascertain the main source of livelihood among the sampled households, the respondents were asked what the households' most important source of income was for the last 12 months. Table **4** below shows split of the most important sources of income for the period between March 2021 and March 2022 across the sampled households.

Table 6: Most important household source of income in the last one year

Most important household source of income in the last one-year (%) N=4180															
		Household type			Gender		Age			Household size			Province		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	Manicaland	Masvingo	Mat. South
Food/cash crop sales	38.7	46.2	36.9	33.3	40	38	35.6	40.2	39.7	36.5	39.9	47.4	44.6	35.4	32.4
Casual labour	24.3	19.8	26.3	26.4	25.4	23.7	26.4	25.3	22.5	23.7	25.9	20.9	26.9	26	16.4
Remittances	13.3	9	15.1	15.6	10	15.1	13.3	10.2	14.9	16.3	10.1	8	9.2	12.8	22.2
Salary/wages	4.5	3.8	4.9	5	4.1	4.8	4.5	6.4	3.6	4.7	4.5	3.9	3.8	5.1	5
Livestock production/sales	4.2	5.6	2.9	4.1	4.2	4.2	3.9	4.2	4.3	4.1	4.5	3.6	3.4	3.4	6.8
Skilled trade/artisan	3	4.1	2	3	4.1	2.4	3.9	1.7	3.1	2.5	3.5	3.9	3.3	2.8	2.6
Own business	2.4	2.9	1.9	2.5	3	2.2	3.1	2.4	2.1	2.4	2.5	2.5	2.1	2.7	2.7
Pension	2.1	2.4	2.1	1.7	2.1	2.1	1.7	1.6	2.6	2.5	1.6	1.7	1.3	2.5	2.9
Petty trade	1.9	2.1	1.9	1.7	1.7	2	1.9	2.7	1.5	1.8	1.9	2.5	2.5	0.3	3.3
Small scale mining/ mineral sales	1.7	1	2.6	1.4	1.9	1.6	1.8	1.5	1.8	1.7	1.6	2.2	0.3	3.6	1.5
Gathering natural products for sale e.g., firewood	0.9	0.7	0.7	1.4	0.8	1	1	0.8	0.9	0.9	0.9	1.1	0.9	0.5	1.6
Beer brewing	0.8	0.8	0.8	0.8	0.6	0.9	0.6	1.2	0.8	0.8	0.8	1.1	0.2	2.1	0
Food assistance	0.6	0.4	0.3	1	0.4	0.7	0.4	0.4	0.8	0.7	0.7	0	0.2	0.9	1
Others (specify)	0.6	0.6	0.5	0.9	0.9	0.5	0.5	1	0.6	0.7	0.5	0.8	0.4	0.8	0.8
Begging	0.2	0	0.3	0.3	0.1	0.3	0.3	0.1	0.3	0.2	0.3	0	0.1	0.4	0.1
Fishing	0.2	0.3	0.1	0.2	0.3	0.1	0.3	0.1	0.2	0.2	0.2	0.3	0.2	0.3	0
Cross border trade	0.2	0.1	0.2	0.4	0.2	0.2	0.4	0.2	0.1	0.3	0.2	0	0.1	0.3	0.3
Rentals	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0	0.2	0.1	0.1	0.3	0.1	0.1	0.2
Not applicable (no other source)	0.1	0.1	0.1	0.1	0	0.1	0	0.1	0.1	0.1	0.1	0	0.2	0	0
Gifts	0	0	0.1	0.1	0	0.1	0	0	0.1	0	0.1	0	0.1	0	0.1
Currency trade	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1	0	0
Collecting scrap/ waste material	0	0	0.1	0	0	0	0.1	0	0	0	0.1	0	0.1	0	0
		Chi^2 = 150.03 Prob = 0.000			*Chi^2 = 49.9 Prob = 0.001*		*Chi^2 = 95.64 Prob = 0.000*			*Chi^2 = 83.64 Prob = 0.001*			*Chi^2 = 17.81 Prob = 0.000*		

Food/cash crop sales contributed the most to household income at 38 percent, 30.2 percent and 27.8 percent in the treatment, pure control, and control households respectively. This source was most important for large households (40 percent for households with >8 members) compared to smaller households (30.5 percent for households with 1-5 members). The trend was similar when disaggregated by gender and age. Casual labour was the second most important source of household income, contributing the least in the treatment households (19.8percent) and comparatively higher (26.3 percent and 26.4 percent) in the pure control and control households. This trend was also observed when the respondents were disaggregated by gender and location, being highest (26.9 percent) in Manicaland and

least (16.4 percent) in Matabeleland South. Other forms of household income (e.g., trade, salary/wages, artisanal mining etc) contributed less than 10 percent to household income, the trends reflecting a similar pattern when respondents were disaggregated by gender, location, household size and age. Remittances were an important alternative source of income for the elderly, and more so in Matabeleland South (12.6 percent) than in Masvingo (10 percent) and Manicaland (5.2 percent).

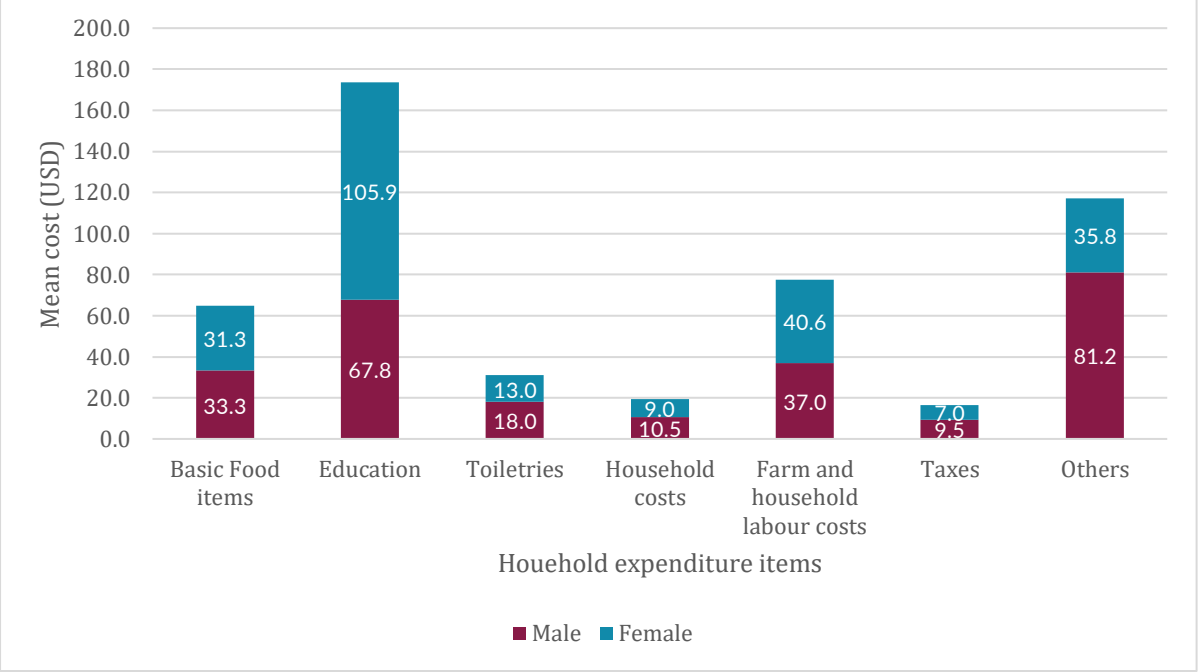
Households in which the father contributes the most to household income (mean 30 percent) compared to the mother (mean 27 percent) across all factors (age, gender and location), were almost equal in number to households in which both father and mother contributed to household income. Children (both male and female) contributed slightly higher (13.8 percent) to household income in Matabeleland South compared to 4.8 percent in Manicaland and 9.3 percent in Masvingo.

3.2.2. Household expenditures per month

Table 7: Household expenditure in the last calendar month (Feb/Mar 2022) ~ USD[3]

	Basic food items	Education	Toiletries	Household costs	Labour costs	Taxes	Other
Treatment	35.55	74.49	10.94	10.29	35.53	7.77	45.87
Pure control	35.43	101.56	23.24	8.81	46.25	7.34	96.54
Control	30.14	104.21	9.64	9.52	38.85	8.73	32.29
% Proportion	16%	33%	5%	5%	16%	3.5%	20.5%

Figure 4: Household expenditure in the last one year by gender



[3] All monetary value tables have adopted USD with conversion rates as: - 1 USD 2 Rand 3 Pula 4 ZWL

Education contributed the most to household expenditure across all disaggregation factors (household type, gender, age and location), being almost similar in the pure control and control groups (US$ 101.56 and US$ 104.21 respectively) compared to the treatment group (US$ 74.49), and a higher expenditure proportion for females (US$ 105.95) than for males (US$ 67.79). Food and labour costs contributed a similar expenditure proportion (16 percent) across all household types, ages and gender, while taxes contributed the least (3.5 percent). However, labour costs were significantly higher in Matabeleland South (US$ 51.60) compared to Manicaland (US$ 28.85). Similarly, education costs were significantly higher in Masvingo (US$ 130.89) compared to Manicaland (US$ 76.28) and Matabeleland South (US$ 54.47). The youth and elderly tended to spend more household income on education (US$ 119.14 and US$ 99.66) than middle-ages respondents (US$ 50.45). Overall, females had higher household income expenditure than their male counterparts in most counters (Table 8).

3.2.3. HH sources of food sources in the last one year

Table 8: Sources of HH Food over the past 12 months

Sources of HH Food over the past 12 months; N=4180															
		Household type			Gender		Age			HH Size			Province		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Own production	67.3	73.7	66.6	61.7	70.1	65.8	65.2	70.0	67.2	66.6	67.5	70.8	65.8	71.0	64.2
Cash purchases from household income	10.6	8.3	11.6	11.8	10.4	10.8	12.1	9.3	10.4	11.2	10.3	8.3	10.2	7.5	16.4
Purchases from cash transfers (humanitarian assistance)	0.2	0.2	0.1	0.2	0.3	0.1	0.2	0.2	0.2	0.1	0.3	0.0	0.0	0.1	0.8
Food aid (humanitarian assistance)	3.3	2.7	3.4	3.6	2.3	3.8	3.4	2.4	3.6	2.8	3.8	4.1	1.2	3.5	6.8
Casual labour for food	12.8	10.4	12.8	15.4	13.0	12.8	14.1	12.8	12.1	12.2	13.8	12.9	16.8	13.3	4.5
Remittances	5.2	4.1	5.1	6.5	3.5	6.1	4.4	4.6	6.1	6.6	3.7	3.0	5.2	4.1	7.2
Other	0.6	0.6	0.4	0.7	0.4	0.7	0.6	0.7	0.5	0.5	0.7	0.8	0.8	0.5	0.1
		Chi2 = 49.02 Prob = 0.000			*Chi2 = 25.23 Prob = 0.000*		*Chi2 = 17.6 Prob = 0.128*			*Chi2 = 31.87 Prob = 0.01*			*Chi2 = 215.43 Prob = 0.000*		

Own food production contributed the most (67 percent) to household food sources. About three quarters of the households in the treatment group (73.7 percent) produced their own food over the last 12 months, compared to pure control (66.6 percent) and the control (61.7 percent), and drawn on more by male (70 percent) than by female (65.8 percent) respondents. Cash purchases from HH income and casual labour for food contributed significantly (11 percent and 13 percent respectively) to household food sources, the youth relied on these sources than the other age groups (middle-aged and elderly respondents). These trends are consistent across all household types, ages and gender. Food purchases from outside sources of income e.g., cash transfers and remittances, are not significant contributors to household food sources across all factors (household type, gender and age). However, the elderly relied more on remittances for food sources than the young and middle-aged respondents, as well as female respondents relying slightly more (3.8 percent) on food aid sources than male respondents (2.3 percent).

3.2.4. Household sources of income

Table 9: Estimated total income per activity in the last calendar month (Feb/Mar 2022) - USD

	Remittances	Food/cash crop sales	Livestock sales	Casual labour	Forms of trade/ businesses	Salary/wages
Treatment	79.39	56.98	108.76	36.49	269.51	484.81
Pure control	80.14	43.85	106.25	33.70	93.25	1193.62
Control	67.37	42.19	95.14	32.95	235.92	1433.00
Mean	75.6	47.67	103.38	34.38	199.44	1037.14

Salary/wages earnings contributed the most to household income, three times higher in the control group (US$ 1433) than the least contribution in the treatment group (US$ 484.81). This similar trend was observed when the data was disaggregated by location, salary/wages earnings being highest in Masvingo (US$ 1841.48) and least in Matabeleland South (US$ 100.71), livestock sales and own business/beer-brewing making the greater contributions to household income than salary/wages earnings in Matabeleland South. Males contributed higher than females in all forms of household income, however, female household members make an almost equivalent salary/wages earnings contribution to the household income, and higher than males through social transfers and loans. Middle-aged household members contribute the most proportion of household income (e.g., US$ 1350.88 in salary/wages earnings), and youth the least, except in loans and rentals. A combination of forms of trade was a significantly higher contributor to total household income (US$ 269.51 and US$ 235.92 in the treatment and control households respectively) compared to livestock sales and remittances, with these three sources of income contributing almost equally to household income for the pure control households.

3.3. LIVELIHOODS AND ASSET-BASED COPING STRATEGIES

3.3.1.1. Livelihood coping strategy index

To compare coping capacity across variables of interest to the project, a Livelihood Coping Strategy Index was constructed following these steps. Initially, the respondents were asked for a set of questions regarding whether they had sold or made any changes to their assets or livelihoods in the last 30 days due to the lack food of or lack of money to buy food. The answers to these questions were either yes/no. 10 coping strategies were categorized into the following four groups: Emergency strategies- which affect future productivity, and are the most difficult to reverse; Crisis strategies- such as selling productive assets and reducing human capital formation and are difficult to reverse; Stress strategies-such as borrowing money, purchasing food using credit or savings, indicates a reduced ability to deal with future shocks and can lead to a current reduction in resources or increase in debt; and Neutral strategies:- do not employ any of the above strategies and reflect an improved ability to cope with shocks. The livelihood coping strategy index was then constructed as a weighted index of the adoption of these various types of coping strategies: LCSI = (adopt emergency strategy*4) + (adopt crisis strategy*3) + (adopt stress strategies*2) + (adopt neutral strategy*1) and the maximum score is (3 emergency strategies X4) + (4 crisis strategies X3) + (3 stress strategies X 2) = 30. The average LCSI per HH is reported for this indicator. The sum of these values yields the Livelihoods CSI. Households relying mostly on emergency and crisis strategies were likely to undermine their resilience capacity and affect their wellbeing.

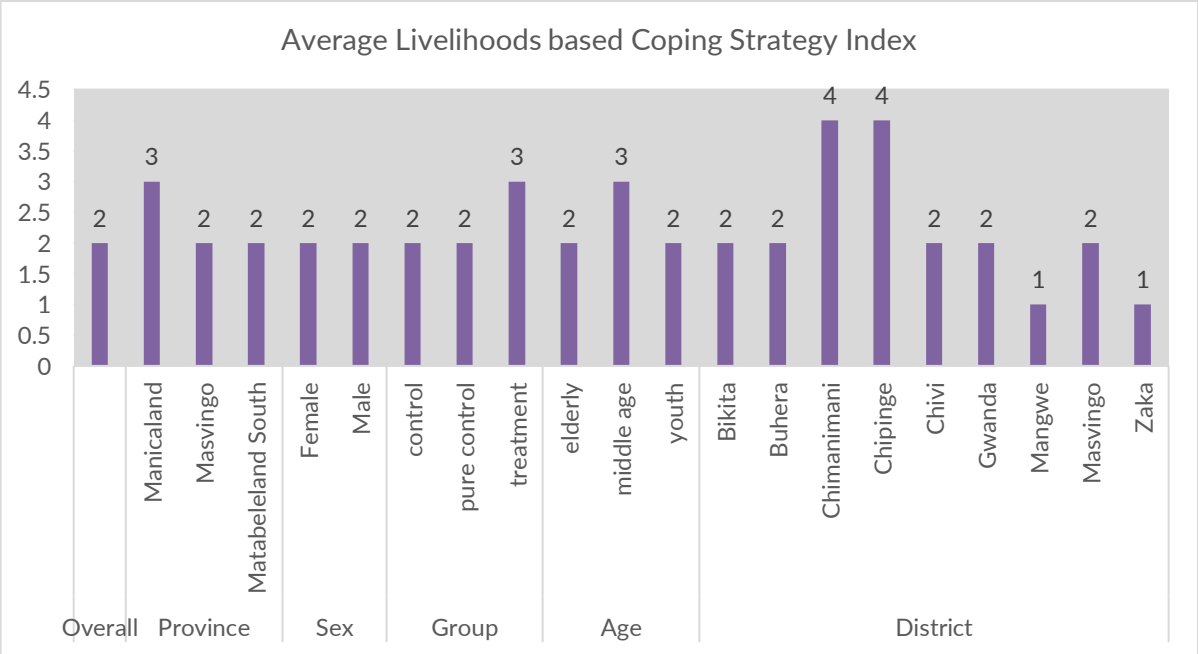


Figure 5: Average Livelihoods based Coping Strategy Index

The Livelihood Coping Strategy Index (LCSI) overall for the sample was 2. Manicaland had a slightly higher score of 3 with other provinces at 2. The baseline did not find any difference in LCSI by sex of farmer. However, based on age, middle aged respondents had a higher index at 3, compared to 2 for the other age categories. Treatment households had a higher LCSI (3) compared to the pure or control groups. Focusing on districts, the baseline found that Chimanimani and Chipinge (4) had a high LCSI, meaning that households in those districts were more likely to experience food insecurity and lack of sufficient income.

3.3.1.2. Average household income

Average monthly income was calculated for the surveyed households based on the 30-day recall period. The average monthly income in USD for the survey population was $215. The average monthly income ranged from $100 in Mat South to $366 in Masvingo province. Females had slightly higher average income than males, earning $241 against $201 for the other gender. Pure control households ($236) earned more than treatment ($229) or control ($178) households. With respect to age, the elderly had the highest average monthly income ($266), more than youth ($207), with middle aged respondents earning the least average ($172). Average monthly income varied quite substantially across the districts, with a range of $453. Gwanda had the highest average income at $524 monthly, followed by Chivi ($380) and Buhera ($276). Bikita ($91) and Zaka ($71) had the least average monthly income of all districts.

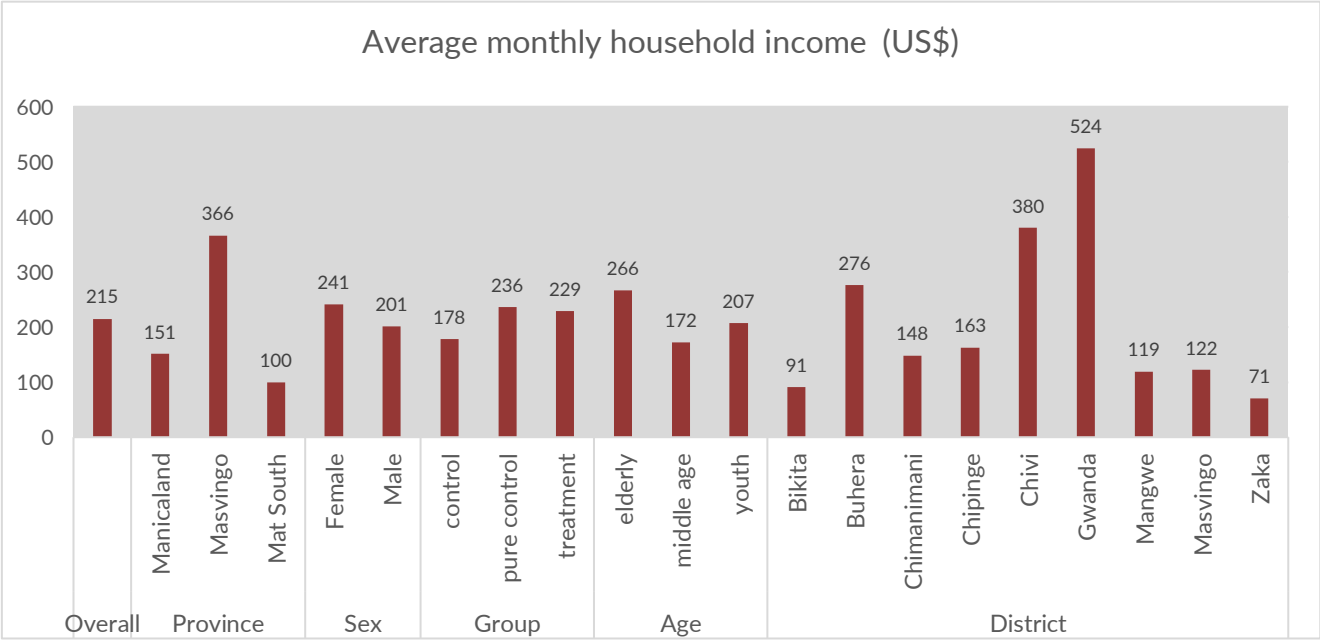


Figure 6: Average monthly household income

3.3.1.3. Livelihood Diversity

The diversity of a livelihood is a proxy of its likely exposure in the face of climate and other shocks and stresses. A diverse livelihood therefore is more likely to cope with and adapt to climatic and other shocks and stresses. To understand the level of diversity of livelihoods, a livelihood diversity score was calculated by assigning a score of 1 for each livelihood source for the 23 possible livelihoods in the project intervention areas. For livelihood activities where a household was not involved, a score of 0 was assigned. The sum of all the 23 individual score gives the livelihood diversity score.

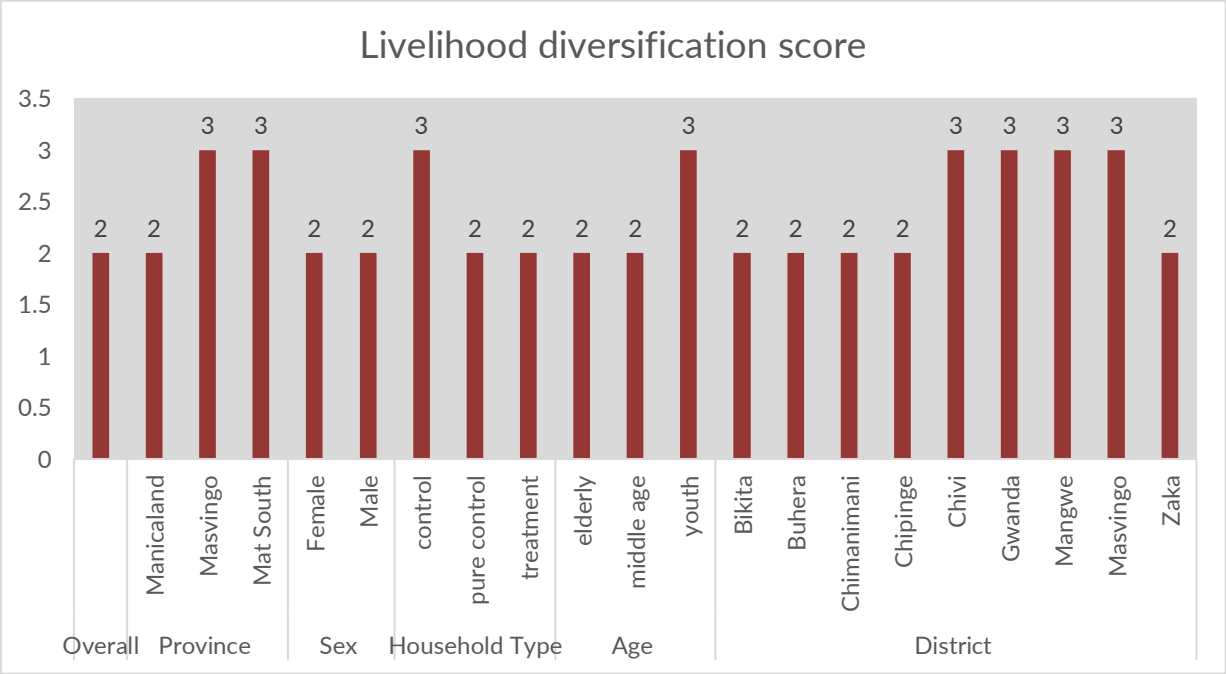


Figure 7: Livelihood diversification score

The overall livelihood diversity score for sampled households was 2, suggesting that incomes for the majority of households was derived from two activities. Across the project provinces, Manicaland had the least at 2, while Masvingo and Mat South were more diverse at 3 livelihood sources on average. There was no difference in livelihood diversity score by sex of farmer. However, age mattered in livelihood diversity with youth having a diversity score of 3 and other age categories at 2. Control households had a higher score at 3, with pure and treatment households at a score at 2. With the exception of Bikita (2), all districts in Masvingo had a score of 3, as were the districts in Mat South (Gwanda and Mangwe). All districts in Manicaland had a livelihood diversification score of 2.

3.3.1.4. Assets and Livestock Ownership

Livelihood assets, including livestock, are a key determinant of coping resources that households draw on in the face of adversity. A high asset and livestock score suggests that a household has more resources to draw from to constitute their adaptive or coping capacity. The baseline compared households based on the assets owned including the livestock they owned using an asset and livestock ownership score. This score was constructed from 8 productive assets and 10 livestock assets. Each of the assets was assigned a score of "1" if the household owned the asset at the time of the interview, otherwise a score of "0" was given if they did not. The sum of all the 18 individual scores comprises the asset ownership score.

The overall asset and livestock ownership score was 6. Manicaland, which had the least livelihood diversity score, also had the lowest asset score at 6, with the other provinces scoring 7. Focusing on the social groups, the baseline found that overall, female farmers had a higher asset score (7) compared to their male peers (6). Also, younger farmers had more assets (7) relative to their middle aged and elderly counterparts at 6. With respect to household type, the baseline found that control households had slightly more assets (7) compared to the other two household types at 6 apiece. Of all districts surveyed, only those in Manicaland had an asset score of less than 7. Buhera and Chimanimani had the least scores at 5, with Chipinge being slightly higher at 6.

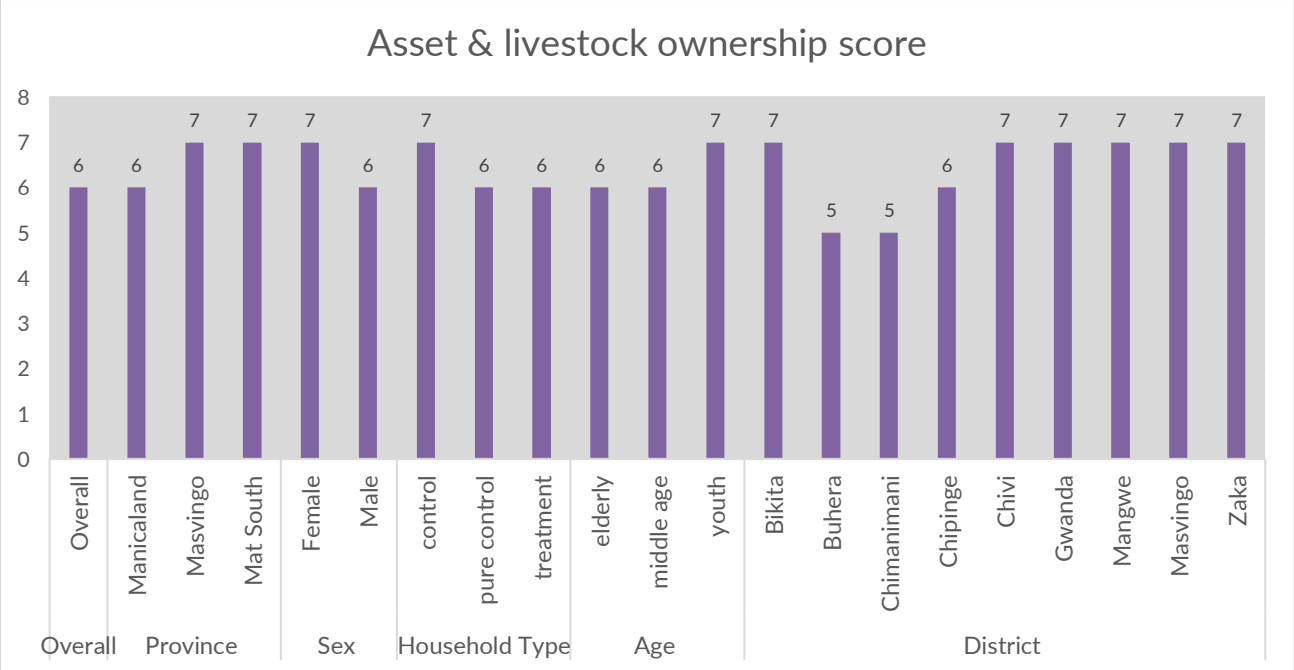


Figure 8: Asset & livestock ownership score

3.3.1.5. Livelihood Coping Strategies

At baseline households in the project intervention areas resort to a range of coping strategies to meet income and food requirements. Focusing on the 30-day recall period, the baseline found that 30 percent of households had spent savings to buy food; 22 percent had reduced expenditure on non-food expenses, and about 11 percent had borrowed money from a

lender or bank to meet living costs. Other adverse coping strategies used included selling household assets (6.4 percent); withdrawing children from school (6.7 percent) and selling breeding stock (5.9 percent) (Table 9)

Table 10: Asset based coping mechanism in the last 30 days upon lack of food

	Treatment		Pure control		Control		Total	
	%	N	%	N	%	N	**%**	**N**
Spent savings on buying food	30	361	27.8	342	27.3	370	**28.3**	**1073**
Reduced non-food expenses	22.3	268	23.1	284	23.6	320	**23**	**872**
Borrowed money from a formal lender/bank	10.8	130	10.5	129	10.4	141	**10.6**	**400**
Begging to get food	8.1	98	10.3	127	10.4	141	**9.7**	**366**
Withdraw children from school because of hunger	6.7	81	7.7	95	7.7	104	**7.4**	**280**
Sold household Assets/goods	6.4	77	7.2	88	7.4	101	**7**	**266**
Sold more animals (non-productive) than usual	5.6	67	3.6	44	4.3	58	**4.5**	**169**
Sold productive assets or means of transport (scotch cart)	3.1	37	3.7	46	4.3	58	**3.7**	**141**
Sold last female breeding livestock	5.9	71	4.3	53	3.2	43	**4.4**	**167**
Leased out land	1.1	13	1.7	21	1.5	21	**1.5**	**55**
Total	**100.0**	**603**	**100.0**	**632**	**100**	**682**	**100**	**1917**

3.4. HOUSEHOLD EXPERIENCES OF SHOCKS AND STRESSES

The GCF project will be implemented in Southern Zimbabwe, a region characterised by high poverty levels averaging 66-75 percent. Livelihoods in this region are predominantly dependent on agriculture, which has been underperforming since 2015, compounded by poor quality and quantity of rainfall with extreme events such as droughts or floods being the most damaging, along with intense mid-season dry spells. The southern provinces, which are the focus of this project, are not only particularly more exposed to climate change impacts, especially droughts and dry spells, but also have the least agricultural potential in terms of rainfall, temperature, and length of the growing season. Climate change impacts manifest through reduced crop yields, which ultimately undermine household food and nutrition security, as well as incomes from crops and livestock. This GCF project intends to deliver increased resilience and enhanced livelihoods of the most vulnerable people, communities, and regions. This module provides an important context within which the project is being implemented, with the anticipation that as resilience is strengthened in these communities through the project's interventions, then the proportion of households likely to report experiencing shock or stress will be reduced.

3.4.1. Household Shock Exposure index

A shock exposure index was constructed using the 27 possible shocks that a household could experience. If a household experienced a shock, a score of 1 was assigned, and if not, then a score of zero. The individual scores were summed up to produce the aggregate shock exposure index. Only households that experienced at least 4 shocks were considered.

Table 11: Shock exposure index by province, sex, household type, age of farmer, and district

		Province			Sex		Group			Age			District								
	Overall	Manicaland	Masvingo	Mat. South	Female	Male	control	pure control	treatment	elderly	middle age	youth	Bikita	Buhera	Chimanimani	Chipinge	Chivi	Gwanda	Mangwe	Masvingo	Zaka
Shock exposure index	**5**	6	6	4	5	5	6	5	5	5	5	5	5	5	6	7	6	5	7	4	3

The overall shock exposure index for the sample population was 5, with households in Manicaland (6) and Masvingo (6) having a higher exposure relative to those in Mat South (4). Gender and age of farmer were not relevant predictors of household shock exposure. However, the household type was correlated to the household's shock exposure index. The shock exposure index for the control households was 6, while the treatment and pure control were both at 5. Districts surveyed had significantly different shock exposure indices, with Chipinge and Mangwe having the highest at 7, followed by Chimanimani and Chivi (6). Zaka and Masvingo had the least shock exposure at 3 and 4, respectively.

Table 12: Proportion of households experiencing more than 5 shocks

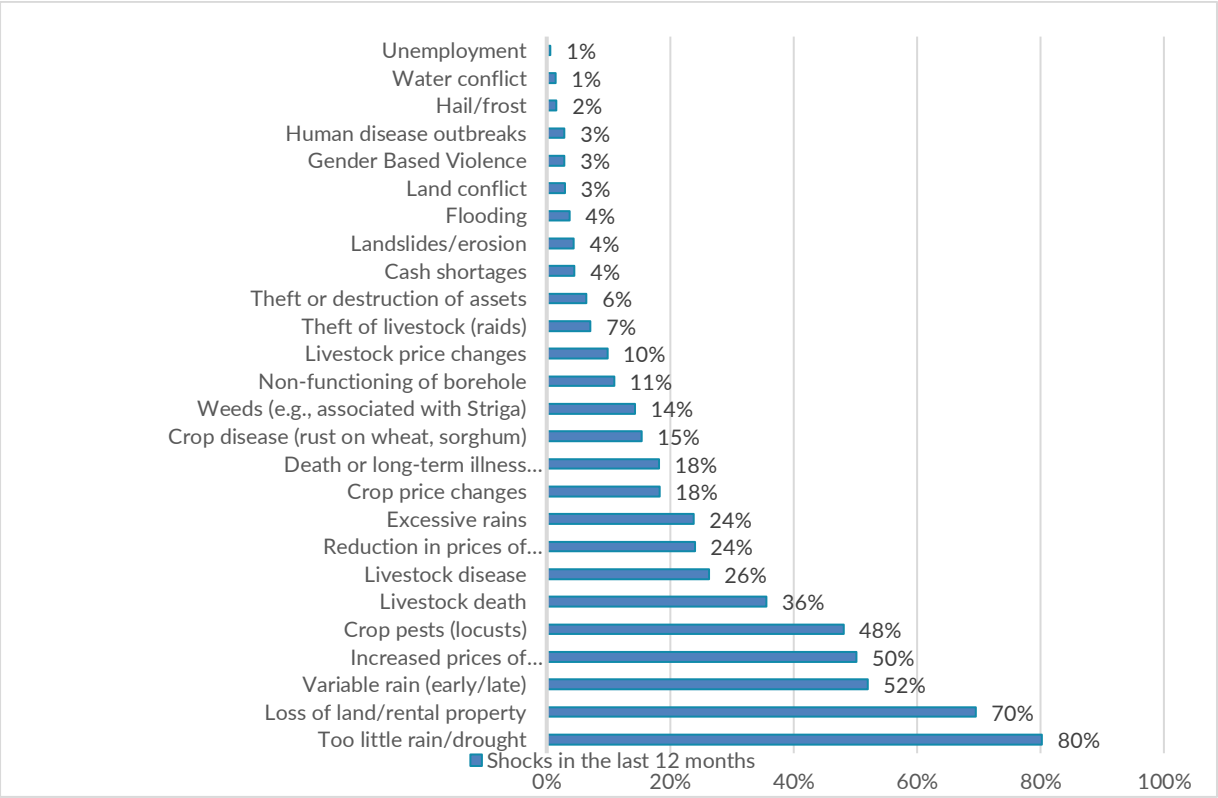
Shock experienced	Total	Household type			Province			Province									
								Manicaland			Masvingo				Mat. South		
								District			District				District		
		treatment	pure control	control	Manicaland	Masvingo	Matabeleland South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
0-5 Shocks	**58**	54	64	57	54	51	78	53	64	49	36	47	70	36	71	88
More than 5 shocks	**42**	46	36	43	46	49	22	47	36	51	64	53	30	64	29	12

More households in the pure control areas experienced more than 5 shocks as compared to their counterparts. Majority of the household in Chimanimani, Masvingo and Mangwe district were exposed to more than 5 shocks calling for more targeted intervention in the areas (Table 12)

3.4.2. Main shocks experienced

The baseline analysed households' experience of 27 shocks in the 12 month recall period. The top five shocks experienced across the household types were drought (80.2 percent); loss or land or rental property (69.5 percent); variable rain, such as early or delayed onset and season end (52 percent); increased price of agricultural inputs (50.2 percent) and crop pests (48.1 percent). For all these top five shocks, there were very negligible differences across household types. In the case of significant shocks such as livestock disease, treatment households appear to have suffered more (31.1 percent) than the control (26.5 percent) and pure control (21.3 percent) households. In contrary, control households appear to have suffered slightly more from livestock death, crop and livestock price changes, crop diseases and difficult weeds such as *Striga*. Almost a quarter of all respondents (N=4115) suffered from excessive rains (23.8 percent) and decreased crop and livestock commodity prices (24 percent), with treatment households having higher proportions of affected households. Figure 9 shows the shocks experienced by respondents (N=4115).

Figure 9: Household experience of shocks in the last 12 months



3.4.2.1. Household exposure to shocks by household type

The top five shocks experienced across the household types were drought (80.2 percent); loss or land or rental property (69.5 percent); variable rain, such as early or delayed onset and season end (52 percent); increased price of agricultural inputs (50.2 percent) and crop pests (48.1 percent). For all these top five shocks, there were very negligible differences across household types. In the case of significant shocks such as livestock disease, treatment households appear to have suffered more (31.1 percent) than the control (26.5 percent) and pure control (21.3 percent) households. In contrary, control households appear to have suffered slightly more from livestock death, crop and livestock price changes, crop diseases and difficult weeds such as *Striga*. Almost a quarter of all respondents (N=4115) suffered from excessive rains (23.8 percent) and decreased crop and livestock commodity prices (24 percent), with treatment households having higher proportions of affected households.

Table 13: Household experience by shock

M2. Did your household experience any of these shocks in the last 12 months? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
Type of shock	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Too little rain/drought	80.3	80.4	80	80.3	87.7	72.5	77.7	91.4	94.8	79	95.4	62	71.6	77.2	69.2	88.4
Loss of land/rental property	69.5	68.8	69.8	69.9	78.8	64.5	58.9	73.9	83	82.2	81.4	59.5	60.8	63	68.6	46.9
Variable rain (early/late)	52	52.8	49.6	53.7	51.9	62.3	35.8	51.4	47.8	54.9	96.5	63.9	36.5	68.5	37	34.3
Increased prices of agricultural inputs	50.2	51.3	49.5	49.7	58.2	47.7	38	72.1	31.1	57.9	51.9	51.3	36	65.2	35	41.8
Livestock death	35.6	38.5	31.7	36.8	36.6	44.1	20	42.1	33.9	31.6	46	38.2	50	50	24.5	14.4
Livestock death	35.6	38.5	31.7	36.8	36.6	44.1	20	42.1	33.9	31.6	46	38.2	50	50	24.5	14.4
Livestock disease	26.3	31.1	21.3	26.6	22.7	37.5	15.3	22.3	23	23	38.9	32.4	42	46.7	21.5	7.6
Decreased prices for agricultural products	24	26.8	20.3	25.2	30.2	26.4	7.7	39.5	20.9	24.7	18.9	29	24.8	40.2	11.5	3
Excessive rains	23.8	25.3	23.5	22.7	24.1	34.5	6.2	13.8	14.6	42.1	25.3	35.9	38.1	37	5.4	7.1
Excessive rains	23.8	25.3	23.5	22.7	24.1	34.5	6.2	13.8	14.6	42.1	25.3	35.9	38.1	37	5.4	7.1
Crop price changes	18.3	22.1	14.6	18.5	20.7	23.4	5.4	16.8	6.8	33.8	35.4	17.6	22.2	30.4	8.9	1
Crop price changes	18.3	22.1	14.6	18.5	20.7	23.4	5.4	16.8	6.8	33.8	35.4	17.6	22.2	30.4	8.9	1
Death or long-term illness	18.2	17.7	16.9	20.1	20.1	18.7	13.6	10.3	21.9	30.8	31.6	16	14	19.6	16.7	9.8
Non-functioning of borehole	10.9	12.3	8.9	11.7	8.7	12.8	12.4	6.8	3.7	14.1	9.8	13.9	14.4	6.5	17.9	5.5
Livestock price changes	9.9	13.3	6.5	10	11.1	11.3	5	11.9	2.3	15.5	7.4	6	19.3	21.7	8.5	0.8
Livestock price changes	9.9	13.3	6.5	10	11.1	11.3	5	11.9	2.3	15.5	7.4	6	19.3	21.7	8.5	0.8
Theft of livestock (raids)	7.1	8.4	5.8	7	7.7	3.6	11.3	4.8	7.3	11.4	6	1	5.3	6.5	17.7	3.3
Theft of livestock (raids)	7.1	8.4	5.8	7	7.7	3.6	11.3	4.8	7.3	11.4	6	1	5.3	6.5	17.7	3.3
Theft or destruction of assets	6.4	6.4	5.5	7.5	6.4	5	8.7	4.6	5	9.5	4.9	4	5.3	10.9	12.7	3.8
Theft or destruction of assets	6.4	6.4	5.5	7.5	6.4	5	8.7	4.6	5	9.5	4.9	4	5.3	10.9	12.7	3.8
Cash shortages	4.5	5.6	2.4	5.5	5.9	2.5	4.7	4.7	3.9	8.6	3.9	1.9	1.8	5.4	8.2	0.3
Flooding	3.7	4	3.5	3.7	4.6	3.4	2.3	1.7	5	7.8	6	2.9	2.5	3.3	3.8	0.5
Land conflict	2.9	3.7	2.1	3	1.7	3.1	5	0.8	1.8	2.8	3.2	2.9	2.1	8.7	8.9	0.3
Gender Based Violence	2.9	2.7	2.6	3.3	3.2	3.6	1	1.8	3.4	4.9	5.6	4.4	1.1	3.3	1.2	0.8
Human disease outbreaks	2.8	2.8	2.6	3.1	3.2	2.2	3	1.8	1	6.3	2.8	2.3	1.4	4.3	4.4	1.3
Human disease outbreaks	2.8	2.8	2.6	3.1	3.2	2.2	3	1.8	1	6.3	2.8	2.3	1.4	4.3	4.4	1.3
Hail/frost	1.6	2.2	1.4	1.2	1.5	2	1.2	0.9	1.3	2.2	2.5	2.8	0.2	3.3	1.6	0.8
Water conflict	1.4	1.8	1.3	1.2	1.1	1.2	2.3	0.8	1.6	1.3	2.1	0.6	1.6	0	2.4	2.3
Unemployment	0.6	0.4	0.6	0.8	0.6	0.8	0.4	0	0.5	1.3	0.7	1.1	0.2	1.1	0.8	0

The age and gender of respondent did not have any influence on the experience of shock. In comparison with the other provinces, sampled households in Manicaland suffered from drought, loss of land or rental property, crop diseases, and decrease in prices of agricultural products for both crops and livestock. In Masvingo, relative to the other provinces, respondents suffered the most from crop pests, variable rainfall, excessive rains, and both illness and death of livestock. Households in Mat South suffered the worst in terms of livestock theft and problematic weed pressure. Mat South also had the fewest reported cases of crop diseases and pests and was the least impacted by morbidity or death within households, and gender-based violence.

At district level, drought most affected households in Bikita (95.4 percent) and Chimanimani (94.8 percent). These were also the districts with the highest frequency of households affected by loss of land or property, with 81.4 percent and 83 percent of households affected, respectively. Districts like Gwanda (69.2 percent) and Chivi (62 percent) had

relatively fewer households reporting drought as a shock experienced. Linked closely to drought, was the variable rainfall pattern characterised by unclear onset or end of rainfall season or events. Like drought, Bikita was the most affected with 96.5 percent of households citing this shock. Other districts were much lower, relatively, and Gwanda (37 percent) and Mangwe (34.3 percent) in terms of variable rainfall experience. With respect to land or property loss, Mangwe (46.9 percent) and Chivi (59.5 percent) were the least affected districts. The most important market shock experienced was the increase in agricultural input prices. Buhera and Zaka were the most affected districts at 72.1 percent and 65.2 percent, respectively. In contrast, Gwanda (35 percent) and Chimanimani (31.1 percent) had the lowest frequency of households reporting increased prices of agricultural inputs. Livestock death as shocks was reported mostly in Masvingo and Zaka (50 percent apiece) and Bikita (46 percent), and district in Mat South being the least affected. Households in Gwanda (24.5 percent) and Mangwe (14.4 percent) had the least cases of livestock death as a shock.

3.4.3. Shock Severity, Impacts on Income and Food Consumption

3.4.3.1. Shock severity on household income

Overall, considering the mix of shocks that households in the intervention areas were exposed to, the study found that for 17 percent of surveyed households (N=4115), the shocks did not result in any change in household income. For 36 percent of households, however, the impact of shocks was a slight decrease in income. Severe decrease in income was reported by nearly half the respondents surveyed (48 percent), suggesting that a substantial proportion of households lacked sufficient capacity to deal effectively with the range of shocks that they were exposed to (Table 14).

Table 14: Severity of the impact of shocks on household income

	Column Responses %	Count
Remained the same	17	1119
Slight decrease	36	2390
Severe decrease	48	3203
Total	100%	4114

3.4.3.2. Shock severity on household income by household type

When severity of shocks on household income was analysed for different household types sampled in this study, it was found that there was no statistical difference between the cases in each of the three groups, implying that shocks had the same effect in treatment and pure control households as they did on the control ones. Across all household types, 16.7 percent of households remained the same income-wise despite shock exposure, while 35.6 percent suffered a slight decrease, and 47.7 percent a severe decrease in income. Neither gender nor age of respondent mattered in influencing the impact of shocks overall on household income.

Table 15: Severity of impact of shock on household income by household type

	Treatment (% N)	Pure control (% N)	Control (% N)	Total (% N)

Remained the same	27.5	368	26.5	374	27.7	377	27.2	1119
Slight decrease	61.9	830	56.5	797	56.0	763	58.1	2390
Severe decrease	79.4	1064	73.8	1041	80.6	1098	77.9	3203
Total	100.0%	1340	100.0%	1411	100.0%	1363	100.0%	4114

3.4.3.3. Shock severity on household income by location

Survey data shows that household incomes were worst impacted by shocks in Mat South where 56.9 percent of households suffered a severe income decrease in the twelve months under review. At 43.6 percent Masvingo had the least proportion of households reporting severe decrease in income as a result of shocks experienced by households. In contrast Manicaland had slightly more households whose income did not change due to shocks experienced.

Table 16: Severity of impact of shock on household income by location

	Manicaland (% N)		Masvingo (% N)		Mat. South (% N)		Total (% N)	
Remained the same	28.7	513	28.1	402	22.8	204	27.2	1119
Slight decrease	57.0	1020	70.5	1009	40.4	361	58.1	2390
Severe decrease	76.4	1367	76.2	1091	83.3	745	77.9	3203
Total	100.0%	1789	100.0%	1431	100.0%	894	100.0%	4114

3.4.3.4. Overall impact of shocks on household income

Table 17: Severity of shocks on household income

M3. How severe was the overall impact on your household's income? by Shock/stress					
	Remained the same (%)	Slight decrease (%)	Severe decrease (%)	Total (%, N)	
Too little rain/drought	36.6	15.5	47.9	79%	3302
Loss of land/rental property	36.6	15.7	47.7	68%	2860
Variable rain (early/late)	37.6	16.1	46.3	51%	2140
Increased prices of agricultural inputs	35.9	17.9	46.2	49%	2064
Crop pests	38.4	17.9	43.7	47%	1978
Livestock death	36.2	18.4	45.4	35%	1465
Livestock disease	37.4	16.6	46	26%	1080
Decreased prices for agricultural products	37.6	16.1	46.3	24%	988
Excessive rains	33	19.9	47.1	23%	980
Crop price changes	35.9	16.7	47.4	18%	754
Death or long-term illness	45	9.5	45.5	18%	750
Crop disease	38.7	18.8	42.6	15%	633
Weeds	40.6	19.3	40.2	14%	589
Non-functioning of borehole	34	18.7	47.3	11%	450
Livestock price changes	36.3	13.4	50.3	10%	406
Theft of livestock (raids)	37.1	16.1	46.8	7%	291
Theft or destruction of assets	38	16.7	45.3	6%	265
Cash shortages	30.9	16.4	52.7	4%	184
Landslides/erosion	37.4	18.3	44.4	4%	180
Flooding	33.2	20.5	46.2	4%	152
Land conflict	38.3	14.4	47.3	3%	120
Gender Based Violence	38.9	19.7	41.4	3%	118
Human disease outbreaks	32.1	26.2	41.6	3%	117
Hail/frost	38.5	27.3	34.3	2%	65
Water conflict	32.5	24.2	43.3	1%	58
Unemployment	31.1	22.2	46.7	1%	25
Total	16.7%	35.6%	47.7%	100.0%	4114

Error! Reference source not found. shows the proportion of households that experience no, mild or high effect of specific shocks on their incomes. Across all shocks, with the exception of frost or hail (34.3 percent), at least two fifths of all households reported a severe decrease in household income. Cash shortage as a single shock had the highest proportion of households that experienced severe decrease in income. This was linked to lack of mode of payment for casual labour or for grain or livestock sold, leading to in-kind and other non-cash payments, with the result being fewer opportunities for income earning.

3.4.3.5. Shock severity on household food consumption by household type

Focusing on the twelve-month period prior to the baseline survey, field data suggests there was no statistically significant difference in the severity of shocks as experienced by the different household types sampled across all severity levels (Table 18). In fact, there was also no difference in shock severity by gender or age of the respondents.

Table 18: Shock severity on household food consumption by household type

	Treatment (% N)		Pure control (% N)		Control (% N)		Total (% N)	
Remained the same	26.4	354	24.1	340	25.2	344	25.2	1038
Slight decrease	60.1	805	54.9	774	55.0	750	56.6	2329
Severe decrease	80.7	1082	77.5	1093	82.1	1119	80.1	3294
Total		1340		1411		1363		4114

3.4.3.6. Shock severity on household food consumption by location

Across all three provinces the proportion of households whose food consumption did not change despite the shocks remained the same averaging 15.6 percent. Despite Mat South having the least proportion of households that experienced slight decrease in food consumption, the province had the highest share of households that expressed having experienced a severe decrease in food consumption (57.1 percent). In fact, across all provinces the proportion of households that experienced severe decrease in household food consumption was higher than either of households experiencing a slight decline or no change.

Table 19: Shock severity on household food consumption by location

	Manicaland (% N)		Masvingo (% N)		Mat. South (% N)		Total (% N)	
Remained the same	16.1	462	15.0	374	15.6	202	15.6	1038
Slight decrease	34.1	981	39.9	993	27.4	355	35.0	2329
Severe decrease	49.8	1432	45.1	1122	57.1	740	49.5	3294
Total	100.0%	1789	100.0%	1431	100.0%	894	100.0%	4114

3.4.3.7. Overall severity of shocks on household food consumption

Surveyed households reported that they were exposed to and impacted by the various shocks differently. The analysis sought to establish the relative impact of these shocks based on the respondents' own assessment of the shock's effect on household food consumption. The shocks for which a higher proportion of affected households did not experience any change in food consumption include effects of hail or frost (26.5 percent); human diseases outbreaks (26.1 percent); unemployment (22 percent) and conflicts over water (22.5 percent).

The top six shocks that had the severest impact on food consumption were cash shortages (53.1 percent); livestock price changes (50.7 percent); crop commodity price changes (49.9 percent); too little rain or drought (49.8 percent); unemployment (49.5 percent) and loss of land or rental property (49.5 percent).

Table 20: Severity of impact of shocks on household food consumption

	M4. How severe was the impact on your household's food consumption?				
	Remained the same	Slight decrease	Severe decrease	Total	
Excessive rains	17.5	33.2	49.2	100.0	980
Livestock disease	16.2	36.5	47.3	100.0	1080
Livestock death	17.8	35.7	46.6	100.0	1466
Livestock price changes	13.9	35.5	50.7	100.0	406
Crop price changes	16.3	33.8	49.9	100.0	754
Human disease outbreaks	26.1	29.3	44.6	100.0	117
Theft or destruction of assets	17.3	36.2	46.5	100.0	265
Theft of livestock	16.2	35.8	48.0	100.0	291
Land conflict	14.5	38.5	47.1	100.0	120
Water conflict	22.5	35.8	41.7	100.0	58
Gender Based Violence	18.4	38.9	42.7	100.0	118
Flooding	20.1	32.4	47.5	100.0	152
Increased prices of agricultural inputs	16.0	34.9	49.1	100.0	2064
Decreased prices for agricultural products	14.8	36.7	48.5	100.0	988
Cash shortages	17.7	29.3	53.1	100.0	184
Loss of land/rental property	14.7	35.8	49.5	100.0	2860
Unemployment	22.0	29.3	48.8	100.0	25
Death or long-term illness	9.4	43.3	47.3	100.0	750
Non-functioning of borehole	18.0	33.9	48.1	100.0	450
Too little rain/drought	14.4	35.8	49.8	100.0	3302
Variable rain (early/late)	15.1	36.8	48.1	100.0	2140
Hail/frost	26.5	39.0	34.6	100.0	65
Landslides/erosion	18.7	37.3	44.0	100.0	180
Crop disease	18.3	38.3	43.4	100.0	633
Crop pests	16.8	37.7	45.5	100.0	1979
Weeds	19.4	40.1	40.5	100.0	589
Total	15.6%	35.0%	49.4%	100.0%	4115

3.4.3.8. Coping strategies for main shocks

The survey also identified the main strategies for coping with the shocks that they were exposed to. With a specific focus on drought, the top four coping strategies used were reducing food consumption (37.7 percent); taking up casual labour (15.2 percent); and selling livestock (8.6 percent). About a fifth (22 percent) reported that they did not have any strategy for coping with drought. Further, the coping strategies were analysed by district.

Table 21: Drought coping strategies

	Province								
	Manicaland			Masvingo			Matabeleland South		
	District								
	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Reduce food consumption	24	56	48.5	41.5	35.5	41.5	39.4	42.5	21.7
Sell livestock	7.8	8	5.9	7.9	4.5	4.9	3	14.3	18.5
Take up new wage labour/casual labour	15.4	15.6	19.4	24.2	24.2	14.7	4.5	3.7	4.7
No coping strategies	29	10.2	22.7	32.5	13.2	27.8	47	15	16.4

Reducing food consumption in response to drought was most used as a coping strategy in Chimanimani (56 percent) and Chipinge (48.5 percent), but less important in Buhera (24 percent) and Mangwe (21.7 percent). Selling livestock was a strategy used by most households in Mangwe (18.5 percent) and Gwanda (14.3 percent). Casual labour was another coping strategy in response to drought, used by a quarter of respondents in Bikita and Chivi. Casual labour was less of a coping strategy for Gwanda (3.7 percent), Mangwe (4.7 percent) and Zaka (4.5 percent). The survey also encountered some households that had no coping strategies to deal with drought. In Zaka, 47 percent of households that were affected by drought had no coping strategy to depend on. The figure was also high for Bikita (32.5 percent) and Buhera (29 percent). Despite Chimanimani having the second highest proportion of households affected by drought, the district had the least proportion of households without any coping strategies.

3.4.4. Covid-19 Experience and Implications on Rural Livelihoods

3.4.4.1. Proportion of households affected by Covid-19

Across all intervention areas 9.4 percent of all households reported at least one member of household falling ill to Covid-19 between March 2021 and March 2022. The prevalence was 10.8 percent for treatment households and slightly lower at 9.6 percent and 8 percent for control and pure control households, respectively.

Table 22: Proportion of households reporting illness due to Covid-19 by household type

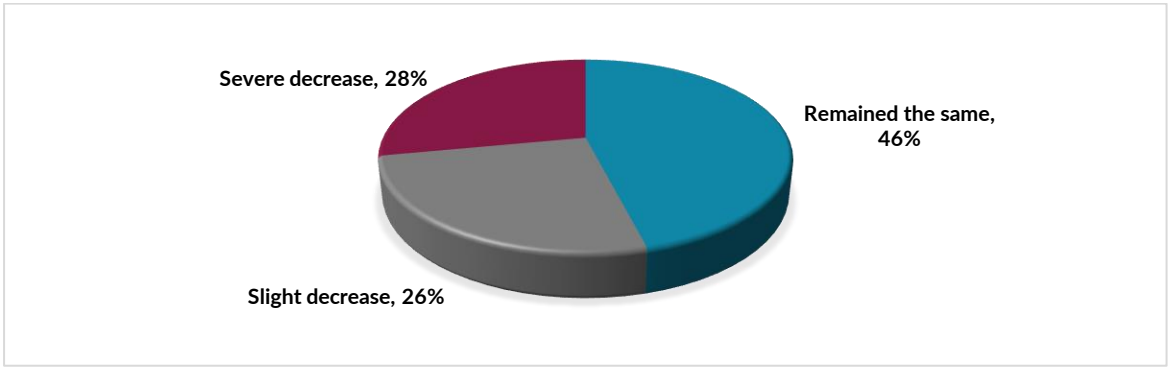
	Did anyone in the household fall ill to Covid-19 during the period March 2021 to March 2022		
	No (%)	Yes (%)	Total (%)
Treatment	89.2	10.8	100.0
Pure control	92.0	8.0	100.0
control	90.4	9.6	100.0
Total	90.6%	9.4%	100.0%

Slightly more male respondents (10.2 percent) reported an experience of Covid-19 in their households than female respondents (9.0 percent). Younger respondents were the least likely to have experienced Covid-19 in their households (8.7 percent) compared to the elderly (9.2 percent) and middle-aged respondents (10.9 percent). There was no statistically significant difference in prevalence of Covid-19 reported by households across the three provinces at 9.4 percent.

3.4.4.2. Effect of Covid-19 on household income

Most households surveyed reported that their incomes had been impacted negatively because of Covid-19. While for 46 percent incomes remained the same, 26 percent of households reported a slight decrease in income and a further 28 percent stated that their income had severely decreased due to Covid-19.

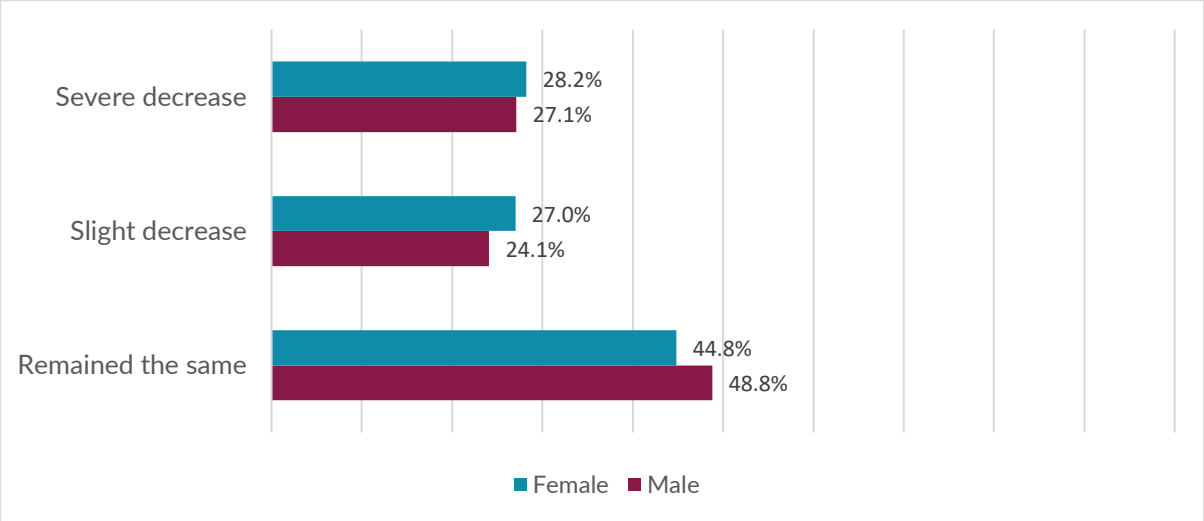
Figure 10: Impact of Covid-19 on household/farm income



Baseline results indicate that 30.2 percent of households in the treatment group experienced a severe decrease in income compared to 28.3 percent in the pure control and 27.4 percent in the control groups. Household/ farm incomes for 48.2 percent of households in the control group remained unaffected by the same income-wise despite Covid-19, a few percentage

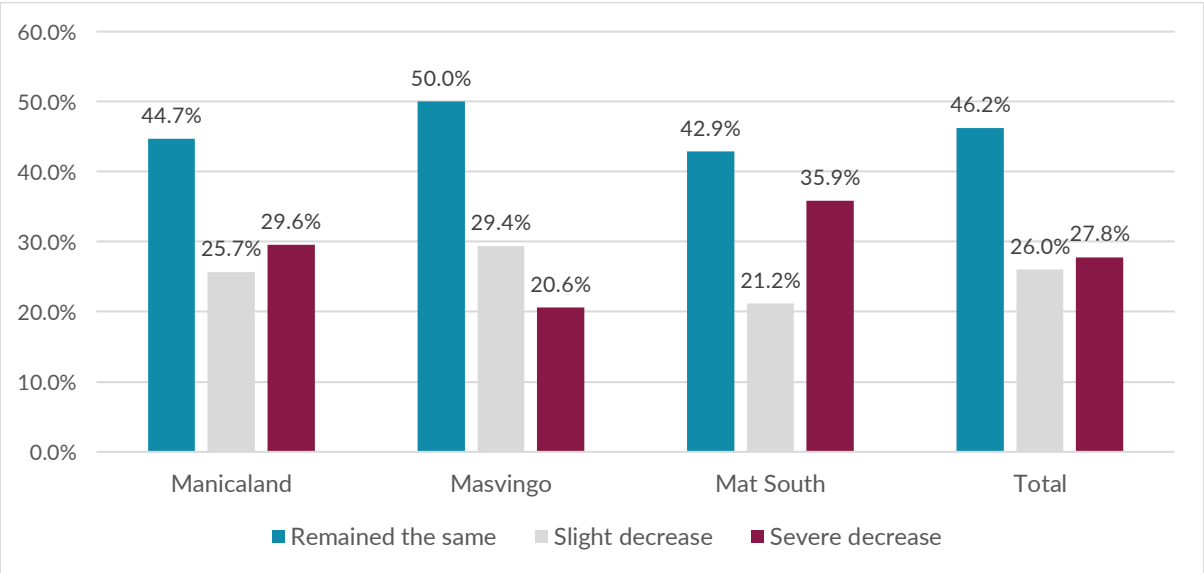
points above peer households in the control (45.7 percent) and treatment group (44.7 percent).

Figure 11: Effect of Covid on access to HH or farm income by gender



The age of the respondent or their gender did not influence their experience of the income impact of Covid-19. However, results show that there were some differences with respect to location, with slightly more households unaffected in Masvingo (50 percent) compared to other provinces, namely Mat South (42.9 percent) and Manicaland (44.7 percent). Mat South suffered the most severe decrease in household income (35.9 percent) compared to Manicaland (29.6 percent) with Masvingo suffering the least (20.6 percent).

Figure 12: Effect of Covid-19 on household income by province



3.4.4.3. Effect of Covid-19 on food security

The proportion of households reporting that they were affected by Covid-19 in terms of their food consumption mirrored that for household income. Household food security status remained the same for 46 percent of households, while 26 percent experienced a slight decrease in food security and a further 28 percent reported severe decrease in household food consumption. Considering the household type, a higher proportion of treatment households (29.4 percent) reported having experienced a severe decrease in food consumption due to Covid-19 compared to control (27.4 percent) and pure control (25.8 percent).

Of the households that reported remaining unchanged despite Covid-19, the control group had a slightly higher proportion (47.9 percent) compared to the pure control (45.4 percent) and treatment households (45.5 percent).

Table 23: How has the Covid 19 pandemic affected your household's food consumption?

		Remained the same	Slight decrease	Severe decrease	Total
B5: Household type	Treatment	45.5 %	25.1%	29.4%	100.0%
	Pure control	45.4%	28.8%	25.8%	100.0%
	Control	47.9%	24.7%	27.4%	100.0%
	Total	46.3%	26.2%	27.5%	100.0%

Pearson chi2=9.916 p-value=0.042

There was no statistically significant difference in household food consumption by age of respondent because of Covid-19. However, male respondents were at least 4 percent more likely to have remained at same food consumption levels (48.9 percent) compared to female counterparts, with slightly more women experiencing severe decrease in food consumption (28.2 percent) compared to male respondents (26.2 percent).

Table 24: Covid 19 pandemic effects on household's food consumption for male and female respondents

		COV_3. How has the Covid 19 pandemic affected your household's food consumption? Remained the same	Slight decrease	Severe decrease	Total
Sex of farmer	Male	48.9%	24.9%	26.2%	100.0%
	Female	44.9%	26.9%	28.2%	100.0%
	Total	46.3%	26.2%	27.5%	100.0%

Pearson chi2=5.921 p-value=0.052

At provincial level, however, Mat South had the highest proportion of households that experienced the severest decrease in food consumption (35.1 percent), and Masvingo the least at 20.3 percent. In contrast, Masvingo reported the highest proportion (49.7 percent) of households whose food consumption had remained unchanged despite Covid-19 (Table 25).

Table 25: How has the COVID-19 pandemic affected your household's food consumption?

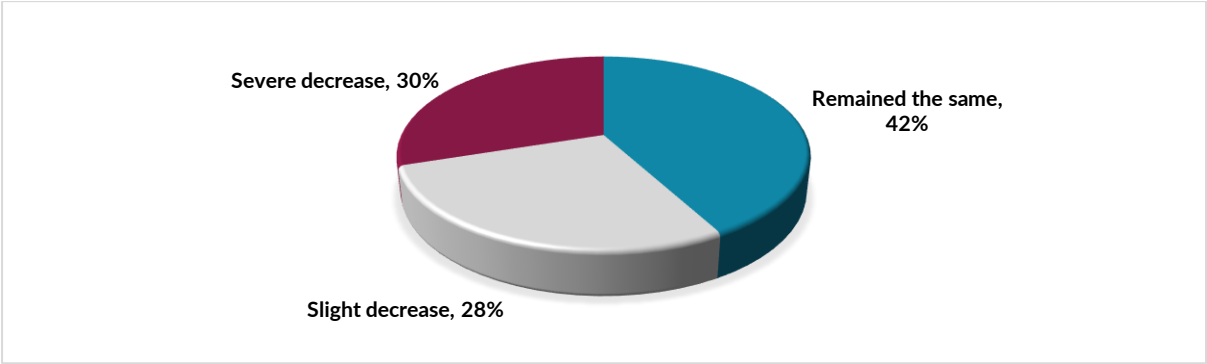
		How has the Covid 19 pandemic affected your household's food consumption? Remained the same	Slight decrease	Severe decrease	Total
Province	Manicaland	44.5%	25.9%	29.5%	100.0%
	Masvingo	49.7%	30.0%	20.3%	100.0%
	Mat South	44.1%	20.8%	35.1%	100.0%
	Total	46.3%	26.2%	27.5%	100.0%

Pearson chi2=73.743 p-value=0.000

3.4.4.4. Effect of Covid-19 on market access

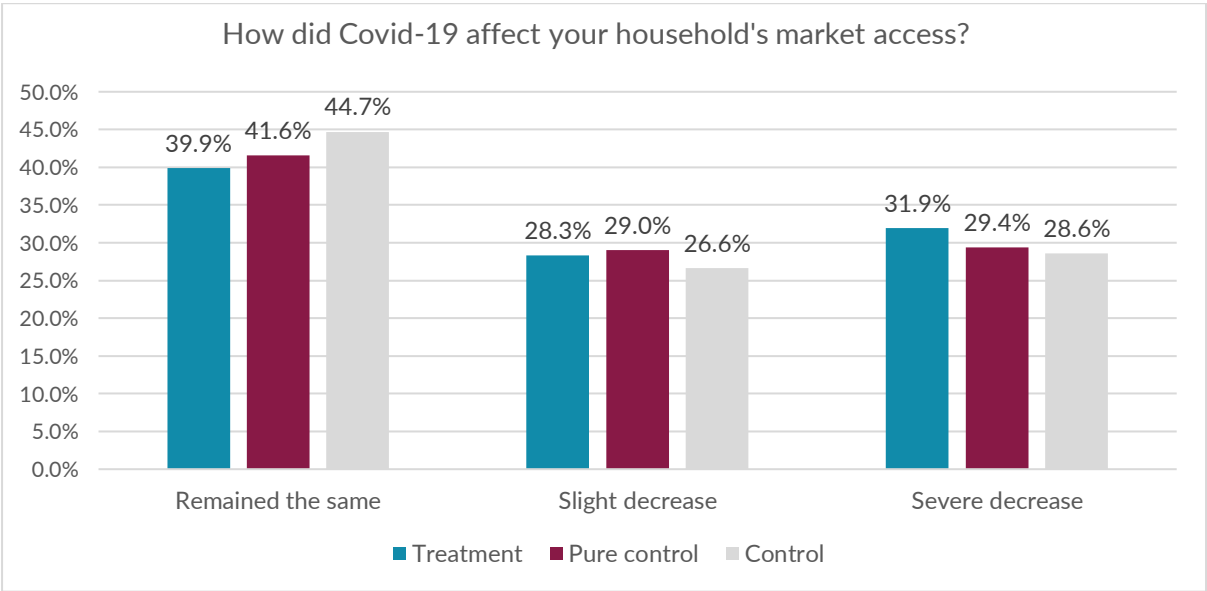
Covid-19 reportedly impacted livelihoods directly through affecting market access. In 42 percent of all cases surveyed (N=4181) market access did not change due to Covid-19. However, for 28 percent of households there was a slight decrease in market access, and a further 30 percent reported a severe decrease (Figure 13)

Figure 13: Effects of Covid-19 on market access



Treatment households were more likely to have experienced severe decrease (31.9 percent) in market access compared to pure control (29.4 percent) and control groups (28.6 percent). In fact, the treatment group had the least proportion of households that were not affected by Covid-19 in terms of market access (39.9 percent) while pure control (41.6 percent) and pure control groups (44.7 percent).

Figure 14: Covid-19 effects on household market access



The baseline study found differences in experience of Covid-19 effects on market access. 44.7 percent of male respondents reported that their households' market access had not changed due to Covid-19 compared to 40.7 percent for female respondents. Female respondents were also more likely to experience a slight decrease in market access (29.3 percent) than males (25.4 percent). With respect to households experiencing severe decrease

in market access, the baseline did not find any statistically significant difference between male and female respondents. Age of respondents did not have any effect on their experience of Covid-19 effects on market access.

Table 26: Effect of Covid-19 on market access by gender and age of respondent

		COV_4: How is it affecting market access?			
		Remained the same	Slight decrease	Severe decrease	Total
Sex of farmer	Male	44.7%	25.4%	29.9%	100.0%
	Female	40.7%	29.3%	30.0%	100.0%
	Total	**42.1%**	**28.0%**	**29.9%**	**100.0%**
Age of farmer	Youth	41.4%	28.7%	29.9%	100.0%
	Middle age	41.1%	28.1%	30.8%	100.0%
	Elderly	43.0%	27.5%	29.5%	100.0%
	Total	**42.1%**	**28.0%**	**29.9%**	**100.0%**

3.4.4.5. Implications of household shock experience to GCF programming

Evidence from the baseline shows that households in the intervention areas are exposed to multiple shocks. While climate change is the most significant, considering that households are predominantly dependent on rainfall for their livelihoods, the exposure to market, environmental and social shocks further magnify the vulnerability of these households. As a project strategy, there is need to focus on addressing resilience from a perspective that recognises that the livelihood and agri-food system should be resilient not only to climatic, but other shocks too.

3.5. HOUSEHOLD FOOD AND NUTRITION STATUS AND COPING STRATEGIES

Household food and nutrition status was measured at baseline using the standard measures, namely the Food Insecurity Experience Scale (FIES); Household Hunger Score (HHS) and the Household Dietary Diversity Score (HDDS) [45]. Household food and nutrition status responds to CPD Outcome 3, "**Vulnerable communities are equipped to cope with climate change and build resilience for household food and nutrition security".** Thus, sustained improvement in household food and nutrition security, in the context of smallholder farmers operating under high climate risks, would provide a strong indication of the success of the GCF intervention in building resilience. Overall, at the time of the survey and based on the experiences in the previous one month, and past 12 months, data from the intervention districts shows that the majority of surveyed households were food insecure. Specific indicators are discussed in the following sections

3.5.1. Food insecurity experience scale Indicator

The FIES indicator in the context of GCF programme will be used to assess the population prevalence of food insecurity to identify vulnerable populations with the aim of supporting them to produce food for the household consumption all year through measures in line with climate smart agriculture. To calculate this indicator, the FIES module with a one -month recall period was administered on sampled households. The module consisted of eight questions that sought to capture a range of food insecurity severity, with yes/no responses. Thereafter, the analysis used severity weights for all eight questions and a standardization process by applying the Rasch model developed by FAO. The thresholds of three FIES categories: no/little hunger, moderate hunger and severe hunger were subsequently obtained from the Rasch CML estimations. Households were then classified for FIES using the sum of scores for 8 individ45stimationions and thresholds that were obtained from the Rasch CML procedure. To calculate the indicator value, the number of HHs with FIES for the severe category over the last 12 months was considered as the numerator and the total number of HHs in the sample is considered as the denominator.

The FIES (Table 27) shows that 23.5 percent of sampled households were experiencing severe hunger, and 58 percent in the moderate plus severe classification. It should be noted that the survey was conducted in March-April 2022 when most households were yet to harvest their crop. While typically would have been consuming green harvest, most did not even have that option due to an unfavourable rainfall season. Surveys conducted in May-

[4] Swindale and Bilinsky, (2006). "Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide"

[5] Kennedy et al., (2011). "Guidelines for Measuring Household and Individual Dietary Diversity"

June 2022, such as the ZimVAC, may have slightly elevated figures of food security as more households had started harvesting their crop.

Table 27: Prevalence of moderate or severe food insecurity in the population, based on the FIES

Scale	Proportion
Severe	23.5%
Moderate+ severe	58%

3.5.2. Household hunger scale

The household hunger scale (HHS) was used as an additional food security indicator. The HHS assesses only the most severe experiences of food insecurity. The HHS module in the questionnaire covered a recall period of 30 days and consisted of two types of questions (three "occurrence" and three "frequency-of-occurrence" questions). The respondents were first asked if a given condition was experienced (yes or no) and, if it was, then with what frequency (rarely, sometimes, or often). All questions were worded to be as universally relevant as possible and focused strictly on the hunger-specific experience of insecure access to food. The resulting responses were transformed into a categorical indicator of hunger. As a categorical variable, households were categorized as "little to no hunger in the household" (0-1), "moderate hunger in the household" (2-3), or "severe hunger in the household" (4-6). Frequencies were subsequently determined as shown in Tables below:

Table 28: Household hunger scale within samples respondents

	Column N %	Count
Little to no hunger in the household	35	1461
Moderate hunger in the household	23	941
Severe hunger in the household	43	1778
Total	100%	4180

According to the household hunger scale (HHS) based on household reported food consumption, at baseline 35 percent of households had 'little to no hunger in the household' while a further 23 percent reported that they were experiencing 'Moderate hunger in the household'. The largest share of respondents (43 percent) was experiencing 'Severe hunger in the household' (Table 28).

3.5.2.1. Household hunger in 30 days

Table 29: Household hunger scale for the last 30 days before baseline

Household Hunger Scale Indicator (30 days) N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. South	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Little to no hunger in the household	35.0	36.9	35.5	32.5	27.6	37.1	45.8	34.9	28.3	18.6	11.5	35.9	50.4	59.8	39.8	53.3
Moderate hunger in the household	22.5	22.2	24.4	20.9	24.9	20.5	21.0	25.4	33.5	19.3	23.3	19.0	19.1	29.3	23.7	17.5
Severe hunger in the household	42.5	40.9	40.1	46.6	47.4	42.3	33.3	39.8	38.2	62.1	65.2	45.1	30.5	10.9	36.5	29.1
		Chi2=16.31 P-value=.003*			Chi2=97.2 P-value=.000*			Chi2=383.89 P-value=.000*								

Treatment household had a marginally higher proportion of households with little or no hunger (36.9 percent) compared with pure control (35.5 percent) and control (32.5 percent) households. Households in the control group (46.6 percent) faced the severest hunger of all household types, with the treatment and pure controls at less than 41 percent.

Mat. South had the highest proportion of households that had little or no hunger (45.8 percent), almost twice the figure for Manicaland. Masvingo had 37.2 percent of its households having little to no hunger. While Manicaland had the highest proportion with moderate hunger (24.9 percent) the province also had the highest prevalence of severely hungry households (47.4 percent). Mat South had the least proportion of households facing severe hunger (33.3 percent).

Analysis at district level revealed stark difference in household hunger, based on a 30-day recall. According to the HHS, Zaka (59.8 percent), Mangwe (53.3 percent) and Masvingo (50.4 percent) had the highest proportions of households with little or no hunger. In comparison, at least a third of households in Buhera and Chivi were experience little to no hunger, while Chipinge and Bikita had the least proportion of households experiencing little to no hunger at 18.6 percent and 11.5 percent, respectively. Conversely, these two districts had the highest proportion of households experiencing severe hunger with 62.1percent and 65.2 percent, respectively.

3.5.2.2. Household hunger by household size in 30 days

Table 30: Household hunger scale in the last 30 days by household size

	1-5 members		6-8 members		>8 members		Total	
Little to no hunger in the household	37.6	860	32.9	502	27.3	99	35.0	1461
Moderate hunger in the household	21.6	494	23.8	363	23.1	84	22.5	941
Severe hunger in the household	40.9	936	43.4	662	49.6	180	42.5	1778
Total	100.0%	2290	100.0%	1527	100.0%	363	100.0%	4180

Pearson Chi2= 20.457 P-value=0.000

At baseline, smaller households were more likely to be more food secure than their larger counterparts. About 37.6 percent of households with up to five members had little or no hunger, compared with 32.9 percent for moderately sized households (6-8 members) and large households (more than 8 members) at 27.3 percent. While overall 42.5 percent of households were experiencing severe hunger, the data shows that the figure was nearly half (49.6 percent) for large households.

3.5.2.3. Household hunger in the last 12 months

Table 31: Household hunger scale for the last 12 months before baseline

Household Hunger Scale Indicator (Year) N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Little to no hunger in the household	37.2	40.4	36.9	34.3	31.0	38.9	46.4	40.2	25.5	23.3	13.6	39.2	50.7	57.6	41.4	52.8
Moderate hunger in the household	22.2	21.7	23.8	21.2	24.9	19.6	21.3	24.1	36.4	18.9	22.6	18.7	18.4	22.8	24.3	17.5
Severe hunger in the household	40.6	37.9	39.3	44.5	44.2	41.5	32.3	35.8	38.2	57.8	63.8	42.1	30.9	19.6	34.4	29.6
		Chi2=17.74 P-value=.001*			Chi2=72.85 P-value=.000*			Chi2=332.94 P-value=.000*								

Focusing on household experience of hunger based on a 12 month recall period, the baseline found that overall, 37.2 percent of households had experienced little or no hunger; 22.2 percent had experienced moderate hunger, while the remainder 40.6 percent had experienced severe hunger. Treatment households had the least proportion of households with severe hunger experience (37.9 percent), compared to pure control (39.3 percent) and control (44.5 percent) households. The 12-month HHS mirrored the 30-day HHS at provincial level. At baseline, Manicaland (44.2 percent) had significantly higher proportion of households in the severe category as compared to Masvingo (41.5 percent) and Mat South (32.3 percent). Zoning down to the district analysis, the data shows that Chipinge had the highest proportion of households in Manicaland experiencing hunger in the last 12 months (57.8 percent). Bikita in Masvingo province had an even higher proportion of households in the same severity scale (63.8 percent). At 19.6 percent households experiencing severe hunger in last 12 months, Zaka was the most food secure district, with nearly half the proportion of households in the severe hunger scale in other districts in Masvingo. Second place for food security in the last 12 months to the survey date was Mangwe with 52.8 percent of households experiencing low to no hunger.

3.5.2.1. Household hunger by household size in the last 12 months

Table 32: Household hunger scale in the last 12 months by household size

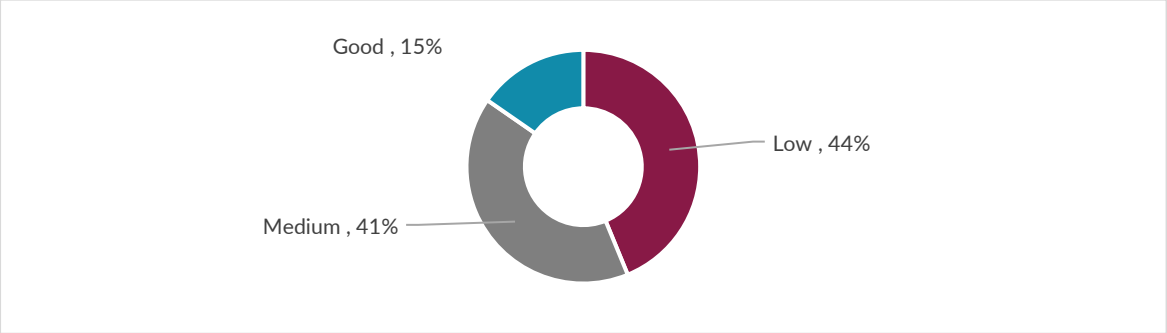
	1-5 members		6-8 members		>8 members		Total	
Little to no hunger in the household	39.3	900	35.4	540	31.1	113	37.2	1553
Moderate hunger in the household	21.3	488	23.8	363	21.8	79	22.2	930
Severe hunger in the household	39.4	902	40.9	624	47.1	171	40.6	1697
Total	100	2290	100	1527	100	363	100	4180

In the 12-month recall period, households with fewer members (1-5 members) were on average more likely to experience little or no hunger (39.3 percent) compared to relatively larger households with 6 to 8 members (35.4 percent) or over eight members (31.1percent). Table 32 also shows that nearly half (47.1 percent) of large households with more than 8 members experienced severe hunger, against 39.4 percent for small households with up to 5 members, or medium sized households with between 5 and 8 members.

3.5.3. Household dietary diversity

Household dietary diversity refers to the number of food groups consumed by a household over a given reference period and is an important indicator of food and nutrition security to assess the likelihood of a household to access variety of foods with the aim of to getting different vitamins, minerals, nutrients, and phytochemicals that can help prevent nutrient deficiencies and chronic diseases. A more diversified household diet is correlated with caloric and protein adequacy, percentage of protein from animal sources, and household income (Swindale & Bilinsky, 2006). The HDDS indicator provides a glimpse of a household's ability to access food as well as its socioeconomic status based on the previous 24 hours (Kennedy et al., 2011). The computation of this score was based on what respondents reported as having ate in the last day, and on this basis, households were classified as having either one of low, medium, or good dietary diversity.

Figure 15: Household dietary diversity



At baseline only 15 percent of households in the intervention areas have good dietary diversity. Baseline data shows that 41 percent if household met medium range while a further 44 percent were classified as having low dietary diversity.

Table 33: Household dietary diversity score (7 days)

Household dietary diversity score indicator N=4180																	
		Household type			Province			District									
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Low dietary diversity	43.8	39.7	43.7	47.9	56.5	31.0	39.3	47.1	55.1	68.6	52.3	20.7	32.7	26.1	40.4	38.0
Medium dietary diversity	40.9	42.7	41.9	38.0	35.9	45.1	43.8	43.3	38.2	25.8	35.9	47.2	45.8	55.4	43.1	44.7
Good dietary diversity	15.3	17.6	14.3	14.2	7.6	23.9	16.8	9.6	6.8	5.6	11.8	32.1	21.5	18.5	16.5	17.3
		Chi2=21.41 P-value=.000*			Chi2=287.03 P-value=.000*			Chi2=468.36 P-value=.000*									

Control (47.8 percent) and pure control (43.7 percent) households had the highest frequency for low dietary diversity, while the treatment households had the lowest (39.7 percent). With respect to good dietary diversity, the Treatment households were more likely to have good dietary diversity at 17.6 percent of respondents surveyed (N=4181). Gender and age of respondent did not have any effect on household dietary diversity.

The baseline survey found some strong differences in dietary diversity by province. Manicaland had the highest proportion of households with low dietary diversity (56.5 percent) highly contributed by Chimanimani district. This was almost twice the figure in Masvingo. Masvingo, with its low proportion of households with low dietary diversity, had the highest proportion with good dietary diversity (24 percent), almost three times as much as Manicaland.

Only 7.6 percent of households in Manicaland had good dietary diversity compared to 16.8 percent in Mat South and 24 percent in Masvingo. Masvingo province reported the highest proportion (23.9 percent) of households with good dietary diversity which was more than three times that of Manicaland. More than half (56.5 percent) of the households in Manicaland experienced low dietary diversity, this was followed by Matabeleland South (39.3 percent) and Masvingo (31 percent). There was no difference in household dietary diversity by age, gender, or household size.

Household dietary diversity score was statistically different across the surveyed districts (Chi^2=468.36 P-value=.000*). Survey data shows that Chipinge had the highest percentage of households classified as having low dietary diversity at 68.6 percent, followed by Chimanimani in the same province at 55.1 percent. The third least dietary diverse district was Bikita with more than half of sampled households (52.3 percent) in the low category. Chivi and Masvingo districts in Masvingo were the most dietary diverse, with 32.1 percent and 21.5 percent of households classified as having good dietary diversity. The two districts in Mat South, Mangwe (17.3 percent) and Gwanda (16.5 percent) both had slightly higher proportions of households in the good dietary diversity score, compared to peer districts in Manicaland, which were all in the single digits (**Error! Reference source not found.**).

IMPACT: INCREASED RESILIENCE AND ENHANCED LIVELIHOODS OF THE MOST VULNERABLE PEOPLE, COMMUNITIES AND REGIONS.

At impact level the project will track the number of males and females benefiting from the adoption of climate resilient livelihoods. At baseline the number is zero '0' as there are no beneficiaries at this point. Recognising that some of the interventions promoted through GCF are presently being implemented by Government and other partners operating in the targeted districts. Such interventions include VSLs, irrigation, value chains, and climate smart agriculture.

Indicator 3 - Number of males and females benefiting from the adoption of diversified climate resilient livelihood options (incl. fisheries, agriculture, tourism etc.)
Baseline value: Zero:

IMPACT: INCREASED RESILIENCE OF HEALTH AND WELLBEING AND FOOD AND WATER SECURITY

In line with the GCF program, this section will focus on water used for irrigation purposes across the households. One of the key indicators to track in this outcome is "**Indicator 4 - number of males and females with year-round access to reliable and safe water supply despite climate shocks and stresses (Irrigation water)".** It is key to note that within the project intervention districts, there are existing irrigation schemes by the GOZ which will play a major role in intervention of the GCF project. At baseline this indicator was set at zero as the program was yet to start improving irrigation schemes among other water resources. Below section describes the irrigation water ecosystem at baseline highlighting the water challenge currently and some of the areas of interest for the GCF project.

3.5.4. Water accessibility

To examine efficiency and sustainability of the water source, distance to the water source and time taken to fetch water was estimated to assess human effort required to get water which forms a basis of creating intervention mechanism to reduce human effort, hence increasing efficiency.

3.5.4.1. Distance to main source of water

Table 34: Assessment of distance to the nearest water point

O3: How far is the closest main source of cooking and drinking water? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
less than 500m	48.7	49.6	44.5	52.3	47.8	49.9	49.8	47.8	45.7	54.4	53.0	30.8	61.0	54.8	46.3	49.1
more than 500m but less than 1 km	32.1	29.4	35.5	31.1	33.4	30.7	31.3	33.1	32.2	28.4	32.1	39.2	18.1	36.4	35.9	30.0
1km and above	15.7	17.7	15.2	14.2	15.8	15.7	15.2	15.5	20.1	10.4	14.0	28.7	5.6	8.8	17.1	20.2
Water on premises	3.5	3.4	4.8	2.3	3.0	3.8	3.8	3.5	1.9	6.8	0.8	1.3	15.3	0.0	0.8	0.7
Don't know	0.0	0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
		Chi2=37.65 P-value=.000*			Chi2=335.96 P-value=.000*			Chi2=739.14 P-value=.000*								

About four fifths (86 percent) of the study respondents were located within a kilometre from their main source of water. Almost half (48.7 percent) of all respondents were living within 500 metres of the closest main source of water, and a further 32 percent between 500 metres and a kilometre from the main source of water. Treatment households (17.7 percent) were marginally more likely to walk for more than a kilometre to access water, compared to the pure control (15.3 percent) and control (14.2 percent) groups (Table 34).

3.5.4.2. Time taken to collect water

Table 35: Proportion of time taken to collect water

O4: How long does it take to get to the source of water? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
less than 15min	55.0	54.5	53.6	57.1	53.6	55.7	55.1	55.4	53.1	62.4	57.3	37.9	74.2	56.6	53.8	56.8
15-30min	31.0	30.1	33.4	29.4	30.9	30.3	31.1	31.1	30.1	27.3	31.0	37.8	18.4	34.8	31.8	29.8
30min to 1 hour	10.9	12.9	9.9	10.1	12.9	11.2	10.8	10.7	12.9	8.5	9.9	17.2	6.8	7.5	10.8	12.3
> than 1 hour	3.0	2.5	3.1	3.5	2.6	2.9	3.0	2.9	3.9	1.9	1.8	7.2	0.6	1.0	3.6	1.1
Don't know	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Chi2=15.11 P-value=.019*			Chi2=196.61 P-value=.000*			Chi2=298.5 P-value=.000*								

More than half of the respondents (55 percent) sampled in the intervention areas take less than 15 minutes to get to their source of water. A further 31 percent of respondents were located some 15 to 30 minutes away from their water source. Nearly 11 percent of households take between 30 minutes to an hour to walk to and collect water, while a minority 3 percent takes more than an hour. The baseline found out that water sources were closer in Chipinge district as compared to other districts while the opposite was true in Chivi district.

3.5.4.3. Time spent queuing to collect water

Table 36: Time spent queuing to collect water

O5: How long does it take queuing for water and collecting? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
less than 15min	70.6	69.3	72.9	69.7	72.1	69.9	70.6	71.6	66.9	70.3	73.6	66.5	82.8	61.3	63.1	68.4
15-30min	19.5	19.8	19.7	19.1	18.4	19.9	19.9	18.7	20.5	20.4	17.7	21.0	12.6	27.8	23.8	23.2
30min to 1 hour	7.8	8.8	6.3	8.4	7.6	8.1	7.6	7.8	9.3	7.7	6.9	9.5	4.5	8.6	10.5	7.7
More than 1 hour	2.0	2.1	1.1	2.9	1.8	2.1	1.9	1.8	3.4	1.6	1.9	3.0	0.2	2.3	2.7	0.7
Don't know	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Chi2=18.62 P-value=.005*			Chi2=18.7 P-value=.005*			Chi2=173.8 P-value=.000*								

Respondents were asked to estimate the amount of time they spent queuing for water. This information was used as a gauge to understand the accessibility of water and the pressure on the source. As shown in Table 123, most households (70.6 percent) spend less than 15 minutes queuing for a turn to collect water, with the pure control group having the largest proportion (72.9 percent) of the three household types. A further fifth of all surveyed

households took between 15- and 30-minutes queuing for water, and a minority 2 percent took more than an hour in the queue (Table 123).

3.5.4.4. Time taken to travel home from water source

Table 37: Time taken back from the water source

O6: How long does it take to get back home from this source of water? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
less than 15min	45.0	44.6	45.0	45.4	45.4	45.2	45.2	45.5	41.6	53.9	44.7	29.2	68.8	44.9	44.0	56.1
15-30min	32.9	32.4	34.8	31.6	32.1	32.4	32.6	33.2	33.7	28.8	34.3	38.2	19.0	40.0	32.1	29.5
30min to 1 hour	16.2	17.8	14.6	16.3	16.2	16.7	16.1	16.0	18.0	13.1	16.2	21.8	9.1	13.8	16.9	13.3
More than 1 hour	5.9	5.2	5.7	6.7	6.3	5.6	6.1	5.4	6.7	4.2	4.8	10.8	3.1	1.3	7.0	1.1
Don't know	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Chi2=9.44 P-value=.150			Chi2=172.75 P-value=.000*			Chi2=367.18 P-value=.000*								

While 55 percent of the sample took up to 15 minutes to walk to the water source, and 31 percent took between 15 and 30 minutes for the same trip, it seems the journey from the water source back home was longer than the outward one. Table 37 shows that 45 percent of respondents across all household types took less than 15 minutes to walk back home, while a further 33 percent took between 15 and 30 minutes. Statistically, there was no difference in time taken to walk home with water across all household types.

3.5.4.5. Time taken to get to water source, collect water, and travel back home

Table 38: Time taken to get water overall

O7: How long does it take to go there, get water, and come back? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
less than 15min	21.3	20.6	22.8	20.5	20.8	22.6	22.3	20.8	17.4	31.3	15.2	12.6	39.6	34.5	20.8	19.3
15-30min	31.4	32.3	30.8	31.2	33.0	29.9	31.6	31.3	30.6	27.1	37.7	29.4	24.9	22.1	32.4	34.7
30min to 1 hour	28.9	28.3	28.7	29.8	28.3	29.1	28.3	29.9	28.7	25.6	32.7	29.2	23.5	27.8	26.3	29.1
More than 1 hour	18.3	18.7	17.7	18.6	17.9	18.3	17.7	17.9	23.3	16.0	14.4	28.7	12.0	15.3	20.5	16.8
Don't know	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.3	0.0	0.0
		Chi2=4.66 P-value=.793			Chi2=251.09 P-value=.000*			Chi2=418.32 P-value=.000*								

The time taken to get to the water source, collect water and get back home was also estimated for the sample population. About a fifth (21.3 percent) of all households can do this within15 minutes, while a third (31.4 percent) take between 15 and 30 minutes. A further 28.9 percent takes between 30 minutes to an hour to get to, collect water, and get back home. While 2 percent take more than an hour queuing for water only, 18.3 percent take more than an hour for the three tasks. There was no statistically significant difference in time taken between the three household types.

3.5.4.6. Gender and age of water collector

The baseline found a clear gender and age bias with respect to collection of water in the intervention areas. About four fifths (82.4 percent) of all water is collected by adult women, while adult men collect 11.7 percent of all water. Among children, the same pattern recurs with girls collecting 4 percent of all water, and boys less than half of what girls collect at 1.86 percent. The baseline did not find any statistically significant difference in gender and age of main water collector for the three household categories.

Table 39: Proportion of household water collectors

O8: Who usually goes to this source to fetch the water for your household? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Adult women	82.4	83.2	81.5	82.6	82.9	82.0	81.4	83.4	85.1	85.1	83.4	75.9	81.0	89.9	86.5	82.1
Adult men	11.7	10.5	13.2	11.2	11.6	10.9	13.2	10.3	7.6	8.8	11.0	18.1	11.7	5.7	7.7	9.5
Female child (under 15 years)	4.0	4.5	3.3	4.3	3.7	4.9	3.4	4.4	6.5	4.3	4.1	3.4	5.2	3.1	4.1	6.0
Male child (under 15 years)	1.9	1.8	1.9	1.9	1.8	2.1	2.0	1.9	0.8	1.8	1.4	2.6	2.2	1.3	1.7	2.5
Don't know	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Chi2=4.66 P-value=.793			Chi2=251.09 P-value=.000*			Chi2=418.32 P-value=.000*								

3.5.5. Water treatment

The baseline sought to understand treatment of water before use and methods used for treatment.

3.5.5.1. Water treatment after collection

Less than 7 percent of households surveyed treat the water that they use. Households in the treatment group were statistically more likely to treat water (8.14 percent) compared to those in the control (6.63 percent) and pure control group (5.20 percent).

Table 40: Do you treat your water in any way?

O9: Do you treat your water in any way? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	6.6	8.1	5.2	6.6	6.8	6.4	7.1	6.3	5.2	6.7	6.5	6.6	8.6	4.2	6.1	2.4
No	93.4	91.9	94.8	93.4	93.2	93.6	92.9	93.7	94.8	93.3	93.5	93.4	91.4	95.8	93.9	97.6
		Chi2=9.74 P-value=.008*			Chi2=0.07 P-value=0.965			Chi2=32.55 P-value=.000*								

3.5.5.2. Method of water treatment used

Water treatment practices did not differ significantly between the three household categories. At baseline adding bleach or chlorine was the most used treatment for making water safe for drinking, with 56.7 percent of households using this method. The pure control households (45.3 percent) were least likely to use this method of the three household categories. In contrast, most households in the pure control group (42.7 percent) relied on boiling water, slightly higher than the average one third for the entire sample that used this as their main method for water treatment. Other water treatment methods used include sedimentation, where water is left to stand and settle, used by nearly 7 percent of the sample, mostly in the control group, and use of water filter (2.2 percent). Solar disinfection was hardly known or used by the baseline study respondents.

Table 41: Water treatment method used

O10: What do you usually do to the water to make it safer to drink? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Boil	32.5	30.9	42.7	26.1	33.3	34.1	30.9	36.5	26.3	28.9	30.5	42.6	22.7	6.3	48.7	42.9
Add bleach/chlorine	56.7	60.9	45.3	60.9	56.5	54.8	58.6	54.2	52.6	58.7	62.1	44.3	65.2	75.0	41.0	57.1
Use water filter (ceramic, sand, composite, etc.)	2.2	3.6	1.3	1.1	2.9	3.2	1.2	2.1	10.5	2.5	2.1	1.6	0.0	6.3	5.1	0.0
Solar disinfection	0.7	0	1.3	1.1	0.0	0.8	1.2	0.0	0.0	0.8	1.1	0.0	1.5	0.0	0.0	0.0
Let it stand and settle	6.9	2.7	8.0	10.9	4.3	7.1	6.2	7.3	10.5	6.6	4.2	11.5	6.1	12.5	5.1	0.0
Other (specify)	1.1	1.8	1.3	0.0	2.9	0.0	1.9	0.0	0.0	2.5	0.0	0.0	4.5	0.0	0.0	0.0
Don't know	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Chi2=15.78 P-value=.106			Chi2=12.23 P-value=.270			Chi2=55.75 P-value=.050								

3.5.6. Water security

To achieve access to water for climate resilient agriculture through climate-resilient irrigation systems and efficient water resource management, reliable water source is a primary goal that should be reached before extending to agriculture. Below subsections highlight reliability of water sources across the area of intervention.

3.5.6.1. Reliability of water source

To examine the extent of water security based on the main source used, the baseline asked respondents whether their source of water was reliable throughout the year. In almost three quarters of all cases surveyed (73.6 percent) households claimed that their source was reliable throughout the year. There were no significant differences in reliability of water source for the three household groups surveyed.

Table 42: Reliability of water source throughout the year

O11: Is this source of water reliable throughout the year? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	73.6	74.9	73.7	72.4	75.9	73.8	74.0	74.3	68.6	73.7	76.8	68.4	68.3	86.8	72.5	82.9
No	26.4	25.1	26.3	27.6	24.1	26.2	26.0	25.7	31.4	26.3	23.2	31.6	31.7	13.2	27.5	17.1
		Chi2=2.09 P-value=0.352			Chi2=20.75 P-value=.000*			Chi2=79.9 P-value=.000*								

3.5.6.2. Reasons why source cannot supply water throughout the year

For the 26% of households that reported that their water supply was not reliable (N=1102) throughout the year, the main constraint to reliability was seasonal drying up of the water source (71.7 percent). The second most important reason was the breakdown of equipment (24.3 percent) with respondents stating that they were often under resourced or insufficiently trained to maintain the water infrastructure, especially boreholes. Inaccessibility of water source affected 3.5 percent of households, with those in the treatment group being the least affected (1.8 percent) in comparison to peers in the pure (4.2 percent) and control (4.5 percent) groups.

Majority of the seasonal sources were identified in Buhera (73 percent), Chipinge (72.9 percent), Bikita (67.8 percent), Chivi (74.2 percent) and Masvingo (92.6 percent) districts. The baseline also noted significant breakdown of water equipment's in Zaka (45.1 percent), Gwanda (40.1 percent) and Mangwe (61.2 percent). This poses as a drawback towards achieving climate-resilient irrigation systems and efficient water resource management objective

Table 43: Main reason why water source is unreliable

O12: If No, what is the MAIN reason why this source is unable to supply water throughout the year? N=1102																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Source dries up (seasonal)	71.7	69.4	72.6	72.8	69.7	71.6	73.6	73.0	57.0	72.9	67.8	74.2	92.6	52.9	51.4	30.6
Breakdown of equipment	24.3	28.5	22.9	22.0	27.9	24.4	22.0	23.7	38.6	23.5	26.5	23.0	7.0	45.1	40.1	61.2
Inaccessible due to some reason	3.5	1.8	4.2	4.5	2.5	3.7	4.2	2.5	3.5	3.2	5.3	2.1	0.4	2.0	7.3	8.2
Other (specify)	0.5	0.3	0.3	0.8	0.0	0.4	0.2	0.8	0.9	0.4	0.3	0.7	0.0	0.0	1.1	0.0
		Chi2=9.83 P-value=.132			Chi2=7.59 P-value=.270			Chi2=175.38 P-value=.000*								

3.5.6.3. Did this source dry up due to drought or dry spells in the last year?

For respondents that reported that the water source was not reliable (N=1102), about 62 percent of them reported having experienced drying of their water source in the twelve months prior to this survey. An additional 10.8 percent had experienced some drying, and the remainder 27.4 percent had not been affected by drought or dry spell in the previous 12 months to the survey date. In the last twelve months prior to the survey Buhera (64.4 percent) Chipinge (68.6 percent) and Masvingo (79.1 percent) experienced severe drying up of water sources.

Table 44: Did water source dry up last year?

O13: Did this source dry up due to drought or dry spells in the last year? N=1102																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	61.8	60.3	63.9	61.0	63.9	59.6	62.4	64.4	50.0	68.6	57.2	56.0	79.1	58.8	57.1	34.7
Somewhat	10.8	10.3	9.2	12.8	11.5	10.4	12.6	8.4	9.6	4.2	15.6	15.8	2.5	3.9	6.8	6.1
No	27.4	29.4	26.8	26.2	24.6	30.0	25.0	27.2	40.4	27.1	27.1	28.2	18.4	37.3	36.2	59.2
Other (specify)	0.5	0.3	0.3	0.8	0.0	0.4	0.2	0.8	0.9	0.4	0.3	0.7	0.0	0.0	1.1	0.0
		Chi2=3.63 P-value=0.459			Chi2=39.31 P-value=.000*			Chi2=122 P-value=.000*								

4. OUTCOME 1: INCREASED GENERATION AND USE OF CLIMATE INFORMATION IN DECISION-MAKING

The project theory is that, if institutional capacity for generating user-tailored and relevant climate information that responds to farmer needs is increased, and farmers can access and use this information to make agricultural and water management decisions, then farmer coping and climate change adaptive capacity would be enhanced. This would result in enhanced water and food security for the most vulnerable in the Southern Region of Zimbabwe, ultimately contributing to a strengthened resilience of livelihoods in the face of increased risks due to climate change. At baseline the focus was to establish the status of two

1. ***Indicator 5:*** *Capacity for generation of climate information products/services in decision-making in climate-sensitive sectors (institutional level)*
2. ***Indicator 6:*** *Percentage of direct beneficiaries consistently using climate information/ product and services in farming decisions*

key indicators namely:

4.1. CAPACITY FOR GENERATION OF CLIMATE INFORMATION PRODUCTS

At outcome level the GCF project seeks to enhance institutional capacity to generate and disseminate appropriate climate and weather information to smallholder farmers for supporting climate-risk informed water and agricultural management. Institutional barriers that the project intends to address include capacity to effectively forecast future weather and climate impacts on water and smallholder agroecosystems arising due to inadequate forecast systems and trained staff. Simultaneously, farmer facing institutions (AGRITEX, DLPD/DVS and MSD) lack capacity to generate or disseminate user-oriented climate information required to inform farmer adaptive behaviour. The project will track the following capacities in climate generation:

1. Regular generation of localized weather, climate and hydrological model forecasts
2. Use of water resource models and translation of forecasts into impacts
3. Develop information products incorporate indigenous knowledge and,
4. Dissemination of advisories in an inclusive and gender responsive manner.

The baseline assessed the capacity of MSD on criteria (1) and (2) above, and that for AGRITEX on criteria (3) and (4) above. This interpretation of the indicator was determined by the fact that criteria (1) and (2) did not apply to AGRITEX considering that the institutional mandate to generate information was with MSD and respondents interviewed could not relate to questions on those criteria. Respondents were asked whether or not they had the specific competences, and if so, how they rated (using scores from 1 to 5) their competence in the four areas.

4.1.1. Overall Capacity of MSD

Overall, MSD stations surveyed reported high level of confidence in training across a range of competence areas assessed, but reflected that the enabling environment, particularly with respect to access to hardware and software, was insufficient to translate this into results. This finding was consistent with the barriers identified in the project document.

Table 45: Capacity self-assessment in key competences by district

How confident are you about this station's competence in this capacity area? Rank 1-5					
	Masvingo	Zaka	Chipinge	Mangwe	Mean Score
CORE COMPETENCES					
Generation of localized weather, climate and hydrological model forecasts	5	1	4	5	4.5
Use of water resource models and translation of forecasts into impacts	N/A	N/A	N/A	N/A	N/A
Develop information products incorporate indigenous knowledge	5	5	4	5	4.5
Dissemination of advisories in an inclusive and gender responsive manner.	4	3	5	4	4.5
Overall capacity score	4.5	4	4.5	4.5	4.5
OTHER COMPETENCIES ASSESSED					
Tailoring seasonal forecasts to local farmer needs	4	3	5	4	4.5
Information Communication Technology	3	4	3	3	3
Climate services including seasonal prediction	3	5	3	1	2
Supporting clients in mainstreaming climate risks into sectors	3	4	5	5	5
Effective communication	3	4	5	4	4.5
Developing decision support tools for stakeholders	3	1	5	2	3.5
Overall capacity score	3.2	3.5	4.3	3.2	3.8

On core competencies tracked by the project, MSD respondents across surveyed stations reported high confidence on skills and competences in all four areas, with a mean score of 4.5 out of a possible 5. On generation of localised weather, climate and hydrological model forecasts, Zaka scored the least 1 of a possible 5, with Chipinge scoring 4 and the other districts, Masvingo and Mangwe, at 5. However, beyond the core competence, when farmers were asked about their competence in 'climate services including seasonal prediction' MSD scored a lowly 2, with Mangwe scoring '1' of 5 (20%). Further, MSD staff were confident that they could incorporate indigenous knowledge in seasonal forecast generation (4.5/5) to enhance the uptake of seasonal forecasts by farmers through consensus building. Water

resource modelling does not fall under MSD mandate, but rather with ZINWA, and was inapplicable in the interviews done. Climate information dissemination at farmer level is done by AGRITEX. MSD staff also reported confidence in this competence area, particularly based on their experience in working with extension officers in supporting farmers with tailored seasonal forecasts. While high for Chipinge (5) partly due to Terres De Homme (TDH) support, tailoring seasonal forecasts to local farmer needs was a challenge for Zaka (3). Climate services such as seasonal prediction was lowly rated (2), as was capacity to develop decision support tools for stakeholders, which was an incoming intervention. Information communication technology capacity was also rated as low at a score of 3 suggesting need for further capacitation of the MSD stations across the project intervention areas.

4.1.1.1. Capacity for climate forecast dissemination

The capacity of MSD to disseminate climate information is crucial for ensuring that farmers indeed receive the information in formats that are useable for climate resilient decision making. Crucially, the baseline survey sought to establish the capacity of MSD around climate information dissemination in the project districts. For the surveyed stations, respondents believed that on average at least 50-60% of farmers were currently accessing climate information services in the GCF districts. The current baseline survey found that about 65% of all households surveyed (N=4181) had received seasonal forecasts made available mostly through their agricultural extension officers to help farmers make smart decisions. With on average two AGRITEX officers per ward, and prospects for increasing mobility with government support for enhancing AGRITEX mobility, the baseline concludes that there is medium to high capacity potentially for dissemination of climate information once it has been generated. This is also because climate information dissemination is not a standalone support service but could be embedded in other ongoing regular activities with farmers, such as FFS.

> *"I believe that all farmers get this information, but whether they believe or use it is a different story. They get it, but it is their choice to use it or not". KII with MSD in Masvingo Province*

The baseline also picked some constraints that would need to be addressed to ensure that farmers had access to seasonal climate forecasts to effectively support climate smart farming. Firstly, there was recognition that MSD is generally under-represented spatially, with the survey team failing to meet any officer at district level for most of the districts in the project intervention areas. In the low coverage by automated stations, climate information is likely to be generalised for districts and wards, in ways that may fail to adequately capture the specific climate experiences of farmers, some of which vary largely over short distances. For example, generalised climate information may fail to incorporate green belts and rain shadow climate experiences. On a positive note, however, the survey found that for all locations where MSD was interviewed, there appears to be a hand-in-glove relationship in as far as delivering climate-related messages to farmers is concerned, with local extension officers at ward level taking the lead in information sharing around climate risks.

Secondly, KIIs corroborated by FGDs, revealed that poor communication infrastructure development was negatively impacting the role that television and radio in climate information dissemination. Areas with poor network coverage for mobile phones also

struggled with radio reception, thus effectively excluding farmers from accessing climate information disseminated though radio, social media or TV. In Mat South, namely Mangwe and Gwanda districts, FGDs revealed that affected households in **underserved wards were receiving signal from outside Zimbabwe and were, unfortunately only accessing information that was not relevant to their environment. As such, the radio was limited in use for dissemination,** with agricultural extension officers and This was particularly problematic for Mat South (Mangwe and Gwanda) where key informants interviewed, triangulated by farmer FGDs, confirmed that there was poor network reception so much that most households were receiving news and weather information from Botswana and South Africa, and missing out on locally relevant climate news via radio or TV. In the intervention areas, agricultural extension officers have been more prominent in providing climate information, accounting for about 85% of all cases (N=4181). The implication of this finding, therefore, suggests that it is the capacitation of the agricultural extension services that is required to facilitate improved farmer access and use of seasonal climate information.

Thirdly, the baseline found that there were high prospects for innovations that could potentially increase the ease with which climate information could be disseminated. There are prospects for riding on the successful penetration of social media in rural areas especially for locations where network reception permits. In Masvingo, the MSD reported that one innovation they were promoting was creating a social media group on WhatsApp as platforms through which weather and climate information, including early warnings for disasters, could be disseminated.

4.1.1.2. Capacity for tailoring climate information

At baseline, interviews with MSD revealed that financial and technical resources to make all climate observations to allow for tailored forecasts accurate at ward level were insufficient. Data was being collected, analysed, and disseminated at provincial/district level, with the exception of Chipinge where an initiative for creating and mapping new stations had allowed ward level outputs to be generated.

> *"It is our long-term plan to put more weather stations but for now resources do not permit. The equipment is too expensive, and we also need human resources for all these stations. KII with MSD*

The climate information disseminated at present appears to be largely generalisable for large areas, such as district level, and not specific to the ward level where farmers operate. Considering that some districts are spatially large, the forecast may not be applicable to all wards within such districts, as there are micro-climates due to variances in elevation and aspect, among other factors. According to one KII, resourcing all weather station should be a priority for the MSD.

4.1.1.3. Self-rated competence in providing services to specific economic sectors

Linked to the above, the baseline asked selected weather station teams to self-rank their sector-specific competence. This question was intended to assess whether, and to what extent, the MSD was capacitated to support various sectors through predominantly tailoring information to useable decision support tools. Results from the baseline indicate that the

MSD staff surveyed were highly confident about their competence in providing services in disaster management (4.3/5); agriculture (4/5), water resources (4) and then ecosystems (3.7/5). Level of confidence on one's competency in the fisheries sector (1.3/5) was low, with interviewed staff stating that MSD had hardly any institutional relationship with that sector. While MSD interacts with EMA on ecosystem, including climate issues, with competency mean score of 3.7/5, the MSD KIIs reported that there were no platforms on which to engage with, and provide, services to the tourism sector (2.3/5). Of the three district teams responding to this question, the baseline found that the Chipinge team reported the highest level of confidence about their capacity across all competence areas (33) compared to the two other locations at 30 and 19 for Mangwe and Masvingo, respectively. There was also no clarity on how the department should interact with the education sector, where the mean competency level was rated at 2/5).

Table 46: Self rated capacity to provide services to various economic sectors

How would you rate your sector-specific experience of the district MSD office in the following sectors? 1 being least, 5 being highest				
	Masvingo	Chipinge	Mangwe	Mean score
Agriculture (crops) sector	3	4	5	4
Agriculture (livestock)	3	4	5	4
Fisheries sector	1	2	1	1.3
Ecosystems	2	4	5	3.7
Tourism	1	4	2	2.3
Water resources	3	5	4	4
Disaster management	3	5	5	4.3
Health	1	5	3	3
Other Education	2	N/A	N/A	2
Overall score	19	33	30	27

4.1.1.4. Institutional collaborative capacity

The baseline mapped past and ongoing initiatives on climate forecast generation and dissemination in the project districts with the aim of identifying lessons that could inform the design of the GCF project, help explore potential for building up on, piggybacking, or working collaboratively with, the project. Interviews with the MSD revealed that the department did not have specific internally driven programmes per se but worked collaboratively with various partners to support improved farmer access to climate information. At national level is the National Climate Forum through which the MSD proactively seeks to engage partners, including for farmer-facing initiatives. Through the ZRBF project, the MSD engages with national stakeholders following dissemination of the seasonal forecast annually, to support stakeholder understanding of the forecast and guide planning and decision making by partners supporting climate-sensitive initiatives. Also, at national, and indeed at provincial and district levels, respondents prioritised the upgrading of stations to enhance internal capacity to generate and disseminate information more effectively.

Across the four districts surveyed qualitatively for climate information services, some of the flagship interventions that the MSD is involved in include the following:

Table 47: MSD programmatic interventions in GCF intervention districts

District	Some of the ongoing programmatic initiatives and interventions
Masvingo	The WFP led resilience initiative, R4 program, distributed rain gauges in Masvingo South and the MSD is supporting through information provisioning including interpretation of data.
Zaka	General support to farmers through information dissemination and interpreting information
Chipinge	MSD has partnered with Terre des Homme (TDH) to facilitate the invitation and hosting of an Agrometeorologist from Harare to workshop with extension officers in the district. Through this initiative, extension officers collected and shared two GPS coordinates within their wards (9km apart), and this information was used to generates district-wide 14-day weather forecasts for Chipinge. Information generated is tailored for each ward.
Mangwe	By working with development partners, MSD is able to reach target communities for information dissemination, including for weather related hazards and how communities can mitigate against these (4 wards in Mangwe and 6 wards in Bulilima, and Matobo). ZRBF has put up rain gauges in Matobo and Insiza districts in Mat South.

4.1.1.5. Previous and current capacity strengthening activities

Respondents were asked whether they had received any previous training across specific competency areas. Significant capacity gaps were noted for 'developing decision support tools for stakeholders' as well as supporting mainstreaming of climate risks into sectors. Half of sampled stations had previously been trained in forecasting, a similar proportion as for tailoring seasonal climate forecast information. Stations reported previously receiving training related to effective communication and integrating local/indigenous knowledge in seasonal forecasts (Table 48). Across all possible training areas, respondents expressed an interest in getting further skills development.

Table 48: Areas where training has been provided

Have you received training in this area?				
	Masvingo	Zaka	Chipinge	Mangwe
Forecasting	Yes	No	No	Yes
Information Communication Technology (ICT)	No	Yes	Yes	Yes
Tailoring seasonal forecasts to local farmer needs	No	Yes	Yes	No
Climate services including seasonal prediction	No	Yes	Yes	Yes
Supporting clients in mainstreaming climate risks into sectors	No	No	No	No
Effective communication	Yes	Yes	Yes	No
Integrating local and indigenous knowledge in seasonal forecasts	No	Yes	Yes	Yes
Developing decision support tools for stakeholders	No	No	Yes	No

To further illuminate on institutional capacity around climate information in the GCF districts, an analysis of strengths, weaknesses, opportunities and threats (SWOT) based on KIIs was done to inform entry points for the GCF project.

Table 49: SWOT Analysis for institutional capacity for climate information

Strengths	Weaknesses
1. Good collaborative relationship with national and district stakeholders 2. Capacity to access national level competences to support local climate information generation and tailoring	1. Inadequately resourced weather stations 2. Limited contact with farmers 3. Limited budget for field activities, rely on partners' schedules in same areas 4. Not represented in all districts 5. Not all officers are licensed to talk about seasonal forecasts
Opportunities	**Threats**
1. Devolution of Government could lead to improved presence at district and ward level thereby increasing farmer access to climate information, and impact.	1. While MSD may interact directly with farmers on certain aspects, their impact may be undermined where Agritex is left behind in the implementation as the former has experience in communicating complex concepts and information to farmers.

4.1.2. Overall capacity of AGRITEX

(Data from ongoing survey required here)

4.2. CONSISTENT USE OF CLIMATE INFORMATION/ PRODUCT AND SERVICES IN FARMING DECISIONS

To understand the extent to which farmers use climate information products/services in decision-making in climate-sensitive sectors, all households who said they use the information to make farming decisions were considered in the indicator 6 calculation.

> ***Indicator 6: 33 percent** of direct beneficiaries consistently using climate information/ product and services in farming decisions*

There were 7 actions/decisions that a farmer could take and for each, a score of 1 was assigned for each action taken by the farmer. The individual scores were added together and a minimum of 0 and maximum of 7 could be achieved. Following this, farmers were grouped into categories where (0) practised less than 3 and (1) practised 3 or more.

The indicator was calculated as follows; the total number of farmers who undertook at least 3 measures was expressed as a proportion of the total sample size (4180) to give the proportion of farmers using information to make critical decisions.

4.2.1. Use of climate information/ product/ services in farming decisions

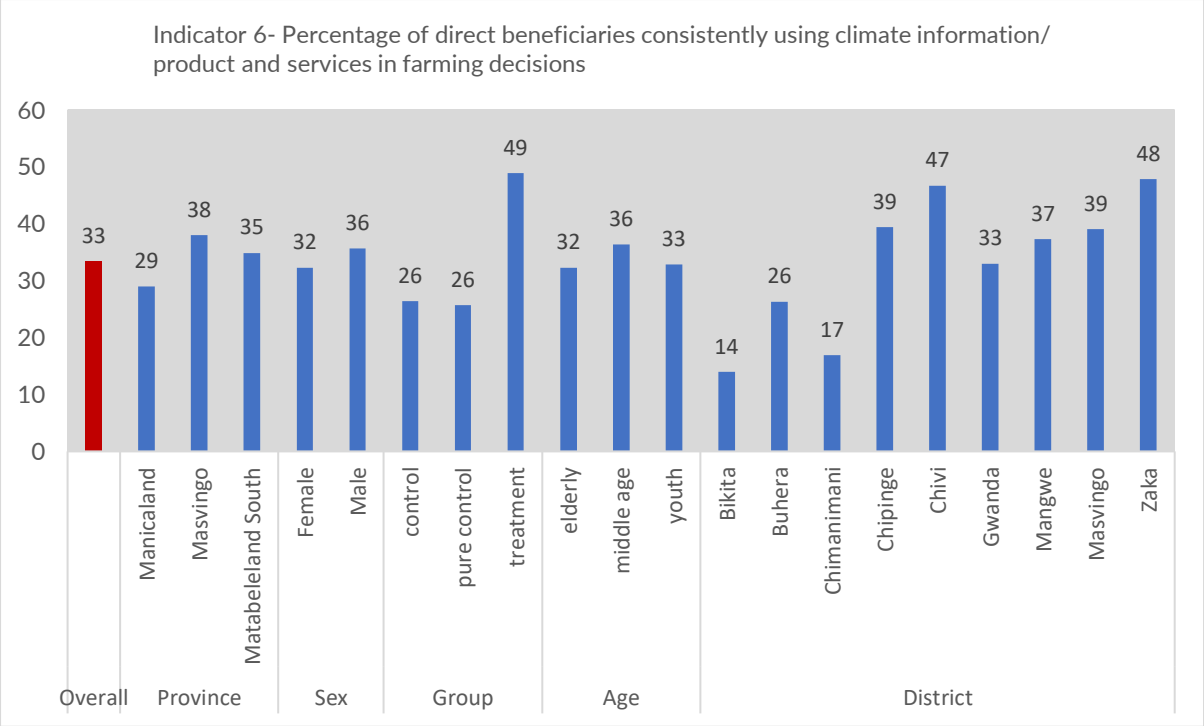


Figure 16: Indicator 6- Percentage of direct beneficiaries consistently using climate information/ product and services in farming decisions

Overall, 33 percent of respondents used climate information. Utilisation was higher in Masvingo province (38 percent) relative to Mat South (35 percent) and Manicaland (29 percent). Male respondents were more likely to use climate information (36 percent) compared to females (32 percent), as were middle aged farmers (36 percent) relative to the other age groups. When household type was considered, treatment households were nearly twice (49 percent) as likely to use climate information than control and pure control households (29 percent). With respect to project districts surveyed, use of climate forecast ranged from 14 percent in Bikita and 48 percent in Zaka. Chimanimani (17 percent) and Buhera (26 percent) had some of the least proportions of farmer climate information use, with Gwanda (33 percent) and Mangwe (37 percent) performing fairly high, relatively.

4.2.2. Decisions and actions taken by farmers receiving climate information

The specific uses of climate information were investigated by asking respondents what decisions or actions they took after receiving climate information. Analysis of field data showed that overall, given seasonal forecast information, the most common response was changing planting date (81.6 percent). Almost two thirds (62.7 percent of farmers changed their crop choice while a further 60.9 percent changed the variety of crop cultivated. These were the three main decisions. Other possible decisions that farmers could make included, purchasing food reserves (7.8 percent), reducing income expenditure (8.6 percent) and purchasing crop insurance (1.2percent) and livestock insurance (1percent) (Table 50). Further, to inform programming at local level, use of climate information was organised along key disaggregating variables as shown in Table 50:

Table 50: Decision made following climate information

Which of the following did you do in response to the climate information that you received?																	
		Household type			Province			District									
								Manicaland			Masvingo				Mat. south		
	Total	Treatment	Pure control	Control	Manicaland	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Changed the planting date	81.5	82.3	84.1	78.1	79.9	81.9	81.7	74.4	87.1	82.7	91.8	88.5	88.2	76.5	76.7	68.6
Changed choice of crop	62.6	65.7	62.9	57.6	63.8	61.1	60.0	56.4	69.9	68.0	28.2	59.1	66.8	72.5	70.7	72.7
Changed variety of crop	59.0	63.5	55.9	55.2	61.4	57.9	56.3	46.3	66.7	66.6	24.5	60.3	61.6	82.4	53.4	86.6
Purchased food reserves	8.6	9.3	5.6	10.1	7.2	8.2	8.3	2.2	7.5	18.7	0.0	7.4	12.7	7.8	12.4	1.2
Purchased weather-indexed crop insurance	1.2	2.2	0.5	0.5	0.7	0.7	1.1	0.0	1.1	3.7	0.0	0.7	0.9	2.0	1.6	1.2
Purchased weather-indexed livestock insurance	1.0	1.4	0.7	0.6	0.9	1.0	0.9	0.2	1.1	1.7	0.0	0.9	0.9	0.0	1.2	2.3
Reduced income expenditure	8.5	9.7	9.0	6.3	6.3	9.6	8.0	5.4	4.3	10.4	0.0	2.5	9.2	13.7	29.7	1.7

Changing the planting date was mostly a response used by respondents in Masvingo province (Bikita, 91.8 percent; Chivi 88.5 percent and Masvingo 88.2 percent). The response was also most common in Chimanimani (87.1 percent). Farmers in Mangwe (68.6 percent) were the least likely to change planting dates given seasonal forecast information. However, farmers in Gwanda and Mangwe were more likely to switch crops than peers in other districts, with Bikita having the least likelihood of crop switches (28.2 percent). Again, switching variety of crop was least likely to be done by farmers in Bikita (24.5 percent), with other districts having more than half their populations being likely to switch crop varieties. Reducing income expenditure was an important response in Gwanda (29.7 percent), while farmers across all districts were highly unlikely to purchase either crop insurance (1.2 percent) or livestock insurance (0.9 percent). With respect to household types, the baseline found that there were no significant differences based on whether the household had been earmarked for targeting with project intervention. For example, 35.8 percent of treatment households changed planting date, compared to 38.4 percent and 37.5 percent for the pure control and the control groups.

According to FGDs, accessing climate information did not always follow with a decision or action on the part of the farmer. Deciding or taking an action would typically require expending resources, such as purchasing a different type of crop, hiring labour to implement a particular farming practice, or other action. Where resources are a constraint, farmers may fail to respond to the climate information provided.

4.2.3. Farmer training in climate change and use of climate information

To further unpack the range of decisions and actions taken by farmers in response to climate change, the baseline investigated the specific field for which climate change related training was provided, based on the 12-month recall period. The hypothesis of the baseline was that

farmers were more likely to use climate information in the fields of agriculture where they had received some climate change-related training.

Table 51: Aspect of agriculture where climate change training was provided

If you received climate adaptation information in the last twelve months, what aspect of your farming was it in relation to?												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
Crop production	97.7	97.8	97.4	97.9	97.5	97.8	97.3	98.1	97.7	97.1	98.7	97.3
Horticulture	19.3	23	18	14.9	20.4	18.7	20.1	21.2	17.7	17.9	20.1	23.4
Livestock feeding	28.7	34.6	23.4	25.2	29.5	28.3	28.1	27.3	30	27.1	30.4	31
Market information	13	13.7	12.3	12.5	15.6	11.5	14.6	12	12.5	12.8	12.7	15.3
Disease management in crops	41.4	46.8	40.4	34	42.8	40.6	42.2	41	41.1	39.5	41.9	49.8
Disease management in livestock	27.9	31.2	28.9	21.6	29.2	27.1	28.8	27	27.8	26.3	28.6	33.7
	Province			District								
				Manicaland			Masvingo				Mat. South	
	Manicaland	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Crop production	97.3	97.7	98.6	98.9	98.9	94.5	99.5	98.5	96.0	93.8	98.1	99.5
Horticulture	24.7	19.3	9.0	17.6	21.3	35.7	5.4	26.6	17.6	16.9	6.7	12.7
Livestock feeding	24.1	30.0	35.2	13.9	24.7	37.2	20.8	31.0	37.7	13.8	39.4	28.2
Market information	13.0	14.7	9.7	3.6	8.4	27.4	8.9	18.9	12.7	12.3	8.3	11.8
Disease management in crops	31.3	49.3	45.9	18.1	21.9	52.8	31.7	57.0	51.2	38.5	45.0	47.3
Disease management in livestock	22.1	33.6	28.3	10.7	15.7	39.9	20.8	41.0	34.0	16.9	34.7	17.7

Based on a sample of 2753 respondents to this question, the survey found that most training provided in climate change topics were biased towards crop production. Crop production techniques covered nearly all (98percent) respondents surveyed, compared to 41 percent reached for livestock production related training. Other important aspects that were covered included livestock feeding in response to droughts (29percent) and disease management in livestock (28percent). Some 19 percent of farmers were capacitated in addressing climate change issues in horticulture, and 13percent reported that they had been equipped with skills for using market information to help them cope better and adapt to climate change.

Apart from training in crop production, across all climate change training areas provided to communities in intervention districts, treatment households were more likely to have received training compared to the pure control and the control groups. Focusing on all

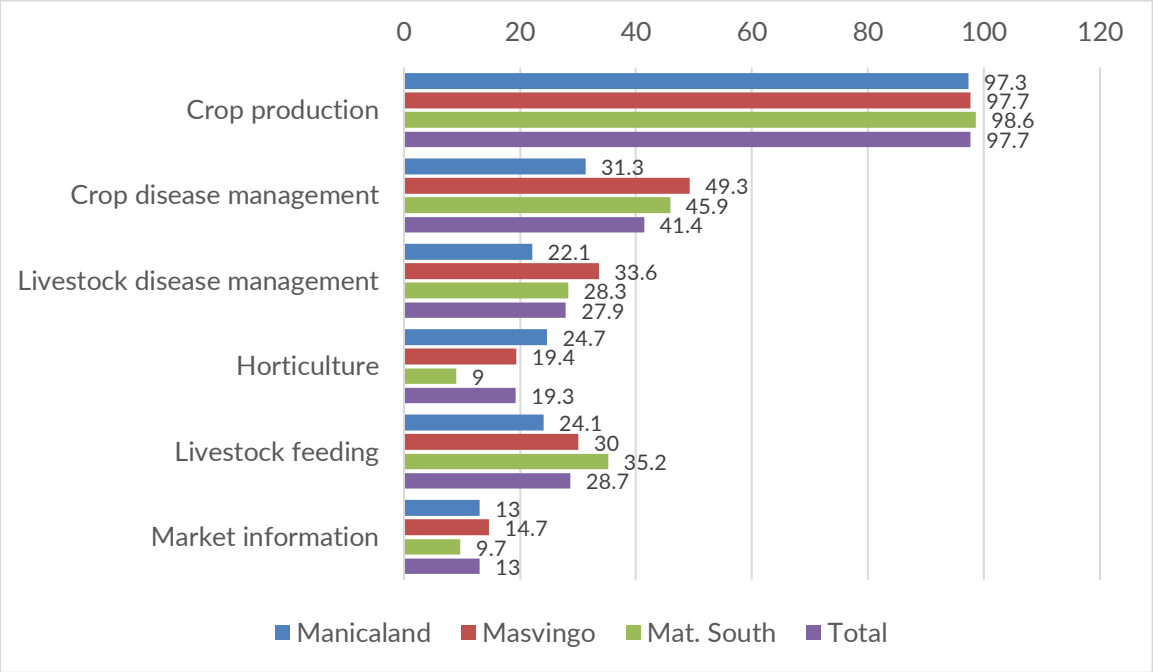
training provided, the data suggests that the training provided had largely focused on crop production, including managing crop pests and diseases, as well as livestock disease management. The proportions trained in livestock were also lower across all household types as this training was likely most attended by those who owned some livestock units. In crop disease management, 46.8 percent of treatment households were trained, compared to 40.4 percent in the pure control and 34 percent in the control groups.

Crop production training was generally very high across all districts, with at least 90 percent of all households being trained. Training in horticulture, however, varied by district, with Chipinge and Chivi leading at 35.7 percent and 26.6 percent respectively. Training in livestock feeding was highest in Gwanda (39.4 percent), Masvingo district (37.7 percent) and Chipinge (37.2 percent), and Chipinge also had the highest proportion trained in market information (27.4 percent). Training in climate change as it relates to livestock disease management was mostly done in Masvingo and Mat South with Chivi (41 percent) and Masvingo (34 percent) leading. Chipinge (39.9 percent) had a high proportion trained in disease management. The baseline did not find any difference in training participation by sex of farmer. Across all training areas, the proportion of men and women trained was the same statistically as shown in Table 51. Also, participation in training was not predicted by age of farmer.

4.2.3.1. Training in climate change and use of climate information

Considering the variation in climatic experiences across the project intervention areas, baseline data was analysed by location to determine if at all there were location specific trainings that had been delivered. Results in Figure 17show that while crop production was an area of focus for all three provinces, horticulture and livestock feeding were slightly more location biased. Manicaland had 24.7 percent of respondents reporting receipt of climate change training as it relates to horticulture, consistent with the province's relatively higher water availability status for horticulture. As expected, livestock feeding training was less in Manicaland (24.1 percent) compared to Masvingo (30 percent) and Mat. South (35.2 percent), with the latter two provinces being generally understood as more competitive for livestock farming than the former.

Figure 17: Focus of climate change training by province



Disease management in crops was more important as a training topic in Masvingo (49.3 percent) and Mat. South (45.9 percent) compared to Manicaland (31.3 percent), while training in disease management in livestock was also least popular in Manicaland relative to the other two provinces.

4.2.3.2. Focus of duration since training was received

About 90percent of respondents (N=2691) who had received training in climate change adaptation had been trained in the last twelve months to the survey. A further 8 percent had been trained at least two years prior, while 17 of the farmers interviewed reported that they had received climate change training more than five years ago.

Table 52: Period when training was conducted

	Proportion	Number
Last 12 months	90%	2417
1 to 2 years ago	8%	214
3 to 5 years ago	2%	43
More than 5 years ago	1%	17
Total	100%	2691

Regarding the geographic spread 12 of the 17 respondents trained over 5 years ago had been trained in Masvingo with the remainder 4 in Mat South and 1 in Manicaland. Manicaland had a slightly higher proportion of farmers trained in the last 12 months (93.1percent) than the other two provinces, with Masvingo at 89.2 percent and Mat South at 85.2percent.

Despite training received, 31 percent of respondents reported that they felt that there was a skills gap that the project needed to address. Survey data shows that 35.4 percent of

treatment households reported that they had a skills gap that the project had to address, while 29.8 percent of control and 28.6 percent of pure control households reported requiring further training on climate-related topics. The baseline did not find any significant differences in likelihood of reporting a skills gap based on age and gender of the respondent.

The qualitative survey further examined the training specific to generation of climate data and its subsequent dissemination and use. It emerged that training in managing a weather station, such as collecting rainfall data, had not been provided at community level for the majority of GCF districts.

4.2.4. Reliability of seasonal forecast

A key determinant of use of climate information across all respondents was the level of reliability of the climate information. Across all household groups, less than half (40.6 percent) of respondents (N=25=2481) that had used the seasonal climate forecast in the 2020/21 season had found it to be reliable. Perception of reliability of the seasonal forecast was lowest for the pure control (29.8 percent) and control (39.7 percent) and slightly higher for the treatment group at 48.8 percent. Perception of reliability of the seasonal forecast varied with location: Respondents in Masvingo found the forecast the least reliable (34.9 percent), while Manicaland was at 41.6 percent and Mat South was at a modest 48.9 percent.

The level of reliability of climate information was linked to the generalise seasonal forecasts that farmers were receiving, and therefore, not necessarily suited for their specific wards, given variations in climatic experiences within districts. Also, qualitative analysis revealed that low reliability of climate forecast data was a deterrent to future use of seasonal forecasts, and any measure to increase climate resilience through seasonal forecast use would have to be built on trust. Increasing the number of local weather data collection points would increase the level of accuracy, allowing for tailored information. From the MSD perspective, farmers were not fully appreciating the concept of probability in the forecasting, treating information given as fact.

4.2.5. Barriers to use of seasonal climate forecasts by farmers

To inform programming on strategic entry points for addressing barriers 1, 1a and 4 as they relate to climate information generation and use by farmers, key informant interviews and focus groups with farmers identified a range of barriers to use of climate information by farmers. Suggestions for programmatic intervention to address these barriers were also identified:

Barrier identified at baseline	Recommendations for programme intervention
1. There appears to be no systematic recording of feedback from farmers on how they are using information. In fact, MSD is not fully aware of how farmers use seasonal forecasting and what further tailoring would make it more appropriate to farmer needs. Information appears to flow in one direction only.	GCF project should consider organising feedback meetings with MSD and AGRITEX during and post-season as platforms for sharing feedback which will inform the generation and packaging of future climate information.
2. Preference for traditional rather than 'western science' generated seasonal	Pre-season climate forecast workshop should bring together western and local knowledge and

forecasts.	achieve consensus on season forecast. Lessons can be learned from the Coping with Drought and Climate Change project in Chiredzi (EMA/UNDP).
3. Historically, forecasts have been intended for commercial rather than communal farmers, and therefore, limited collective experience of reliability of forecasts	Mainstream climate information in agricultural extension messages to promote uptake. Project could consider identifying case studies of successful application of climate information and showcase these through FFS or community field days.
4. Farmers consider and trust forecasts if they have been accurate for their specific local area (village), while the MSD considers accuracy at district level. Climate information disseminated is not fully tailored to the district or ward.	Increase accuracy of data by increasing number of data points for supporting forecast generation, e.g., increasing number of farmer managed rain gauge stations.
5. Farmers do not understand the concept of probability when it comes to forecasts, they interpret and share information as if it were definite. This leads to mistrust of seasonal climate forecast information.	Training workshops with farmers should ensure that farmers understand that seasonal forecasts are data-informed predictions and are a probability rather than fact.
6. Limited farmer access to smart phones to receive more comprehensive climate information. For those with smartphones, reception and money for internet data may limit ability to access this climate information or share it.	FFS are an ideal platform for climate information dissemination as they provide farmers an opportunity to ask further questions or raise concerns. There is strong evidence of sharing of climate information by farmers.
7. Communication boosters are few within some districts so much that some farmers may not be able to access updated information on a regular basis.	Consider supporting advocacy efforts in development of communication infrastructure using evidence from the GCF project.
8. Information provided may not always be relevant to the farmer's needs. Farmers are concerned with knowing how the rainfall will be distributed rather than the total seasonal rainfall amount (below, normal or above normal). In Chipinge, for example, while 1000mm is normal, 650mm distributed evenly with 20mm per week would be sufficient for crops to reach maturity.	Feedback workshops will help ensure that information received is clear and relevant to its intended users.

4.2.6. Conclusion

Under Outcome 1 the GCF project intends to deliver increased generation and use of climate information in decision making. Evidence from the baseline confirms the barriers identified in the project document that capacity for generation and use of climate information is low, thereby undermining the potential for building resilient farming systems. The scorecard with AGRITEX and MSD, for example, show that there is scope for both strengthening technical competences through training, and equipping the officers with the right environment (hardware and software) for producing the intended results. While the project theory is if climate information generation is improved, and if farmers use information produced, then resilience of farming systems will be strengthened. However, evidence showed that receiving

climate information does not translate to use as farmers may not trust the information, may lack resources to act on the information, or the information may not be suitable for their unique local environment. Thus, tailored information should be prioritised, and potentially blended with other farmer-demanded information, such as market information, to influence climate-information uptake. The project should recognise that some work had already been done in some of the districts and learning and building up on what exists is a more effective strategy. Institutional competences should be appropriately aligned to reduce likelihood of role conflicts in the field.

5. OUTPUT 1: INCREASED ACCESS TO WATER FOR CLIMATE-RESILIENT AGRICULTURE THROUGH CLIMATE-RESILIENT IRRIGATION SYSTEMS AND EFFICIENT WATER RESOURCE MANAGEMENT.

Output 1, "Increased access to water for climate-resilient agriculture through climate resilient irrigation systems and efficient water resource management, addresses Barrier 1 to the attainment of resilient livelihoods in the project intervention areas. The project hypothesises that "Smallholder farmers face increasing climate risks to productivity and yield stability of their dryland agro-ecosystems and lack the technical knowledge and capacities to adapt their production practices to increasing climate-driven drought and mid rainy season dry spells". To provide the status of the baseline with respect to this Output area, the following indicators were assessed:

5.1. LAND UNDER CLIMATE-PROOFED IRRIGATION

Indicator 8 **–** *Number of hectares under climate-proofed irrigation*

Indicator 9 **-** *Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures*

At baseline, as reported in the project document, **a total of 11066 hectares across the project intervention districts were under climate-proofed irrigation**. Based on the sample of households surveyed, the baseline examined the specific measures that were being used by farmers to climate-proof their irrigation.

5.1.1. Total area under climate-proof irrigation

Based on the survey sample of 4080 households, total irrigated land under climate-proofed measures was 3872ha. The mean household hectarage under climate-proofed irrigation was 0.93ha, with households in the treatment group (1548ha) having slightly more land than those in the pure (1169ha) and control (1156ha) groups. With respect to gender dimensions in land access, the baseline found that females had more access to climate-proofed irrigation land (2350ha) compared to their male counterparts (1523ha). Spatially, Masvingo had a higher share of the total land (1738ha) and largest per household mean (1.19 ha) compared to the other two provinces. Mean hectarage per household was highest in Chivi (1.45ha) and Masvingo (1.18ha) and least in Mangwe (0.30ha) and Chimanimani (0.26ha) (Table 53).

Table 53: Amount of irrigated land under climate-proofed measures

				I7: How much irrigation land is climate proofed measures?			
				Total	Mean	Median	Maximum
Overall				3872	0.93	0.50	10.00
Household	Treatment			1548	1.14	0.91	10.00
	Pure control			1169	0.81	0.50	8.00
	Control			1156	0.83	0.50	7.00
Gende	Male			1523	1.05	0.55	8.00
	Female			2350	0.86	0.50	10.00
Province	Manicaland			1607	0.89	0.50	10.00
	Masvingo			1738	1.19	1.00	8.00
	Matabeleland South			528	0.58	0.40	8.00
Province	Manicaland	District	Buhera	995	1.29	1.00	10.00
			Chimanimani	99	0.26	0.00	5.50
			Chipinge	513	0.80	0.50	7.00
	Masvingo		Bikita	205	0.71	0.20	5.00
			Chivi	906	1.45	1.20	8.00
			Masvingo	539	1.18	1.00	6.00
			Zaka	87	0.95	0.60	5.00
	Mat. South		Gwanda	408	0.80	0.50	8.00
			Mangwe	119	0.30	0.20	2.02

5.1.2. Climate proof measures for irrigation

At baseline of the 343 farmers practicing irrigation 192 (56 percent) are employing measures to reduce climate risk exposure on the irrigation land. The baseline study analysed the frequency of use of these climate-proof measures in irrigation-based crop production:

Table 54: Proportion of farmers applying climate proof measures on irrigation land.

I5: If yes (Use of measures to reduce climate risk exposure), what measures are you currently using to hedge against climate-related hazards? (N=343))																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	Manicaland	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Water harvesting	40.6	40.3	47.5	33.9	66.2	18.5	43.5	16.7	73.7	57.1	0.0	13.2	41.7	100	35.0	100

Precision irrigation	14.6	13.9	8.2	22.0	23.4	5.4	21.7	50.0	17.5	35.7	50.0	3.9	8.3	0.0	25.0	0.0
Water scheduling regime	16.1	19.4	14.8	13.6	7.8	19.6	30.4	16.7	3.5	21.4	0.0	17.1	25.0	100	30.0	33.3
Supplementary irrigation	13.0	12.5	16.4	10.2	15.6	6.5	30.4	16.7	17.5	7.1	50.0	5.3	8.3	0.0	35.0	0.0
Mulching	71.4	81.9	49.2	81.4	46.8	94.6	60.9	50.0	36.8	85.7	100	98.7	83.3	0.0	60.0	66.7
Use forecast information to make decisions	13.0	18.1	11.5	8.5	10.4	13.0	21.7	0.0	7.0	28.6	0.0	7.9	50.0	0.0	25.0	0.0

Mulching was the climate proofing strategy for irrigation across all surveyed farmers using climate proofing measures. Mulching was being used by 71.4 percent of farmers using climate proof measures for irrigation and was mostly common among farmers in Masvingo (94.6 percent) as compared to those in Mat. South (60.9 percent) and Manicaland (46.8 percent). In Manicaland, mulching is rarely practiced especially in Chimanimani district (36.8 percent).

Among farmers practicing irrigation and employing climate-hazard mitigation measures, water harvesting was cited as the second most common climate-proofing measure and used by 40.5 percent of those climate-proofing their irrigation. This practise was mostly practised among pure control farmer households (47.5 percent) compared to treatment (40.6 percent) and control households (33.9 percent). Water harvesting for irrigation had the highest useage in Chimanimani (73.7 percent), Zaka (100 percent) and Mangwe (100 percent) districts.

Other measures for enabling climate-proofing of irrigation used by sampled farmers included water scheduling used by 16.1 percent of climate-proofing farmers, mostly in Zaka (100 percent), Gwanda (30 percent) and Mangwe (33.3 percent), and less so for Bikita (10 percent), Chimanimani (3.5 percent) or Buhera (6.7 percent). Precision irrigation is another climate proofing measure, applied by half of the irrigation climate-proofing farmers in Buhera and Bikita but not at all used on Zaka and Mangwe. Supplementary irrigation as a climate-proofing measure was used by 13 percent of climate-proofing farmers with Masvingo and Chivi having some of the lowest proportions of users (8.3 percent and 5.3 percent, respectively), long with Zaka and Mangwe where not a single farmer reported using this technique in climate proofing irrigation. Seasonal forecasts were generally more widely used in rainfed farming systems, and for irrigation, 13 percent of farmers used climate information for mitigating against climate risks.

5.1.3. Total irrigated land under different climate-proof measures

Baseline data shows that the majority of climate-proofed land under irrigation was under mulching (126ha) with Masvingo province leading, followed by water harvesting (84ha), where Manicaland dominated. Use of seasonal forecasts in irrigation decision making was linked with 40ha of land, while water scheduling in irrigation was used by 33ha. Other measures such as precision irrigation was less common (30ha), as was supplementary irrigation covering 25ha.

Table 55: Size of land (in ha) under different climate-proof measures for irrigation in 2021/22 season

				I5: If yes, what measures are you currently using to hedge against climate-related hazards? By Size of land under climate proofed agriculture											
				Water harvesting		Precision irrigation		Water scheduling regime		Supplementary irrigation		Mulching		Use forecast information to make decisions	
				Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
Household type	treatment			39.10	1.35	8.49	0.85	12.17	0.87	9.52	1.06	57.00	0.97	13.66	1.05
	pure control			30.44	1.05	11.41	2.28	13.31	1.48	11.90	1.19	31.71	1.06	19.50	2.79
	control			14.29	0.71	10.06	0.77	7.80	0.98	3.35	0.56	37.54	0.78	6.60	1.32
	Total			83.83	1.07	29.96	1.07	33.28	1.07	24.78	0.99	126.24	0.92	39.76	1.59
Province	Manicaland			49.84	0.98	13.37	0.74	7.20	1.20	8.91	0.74	32.04	0.89	6.21	0.78
	Masvingo			23.85	1.40	10.75	2.15	21.05	1.17	10.35	1.73	76.57	0.88	23.35	1.95
	Matabeleland South			10.14	1.01	5.84	1.17	5.03	0.72	5.52	0.79	17.63	1.26	10.20	2.04
Province	Manicaland	District	Buhera	2.50	2.50	4.50	1.50	2.00	2.00	2.50	2.50	5.50	1.83	-	-
			Chimanimani	40.18	0.96	4.02	0.40	1.00	0.50	6.00	0.60	17.86	0.85	0.60	0.15
			Chipinge	7.16	0.89	4.85	0.97	4.20	1.40	0.40	0.40	8.68	0.72	5.61	1.40
	Masvingo	District	Bikita	-	-	1.50	1.50	-	-	1.25	1.25	2.75	1.38	-	
			Chivi	8.75	0.88	3.25	1.08	10.85	0.83	3.10	0.78	52.72	0.70	7.85	1.31
			Masvingo	11.50	2.30	6.00	6.00	6.60	2.20	6.00	6.00	21.10	2.11	15.50	2.58
			Zaka	3.60	1.80			3.60	1.80						
	Mat. South	Distric t	Gwanda	8.93	1.28	5.84	1.17	4.22	0.70	5.52	0.79	17.22	1.44	10.20	2.04
			Mangwe	1.21	0.40			0.81	0.81			0.40	0.20		

***It was assumed that the farmer was applying measures across the portion used in irrigation*

The average size of land under irrigation per farmer in Chipinge, Chivi districts where the two main water conservation measures (mulching and water harvesting) are practiced is smaller as compared to the rest of the districts, which creates an opportunity to increase awareness within those target areas.

5.2. RAIN-FED HECTARES EXHIBITING WATER HARVESTING AND CLIMATE-RESILIENT WATER MANAGEMENT MEASURES

***Indicator 9 – 3664 ha** of rain-fed land exhibiting water harvesting and climate-resilient water management measures. This represents 39 percent of all land under rainfed farming, and translates to **29,601 ha** at baseline.*

The baseline figure for **total rainfed agricultural land under climate-proof measures was 3664 hectares**, with farmers owning a mean of 0.88ha and a median of 0.50ha under climate-proofed rainfed farming. Sampled households had up to a maximum of 10 ha under climate-proofed irrigation per household. Households in the treatment group controlled the most climate-proofed rainfed land (1468ha) compared to the pure (1109ha) and control (1086ha) households. With respect to gender, females controlled 2229 ha compared to 1435 ha for males. The majority of climate-proofed rainfed land was in Masvingo (1659ha), followed by Manicaland (1520ha) and then finally, Mat South (486ha) with total being influenced by the survey's sample size across the three provinces.

Table 56: Size of rainfed land under climate proofed measures

				I12: How much rainfed land is climate proofed measures?			
				Total	Mean	Median	Maximum
Overall				3664	0.88	0.50	10.00
Household type	Treatment			1468	1.09	0.81	10.00
	Pure control			1109	0.77	0.40	8.00
	Control			1086	0.78	0.40	7.00
Gender	Male			1435	0.99	0.50	8.00
	Female			2229	0.82	0.50	10.00
Province	Manicaland			1520	0.85	0.50	10.00
	Masvingo			1659	1.13	1.00	8.00
	Matabeleland South			486	0.53	0.40	8.00
Province	Manicaland	District	Buhera	957	1.24	1.00	10.00
			Chimanimani	77	0.20	0.00	4.00
			Chipinge	486	0.75	0.45	7.00
	Masvingo		Bikita	198	0.69	0.20	5.00
			Chivi	869	1.39	1.00	8.00
			Masvingo	509	1.12	1.00	6.00
			Zaka	83	0.90	0.50	5.00
	Mat. South		Gwanda	372	0.73	0.40	8.00
			Mangwe	114	0.28	0.20	2.02

5.2.1. Water harvesting and climate resilient water management measures

The baseline found that respondents across the survey districts were already using a range of measures for water harvesting and management under rainfed farming systems. Most of this practice has been driven by the significant investments by Government and development partners in the same districts targeted by GCF. Table 57 shows the measures assessed by the baseline.

Table 57: Proportion of respondents using climate-proofing measures in rainfed farming

I11: If yes, what measures are you currently using to hedge against climate-related hazards?																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Water harvesting	15	14	16	13	11	12	26	6	66	4	4	19	6	6	35	13
Mulching	46	52	42	42	41	55	35	28	55	52	18	65	73	14	41	27
Crop rotation	59	64	55	57	50	72	50	64	61	32	71	89	55	31	50	49
No-till/minimum tillage	50	52	52	48	52	57	35	55	37	52	58	71	33	69	29	42
Cover cropping	44	50	39	43	37	55	36	32	40	41	41	59	61	41	45	24
Change in cropping patterns in last 3 years	13	14	10	13	8	19	8	9	0	10	13	32	4	9	9	6
Use drought tolerant crops	54	63	46	52	48	59	56	58	40	39	76	70	35	36	46	69
Use drought tolerant varieties	38	44	33	35	30	42	46	37	19	24	54	51	22	31	37	58

Overall, crop rotation was the most commonly used practice for hedging against climate risk, used by 59 percent of respondents surveyed. Districts lagging in crop rotation use were Chipinge (32 percent) and Zaka (31 percent), while almost nine in ten farmers surveyed in Chivi were using this practice. Crop rotation allows for the next crop to take advantage of any remaining moisture at a different soil depth from the previous crop, while also improving soil fertility. No till and minimum tillage practices used were being promoted by Government and NGOs in the project districts. Planting basins were dug to harvest water and support plant establishment. In total, 50 percent of farmers were using minimum tillage technique for climate-proofing in rainfed farming. Gwanda and Masvingo had the lowest proportions of farmers using this technique at 29 percent and 33 percent, respectively. Mulching (46 percent) and cover cropping (44 percent) were the other popular practices for climate-proofing rainfed farming. Use of drought tolerant crops (54 percent) was another popular practice, though less so in Masvingo (35 percent) and Zaka (36 percent); and drought tolerant variety use (28 percent) were least used in Chimanimani (19 percent) and Masvingo (22 percent). Bikita and Chivi were, overall, the best districts with respect to use of drought tolerant crops and varieties. Only 13 percent of respondents had changed cropping pattern as a climate-proofing measure in the last three years.

5.3. Conclusion

The baseline survey findings confirm that smallholder farmers in the project districts were lacking the technical knowledge and capacities to adapt their practices to increasing climate-driven drought and mid-season dry spells. Evidence from the field survey points to between low and moderate use of various management practices that are key for climate-proofing farming systems. The results presented have indicated districts that have low utilisation of

these climate-proofing measures, but the project should focus more on understanding the locally-relevant climate-proofing measures rather than adopt a one-size fits all approach in scaling up climate-proofed agriculture. For example, promotion of mulching should consider overall strategy for nutritious livestock feeding.

5.4. AGRICULTURE PRODUCTION TECHNOLOGIES/PRACTICES

Agricultural production technology/ practices use was examined through the indicator highlighted below.

Indicator 11 – Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems.

The indicator measures the number of dryland and irrigation farmers practicing climate resilient agriculture. Four categories of indices were used to create this indicator.

Indicator 7- Use by vulnerable households, communities, business and public-sector services of Fund supported tools, instruments, strategies and activities to respond to climate (%). Four categories of indices were use

1) Subscription and Active use of climate information products for crop/water management- 3 questions that is use of information for planning, receiving information on how to adapt farming to climate change and receiving any advisory or warning information to support agriculture were considered. If a farmer responded yes a score of 1 was given giving a minimum of 0 and maximum of 3. The household individual score is divided by maximum possible score and individual households score are added and divided by the sample size.

2) Active use of climate-resilient crop varieties, crop-livestock systems, as well as water-efficient technologies – 3 sub indices were calculated and added: climate-resilient crop varieties -3 questions used that farmer presently practising or using(a) use of drought resistant varieties, (b) use of drought resistant crops, (c) Legume crops included in crop rotation/intercropping. A score of 1 was assigned to every "yes" response and these are added together. A minimum of 0 and maximum of 3 were possible. Active use of crop-livestock systems considering use of livestock manure, improvements in feeding (efficient use of feed/water) practices and balanced feeding (appropriate mix of fodder/forage and concentrates). Active use of water-efficient technologies – 11 technologies were used and a score of 1 was given for every "yes" response. The 3 sub indices scores were summed to give household score. The individual household score is divided by maximum possible score and individual households score are added and divided by the sample size.

3) Active adoption for CRA practices promoted through the FFS curriculum- all the climate resilient agriculture practises used and agric value chains used are given score 1. The individual scores are added and divided by the maximum possible score (49) to get individual household score.

4) Lastly, participation in O&M fund, community open learning days, and participatory planning index was calculated by counting every yes response to, (i) Are you or anyone in this household a member of this? (ii) Are you an active participant in community organizations? And, (iii) Are you an active participant in community projects.

The individual household score is divided by maximum possible score and individual households score are added and divided by the sample size. To get the overall score the 4 indices are added together.

	Baseline Value	Household type			Gender		Age			Province			District								
													Manicaland			Masvingo				Mat. south	
		Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
0-25%	26	8	49	43	32	68	32	18	50	55	23	21	18	14	23	6	6	9	2	9	13
26-50%	51.9	33.8	32.6	33.7	35.0	65.0	26.4	26.2	47.4	42.0	37.7	20.3	20.2	8.7	13.2	7.6	16.4	11.3	2.4	9.7	10.5
51-74%	20.9	58.0	22.6	19.4	36.2	63.8	26.0	25.9	48.1	31.0	42.2	26.8	14.6	4.7	11.7	5.9	21.6	12.8	2.0	22.6	4.2
75-100%	0.8	75.0	3.1	21.9	46.9	53.1	31.3	40.6	28.1	12.5	59.4	28.1	3.1	3.1	6.3	0.0	56.3	3.1	0.0	28.1	0.0

5.4.1. Soil nutrient management practices

Table 58: Proportion of farmers practising various soil nutrient management practices

I15: Are you aware of any of the following soil nutrient management practices?				Composting		Livestock manure		Crop residues turned in to soil		Use of legume crops		Fertilizer use reduction practices		Organic agriculture	
				Aware	Using	Aware	Using	Aware	Using	Aware	Using	Aware	Using	Aware	Using
Overall				**87**	**51**	**93**	**71**	**76**	**53**	**77**	**59**	**54**	**37**	**46**	**24**
Household type	treatment			34	37	33	36	35	36	35	38	36	39	37	36
	pure control			33	34	34	34	32	31	32	29	31	31	31	31
	control			33	29	33	31	33	32	33	33	32	30	32	33
Gender	Male			35	36	35	35	36	38	36	36	36	36	34	36
	Female			65	64	65	65	64	62	64	64	64	64	66	64
Province	Manicaland			44	42	42	38	41	40	40	37	42	38	36	45
	Masvingo			38	46	36	38	39	43	39	42	37	40	37	30
	Mat. South			19	12	22	24	20	17	21	22	21	23	27	24
Province	Manicaland	District	Buhera	46	50	44	43	47	48	48	54	49	58	42	41
			Chimanimani	22	17	23	24	20	16	23	19	16	9	27	31
			Chipinge	32	33	33	33	33	36	29	27	35	33	31	27
	Masvingo		Bikita	19	12	19	19	20	16	20	20	16	8	13	8
			Chivi	44	48	44	45	46	49	45	44	40	39	55	62
			Masvingo	30	34	31	30	29	30	30	31	36	44	26	25
			Zaka	6	6	6	6	4	5	5	6	8	9	5	5
	Mat. South		Gwanda	59	74	56	59	61	72	65	67	49	52	60	60
			Mangwe	41	26	44	41	39	28	35	33	51	48	40	40

Generally, awareness of soil nutrient management practices is highest among the treatment group. Most of the farmers (93 percent) ware aware of livestock manure as a soil nutrient management practice and 71 percent used it in their farm operations. Though many farmers ware aware of composting (87 percent) and use of legumes (77 percent) as a soil conservation measure, the uptake of the two measures poor. Among those aware of organic agriculture, half end up utilizing it creating an avenue for improvement mechanisms. Across all soil nutrient management measures, females have a higher indication of being aware and putting into practise the different soil nutrient management measures.

In general, famers from Mat. South had the lowest awareness and adoption of the different measures as compared to the other provinces especially those in Mangwe district. Within Masvingo province, farmers in in Chivi district (62 percent) had a higher likelihood of adopting organic farming as compared to the other Masvingo districts.

5.4.2. Livestock Practices

Table 59: Proportion of farmers undertaking various livestock production practices

I17: Are you aware of any of the following livestock production practices?																				
			Household type			Gender		Province			Province									
											Manicaland			Masvingo				Mat. South	
											District			District				District	
		Overall	treatment	pure control	control	Male	Female	Manicaland	Masvingo	Matabeleland South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Biogas production	Aware	23	27	19	21	25	21	19	28	20	21	15	19	25	37	21	16	16	26
	Uses	6	6	8	3	7	5	5	6	7	2	11	6	4	7	4	7	8	7
Improvements in feeding	Aware	43	52	39	39	43	43	33	51	50	27	41	35	53	57	47	28	59	39
	Uses	39	42	37	37	43	37	37	40	41	38	31	39	27	27	71	46	46	33
Balanced feeding	Aware	38	48	33	34	40	37	29	42	49	24	29	34	34	50	40	28	61	34
	Uses	30	34	24	29	33	27	30	20	42	32	32	28	9	16	29	35	47	30
Improved animal health management/ vaccination	Aware	83	88	82	80	84	83	82	84	85	86	76	82	79	86	84	83	90	79
	Uses	72	77	67	73	75	71	63	82	76	66	65	58	81	79	86	86	86	61
Efficient treatment of manure	Aware	51	60	47	47	53	50	47	52	58	58	44	36	49	53	49	61	54	63
	Uses	57	61	52	58	59	56	57	56	59	60	63	45	49	50	63	84	62	55
Livestock diversification	Aware	62	70	55	61	63	62	54	66	73	68	37	48	74	65	60	73	71	75
	Uses	58	64	54	56	60	57	58	55	62	64	33	62	65	45	57	84	67	57
Animal Fodder preservation for ruminants	Aware	38	46	31	35	39	37	29	41	50	27	26	33	38	53	30	23	59	39
	Uses	30	35	26	26	31	29	33	24	33	31	48	27	9	29	22	29	29	42
Pen fattening (feeding)	Aware	40	50	34	37	42	39	31	41	58	36	27	27	52	44	28	45	57	59
	Uses	13	14	14	12	13	14	17	8	15	19	5	22	14	4	7	20	13	18
Improved animal shelters	Aware	64	70	63	60	64	64	62	68	62	64	59	61	57	77	65	60	66	58
	Uses	43	43	44	40	43	42	42	49	33	39	39	47	45	43	61	38	29	39
Survival feeding	Aware	52	60	49	49	54	51	47	52	63	47	46	49	48	62	39	53	68	56
	Uses	50	54	48	49	52	49	54	50	45	54	54	52	50	45	62	51	46	45
Water infrastructure for livestock at homestead	Aware	59	66	56	54	60	58	56	61	61	51	62	58	59	65	60	46	65	56
	Uses	44	47	46	40	45	44	42	52	36	36	33	55	46	31	88	43	30	45
Homemade animal feeds	Aware	61	67	60	56	63	60	57	67	59	55	58	60	56	75	63	61	64	53
	Uses	57	60	56	55	60	55	58	59	51	63	58	53	42	52	79	68	55	45
Improved livestock breeds	Aware	51	59	47	47	52	50	43	58	55	41	41	45	58	66	48	52	58	50
	Uses	28	30	29	24	30	27	30	23	33	31	16	37	31	18	23	42	37	26

***Usage is expressed as a subset of those who were aware of a phenomenon*

Awareness and usage of improved animal health management/vaccinations including Castration, Deworming & Dipping, home vaccinations (farmer administered vaccinations) was the most reported method of livestock production practice at baseline. Awareness stood at 88 percent, 82 percent and 80 percent among the treatment, pure control, and control groups respectively. Usage was reported at 77 percent, 67 percent, and 73 percent, respectively. There was notably a tangible proportion of farmers aware and using efficient

treatment of manure, making homemade animal feeds and practising livestock diversification methods as a method of improving livestock production.

Most of the farmers in Masvingo district (88 percent) who were aware of improve livestock water infrastructure used them as compared to other districts. Half of the farmers ware aware of improved livestock breeds especially in Chivi, Bikita and Gwanda though the uptake among those who were aware was wanting.

5.4.3. Water conservation management

Table 60: Water conservation management practises by farmers

I17: Are you aware of any of the following livestock production practices?																				
			Household type			Gender		Province			Province									
											Manicaland			Masvingo				Mat. South	
											District			District				District	
		Overall	treatment	pure control	control	Male	Female	Manicaland	Masvingo	Matabeleland South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Rainwater harvesting	Aware	**51**	57	49	46	50	51	49	49	58	48	67	39	38	58	43	49	54	62
	Uses	**52**	52	53	50	54	51	48	47	64	46	49	49	50	41	59	38	72	55
Re-use of water	Aware	**48**	56	44	45	50	47	45	57	41	41	62	38	53	60	53	66	48	31
	Uses	**45**	50	37	46	47	43	40	51	40	38	36	47	27	51	59	80	36	47
Sprinkler irrigation	Aware	**52**	56	52	48	55	50	54	51	49	53	44	61	41	64	41	48	46	53
	Uses	**3**	3	2	4	3	3	3	4	1	4	4	2	3	4	5	2	2	0
Drip irrigation	Aware	**50**	55	48	46	52	48	51	44	56	50	45	56	41	49	39	47	57	54
	Uses	**8**	9	6	8	7	8	9	5	9	5	20	7	6	3	9	2	13	3
Modification of cropping calendar to improve water use efficiency	Aware	**37**	44	34	32	36	37	26	47	39	24	19	34	62	51	36	34	41	38
	Uses	**55**	59	54	51	57	54	40	66	54	52	25	35	71	57	80	58	63	42

***Usage is expressed as a subset of those who were aware of a phenomenon*

Rainwater harvesting was the water conservation practice that more than half of the farmers in the treatment group (57 percent) were aware of and used (52 percent). 72 percent of the farmers who were aware of rain harvesting practised it in Gwanda district. Although the pure control (52 percent) and control (48 percent) groups' awareness on sprinkler irrigation was highest, they reported the lowest usage of sprinkler irrigation at 2 percent and 4 percent, respectively.

Majority of the farmers who were aware of re-use of water in Zaka district practised it. Modification of cropping calendar to improve water efficiency was common among 62 percent of the farmer household in Bikita with a higher (71 percent) proportion using the method for water conservation.

6. OUTCOME 2: STRENGTHENED ADAPTIVE CAPACITY AND REDUCED EXPOSURE TO CLIMATE RISKS

Indicator 7: *Use by vulnerable households, communities, business and public-sector services of Fund supported tools, instruments, strategies and activities to respond to climate change and variability*

The GCF project will implement a suite of measures that are intended to culminate in strengthened adaptive capacity and reduced exposure to climate shocks. At baseline there are no vulnerable households, communities, business, and public sector services that have yet used the Fund supported tools, instruments, strategies and activities to respond to climate change. The key indicator (Indicator 7) therefore, is at zero '0' at baseline. However, the baseline went further to explore the extent to which the various fund supported tools, instrument, strategies, and activities, as implemented by Government and its development partners, were being used. The baseline status with respect to exposure to shocks of a climatic nature was also investigated.

The baseline examined the proportion of households in the project areas presently using some of the Fund supported tools, instruments, strategies, and activities in response to climate change and variability. These were VSLs, Irrigation, and Climate resilient practices.

6.1. USE OF VILLAGE SAVINGS AND LOANS

Focus groups with communities in the project intervention areas revealed that community-based social protection groups such as burial societies, church-based groups, rotational savings groups, labour pooling groups, etc., were very crucial in supporting households to respond to a range of shocks including a range of covariate shocks (such as drought, dry spells) as well as idiosyncratic shocks (including death, illness, loss of assets, etc.). These community-based organisations were reported to provide resources (social and economic) for coping with shocks and helping prevent households from collapsing beyond recovery. In particular, households surveyed reported that VSLs were very essential for providing financial resources to help members and community members at large to deal with shocks, including

> *"Some of our clients have used small loans that we offer to start (off-farm) businesses, such as brick making while others buy seeds and other inputs". FGD respondent, Mangwe.*

experiences of dry spells, droughts and localised flooding. Critically, members of VSLs reported the indirect contribution of VSLs to resilience:

Table 61: Proportion of households where the household head or any other household member belonged to a village savings and loans group

Does the household head or any other household member belong to a village savings and loan group N=4180															
Category		B5: Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	Manicaland	Masvingo	Mat. South
Yes	21.9	31.4	16.6	18.3	19.5	23.2	20.4	24.9	21.3	20.7	23.4	24.0	25.4	18.8	20.2
No	78.1	68.6	83.4	81.7	80.5	76.8	79.6	75.1	78.7	79.3	76.6	76.0	74.6	81.2	79.8
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Chi2 = 104.9 Prob = 0.000			*Chi2 = 7.66 Prob = 0.006*		*Chi2 = 7.215 Prob = 0.027*			*Chi2 = 4.93 Prob = 0.085*			*Chi2 = 22.25 Prob = 0.000*		

Overall, at baseline, 21.9 percent of all households were members of VSLs. Households in the treatment group (31.4 percent) were nearly twice as likely to belong to a VSL than those in the pure control group (16.6percent) and control (18.3percent) groups. Female household heads, a key demographic category for the GCF, were more likely to be part of VSLs as opposed to male household heads. As shown in the Table 61, 23.2 percent of females against 19.5 percent of males were members of VSLs. The implication of a stronger female bias in VSLs was that some male headed households, without females of adult age able to participate in VSL groups, were less likely to be part of or benefit from VSLs. VSLs generally preferred lending to women as success rates for repayments were higher with women clients than males. Household size was not a predictor of membership in VSLs. Across the southern region, Manicaland had significantly higher proportion of households belonging to VSLs (25.4 percent) relative to Masvingo (18.8 percent) and Mat South (20.2 percent). Programmatically, the GCF may consider building up VSLs more in Masvingo province than the other two.

6.2. USE OF IRRIGATION

At project baseline, 8.2 percent (343 households) of survey respondents were practicing irrigation. There was no difference in use of irrigation by treatment type, although proportions varied by province (highest in Mat South) and district (lowest in Chimanimani, 65.2 percent). Though there were no significant differences in the proportion of farmers practicing irrigation by household type, farmers in Manicaland (10.3 percent) were more likely to practice irrigation as compared to those in Masvingo (8.8 percent) and Mat. South (3 percent). In Manicaland, Chimanimani district had the highest proportion of farmers practicing irrigation (34.8 percent) as compared to Buhera (3.3 percent) and Chipinge (4,2 percent). In Masvingo, Chivi had three times higher number of farmers irrigating as compared to Bikita, Mavingo and Zaka districts. In Mat. South, Gwanda (4.7 percent) had a higher proportion of farmers practising irrigation though overall the proportion was too low across other districts within the project.

Table 62: Proportion of farmers practicing irrigation

Proportion of farmers practicing irrigation (N=343)																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No Irrigation	91.8	90.8	92.5	92.1	89.7	91.2	97.0	96.7	65.2	95.8	99.0	83.9	95.6	94.6	95.3	99.0
Irrigating	8.2	9.2	7.5	7.9	10.3	8.8	3.0	3.3	34.8	4.2	1.0	16.1	4.4	5.4	4.7	1.0
		Chi2=3.07 P-value=.216,			Chi2=44.21 P-value=.000*,			Chi2=316.37 P-value=.000*			Chi2=75.42 P-value=.000*				Chi2=10.36 P-value=.001*	

In addition to determining the proportion of farmers practising irrigation, the size of land under irrigation was also considered by the baseline as an indicator of use of practices consistent with enhanced resilience to climate change and variability.

Table 63: Proportion of land under irrigation in the last season before the baseline survey

I3: Of this total land, how much was used in the current season? (N=343)				Count	Sum	Mean	Maximum	Standard Deviation
Household type	Treatment			125	235.97	1.89	10.00	1.42
	Pure control			108	140.20	1.30	7.00	1.18
	control			110	147.05	1.34	5.50	1.08
Province	Manicaland			186	214.83	1.15	5.50	1.15
	Masvingo			129	255.56	1.98	7.00	1.06
	Matabeleland South			28	52.84	1.89	10.00	2.00
Province	Manicaland	District	Buhera	25	57.00	2.28	5.50	1.63
			Chimanimani	134	122.72	0.92	5.50	0.86
			Chipinge	27	35.11	1.30	4.50	1.25
	Masvingo		Bikita	3	7.25	2.42	5.00	2.24
			Chivi	101	192.56	1.91	5.50	0.88
			Masvingo	20	47.75	2.39	7.00	1.62
			Zaka	5	8.00	1.60	2.50	0.65
	Matabeleland South		Gwanda	24	48.79	2.03	10.00	2.13
			Mangwe	4	4.05	1.01	1.21	0.17

Farmer households in the treatment area on average had more land under cultivation (1.89 ha) as compared to the pure control (1.30 ha) and control (1.34 ha). Manicaland farmer households had the lowest average size of land under irrigation. Though Manicaland had a higher proportion of farmers practicing irrigation, Masvingo farmers on average had bigger proportions of land under irrigation especially those in Bikita and Masvingo districts.

6.3. USE OF CLIMATE RESILIENT PRACTICES

The GCF project intends to promote climate smart agricultural practices to building resilience to climate change. Taking at least 10 practices as the minimum standard for determining if or not a household was practising CSA, the baseline found that overall, 68.7 percent of

households were already using equal to or more than ten climate resilience farming practices. A further 30.7 percent of households were using less than 10 climate resilient practice, while the balance of 0.6 percent were not using any climate resilience practices (Table 64).

Table 64: Proportion of households practising climate smart agricultural production technologies

Proportion of households practising climate smart agricultural production technologies		Overall	District								
			Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
CSA	=/+10 Practices	68.7	69.1%	63.9%	51.7%	72.1%	82.3%	79.6%	78.3%	70.3%	59.8%
	<10 practices	30.7	30.7%	35.1%	47.2%	27.9%	17.7%	20.2%	21.7%	28.3%	39.5%
	Not practising	0.6	.3%	1.0%	1.1%	0.0%	0.0%	.2%	0.0%	1.4%	.7%
CSA Practices Category											
Land conservation	=/+3 Practices	88.6	90.8%	81.3%	79.5%	94.8%	96.0%	92.1%	96.7%	87.6%	85.7%
	<3 practices	9.9	9.0%	16.6%	17.2%	4.5%	3.5%	7.0%	3.3%	9.3%	12.3%
	Not practising	1.5	.3%	2.1%	3.3%	.7%	.5%	.9%	0.0%	3.1%	2.0%
Soil Fertility Management	=/+3 Practices	62.1	68.8%	51.7%	44.6%	57.5%	82.3%	77.4%	69.6%	63.9%	37.5%
	<3 practices	29.4	23.9%	32.2%	38.2%	38.3%	16.6%	19.3%	26.1%	28.3%	50.1%
	Not practising	8.5	7.3%	16.1%	17.2%	4.2%	1.1%	3.3%	4.3%	7.8%	12.3%
Water Conservation	=/+3 Practices	5.4	2.1%	3.4%	2.5%	3.5%	11.8%	9.4%	3.3%	7.4%	3.0%
	<3 practices	42.4	35.5%	49.6%	35.4%	48.8%	39.7%	44.1%	56.5%	49.7%	45.4%
	Not practising	52.2	62.4%	47.0%	62.1%	47.7%	48.5%	46.5%	40.2%	42.9%	51.6%
Livestock Management	=/+3 Practices	50.1	46.9%	38.7%	42.4%	48.1%	51.7%	65.4%	64.1%	55.3%	50.9%
	<3 practices	31.1	30.0%	40.5%	30.3%	32.8%	33.0%	21.3%	20.7%	31.1%	34.3%
	Not practising	18.9	23.0%	20.8%	27.3%	19.2%	15.3%	13.4%	15.2%	13.6%	14.8%

At baseline, for Masvingo (79.6 percent) had the highest proportion of farmers using ten or more CSA practices, followed by Zaka (78.3 percent), while Chipinge (51.7 percent) and Mangwe (59.1 percent) fared the least. Unpacking the CSA practices, the baseline looked specifically into use of land conservation, soil fertility management, water conservation, and livestock management practices. Of the four CSA practice areas, land conservation practices (contours, minimum tillage, terracing, etc.) had the highest proportion of users (using at least 3 practices) at 88.6 percent. Soil fertility management practices (such as use of manure, green manure, precision fertiliser application, crop rotation, etc.) under CSA were being used by

62.1 percent of surveyed households, while good livestock husbandry practices (such as improved feeding, improved animal health management, improved shelters, pen fattening, livestock water infrastructure, etc) were being used by 50.1 percent of households. In contrast, the data shows that a lowly 5.4 percent of households were using water conservation practices. This data demonstrates that in as much as CSA practices have been promoted, there has been limited opportunities for enhancing farmer uptake of water management practices. Focusing on district comparisons, the data shows that all districts had at least 80 percent households using at least three land conservation practices. Soil fertility management practices were least practiced in Mangwe (37.7 percent) and Chipinge (44.6 percent) and mostly used in Chivi (82.3 percent). Water conservation was least used by farmers in Buhera (2.1 percent), in contrast with a high of 11.8 percent in Chivi. Good livestock husbandry practices were mostly used in Masvingo (65.4 percent) and least used in Chimanimani (38.7 percent). Overall, the highest proportions of households using at least three practices across all CSA categories were highest for Chivi and Masvingo, while areas for future consideration for CSA promotion under the Fund should be focused on Mangwe and Chimanimani.

CONCLUSION

At baseline there are no beneficiaries receiving any benefits from the Fund. However, evidence from fieldwork shows that households in targeted communities are already practicing some of the climate resilient practices aimed at building resilience. While proportions of farmers using these technologies may be high, yield data shows that production remains relatively low. The implication here is that the GCF project should focus on learning on what works to increase productivity under CSA. For example, a logistic regression model at midline could determine the combination of technologies that leads to an increase in crop and livestock yield under climate resilient agriculture. Further, the project should consider the implications of household access to finance, for example, through VSLs, as a critical pathway for enabling households to diversity into off-farm and non-farm livelihoods which will ultimately enable households to afford the cost of building resilient agricultural systems, such as purchasing radios to receive forecasts and farming advisories, or buying the appropriate seeds or breeds for their location, among other responses.

7. OUTPUT 2: INCREASED ACCESS TO CLIMATE-RESILIENT INPUTS AND PRACTICES, AS WELL AS STRONGER MARKET LINKAGES

The project background is that increasing climate risks are undermining productivity and yield stability in rainfed farming systems as a result of smallholder farmers lacking technical knowledge and capacities to adapt production to increasing climate-driven drought and mid rainy season dry spells (Barrier 1). Further, smallholder farmers are insufficiently linked to viable value chains, do not have the right market incentives for adopting climate adaptation inputs and practices, including crop diversification, improved rainfed agricultural practices, and climate resilient crop and livestock breeds. Under this Output, the project's strategy is to strengthen farmers' capacity to implement cliate-smart agricultural production in the context of increased climate risks in both rainfed and irrigation farming. Further, the project seeks to establish resilient agriculture and markets through increasing farmer accesss to climate-resilient inputs and practices, as well as building stronger market linkages. To provide an understanding of the baseline, this section will focus on the following indicators:

Indicator 10: *Average level of production increases (%) per hectare in newly irrigated hectares (tons/ha)*
Indicator 11: *Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems*
Indicator 14: *Increased proportion of women's membership in irrigation management committees*
Indicator 16: *Proportion of women and men trained in financial management, and marketing and business development, with a specific focus on women targeting existing women producers' groups and savings and loans groups.*

The baseline situation is presented in five sections, namely (1) average level of production; (2) smallholder farmer use of climate-resilient agricultural practices; (3) women's participation in irrigation management; and (4) capacity in financial management, marketing and business development.

7.1. AVERAGE LEVEL OF PRODUCTION

The change in yield (tonnes per hectare) is a proxy for improvement in cropping sytems. Farmers who occasionally experience increased yield across different seasons enjoy high food security hence they tend to be assured of sustainable agriculture and are expected to be more resilient in the event of climatic changes. The baseline examined change in production of six focused crops across 2020/21 and 2021/22 season to determine if there were average change in yield within the planted area as indicated in **indicator 10** below.

Indicator 10- *Average level of production increases (%) per hectare in newly irrigated hectares (tons/ha) for main crops:*

Pearl millet: -39%

Finger millet: -24%

Sorghum: -40%

Groundnut: -47%

Cowpea: -3%

Maize: -89%

Table 65: Percentage change in yield between 2020/21 and 2021/21 season

Crop	Yield 20/21		Yield 21/22		Indicator
	Proportion planting (%)	Average yield Ton/ha	Prop %	Average yield Ton/ha	% change in Yield
Pearl Millet	22.50	0.71	24.10	0.43	-39%
Sorghum	42.30	0.91	42.20	0.55	-40%
Groundnut	53.00	1.24	52.90	0.66	-47%
Cowpea	18.20	0.68	20.50	0.67	-3%
Maize	86.70	3.58	88.20	0.41	-89%

At baseline, all crops had reduced in yield within the two seasons though yield production of maize was more affected (895) as compared to the rest of crops. Cowpea yields were better with a 3% decrease in yield as compared to the rest of the crops. Maize was the most planted crop (86.7 percent) despite various efforts to promote traditional (small) grains which are more suitable to the project conditions. Most significantly, farmer FGDs raised the issue of lack of offtake markets for traditional grains, which meant that they had excess small grain that they could not dispose of. As a result of this lack of markets, farmers were seemingly 'resisting' small grains.

7.1.1. Crop production index indicator

Crop production indicator was calculated to determine the change in yield per hectare across different seasons. To determine this change, total yield in tonnes was calculated then divided by the total area from which the yield was harvested across the two seasons. Finally, the difference of the two was taken by subtracting the former season yield per hectare from the later season. This process was conducted across common crop value chains like maize and specific crops based on the programme (sorghum and millet). Overall, the indicator can be used to assess change on income post intervention that can be used to cushion household and climatic shock. Below is analysis of the crop production index.

Table 66: Maize crop value chain production index

Maize				hectarage 20/21		hectarage 21/22		Indicator	Yield 20/21		Yield 21/22		Indicator
				Prop %	Mean	Prop %	Mean	Change in Hectarage	Prop %	Mean	Prop %	Mean	Change in Yield
Overall				86.70	0.96	88.20	1.08	0.12	86.70	3.58	88.20	0.41	-3.17
Household type	treatment			32.40	1.11	32.00	1.08	-0.04	32.40	1.00	32.00	0.46	-0.54
	pure control			36.80	0.88	37.10	1.16	0.28	36.80	8.13	37.10	0.39	-7.75
	control			30.70	0.89	31.00	0.99	0.10	30.70	0.83	31.00	0.37	-0.46
Sex of farmer	Male			35.00	1.04	35.30	1.28	0.24	35.00	2.54	35.30	0.44	-2.10
	Female			65.00	0.91	64.70	0.97	0.06	65.00	4.14	64.70	0.39	-3.75
Age of farmer	youth			28.10	1.02	27.90	0.97	-0.05	28.10	2.54	27.90	0.39	-2.15
	middle age			24.10	0.91	24.00	1.08	0.17	24.10	1.08	24.00	0.47	-0.61
	elderly			47.90	0.95	48.10	1.14	0.20	47.90	5.44	48.10	0.38	-5.06
household size	1-5 members			55.00	0.88	55.00	1.07	0.19	55.00	4.80	55.00	0.41	-4.39
	6-8 members			36.20	1.02	36.10	1.06	0.05	36.20	2.40	36.10	0.41	-1.99
	>8 members			8.90	1.22	8.90	1.22	0.01	8.90	0.82	8.90	0.38	-0.44
Province	Manicaland			41.10	0.91	40.70	0.99	0.07	41.10	2.21	40.70	0.48	-1.73
	Masvingo			38.00	1.10	38.20	1.10	0.00	38.00	0.90	38.20	0.43	-0.47
	Mat. South			20.90	0.78	21.10	1.22	0.43	20.90	11.13	21.10	0.23	-10.90
Province	Manicaland	District	Buhera	41.80	0.87	41.80	0.85	-0.03	41.80	1.12	41.80	0.31	-0.81
			Chimanimani	20.20	0.56	19.50	0.59	0.03	20.20	1.67	19.50	0.86	-0.82
			Chipinge	37.90	1.14	38.80	1.34	0.20	37.90	3.70	38.80	0.47	-3.23
	Masvingo		Bikita	17.10	0.90	17.80	0.80	-0.10	17.10	0.64	17.80	0.27	-0.37
			Chivi	43.60	1.03	43.80	1.02	-0.01	43.60	0.91	43.80	0.43	-0.48
			Masvingo	32.60	1.27	31.90	1.28	0.02	32.60	0.94	31.90	0.42	-0.51
			Zaka	6.70	1.27	6.50	1.57	0.30	6.70	1.29	6.50	0.63	-0.66
	Mat. South		Gwanda	62.10	1.06	62.90	1.73	0.67	62.10	17.51	62.90	0.22	-17.29
			Mangwe	37.90	0.33	37.10	0.35	0.02	37.90	0.75	37.10	0.25	-0.49

At baseline, the yield per hectare of maize between 2020/21 and 2021/22 season had reduced. Among the household types, pure control farmers had experienced a two times higher reduction in yield per hectare as compared to those in treatment and control. By location, farmers in Manicaland had the highest lost in yield per hectare as compared to those in Masvingo and Mat. South provinces. Chipinge district experience the highest yield reduction compared to the other districts.

Table 67: Crop production index – Sorghum

Sorghum				hectarage 20/21		hectarage 21/22			Yield 20/21		Yield 21/22		
				Prop %	Mean	Prop %	Mean	Change in Hectarage	Prop %	Mean	Prop %	Mean	Change in Yield
Overall				42.30	0.57	42.20	0.50	-0.07	42.30	0.91	42.20	0.55	-0.36
Household type	treatment			42.30	0.63	49.10	0.51	-0.13	42.30	1.26	49.10	0.78	-0.48
	pure control			23.20	0.49	20.20	0.43	-0.05	23.20	0.62	20.20	0.35	-0.27
	control			34.50	0.54	30.70	0.52	-0.02	34.50	0.67	30.70	0.29	-0.38
Sex of farmer	Male			33.60	0.62	32.90	0.54	-0.08	33.60	1.29	32.90	0.63	-0.66
	Female			66.40	0.54	67.10	0.48	-0.07	66.40	0.72	67.10	0.50	-0.21
Age of farmer	youth			27.30	0.55	28.30	0.50	-0.05	27.30	0.78	28.30	0.70	-0.08
	middle age			23.60	0.64	23.30	0.48	-0.17	23.60	0.78	23.30	0.51	-0.27
	elderly			49.00	0.54	48.40	0.50	-0.04	49.00	1.04	48.40	0.47	-0.57
household size	1-5 members			49.00	0.52	49.30	0.44	-0.08	49.00	0.68	49.30	0.53	-0.14
	6-8 members			40.30	0.57	40.10	0.51	-0.06	40.30	0.71	40.10	0.61	-0.10
	>8 members			10.60	0.80	10.60	0.72	-0.08	10.60	2.72	10.60	0.38	-2.34
Province	Manicaland			35.70	0.56	35.00	0.55	-0.01	35.70	0.74	35.00	0.32	-0.42
	Masvingo			29.20	0.58	31.80	0.42	-0.16	29.20	0.77	31.80	0.91	0.15
	Mat. South			35.10	0.56	33.20	0.51	-0.05	35.10	1.20	33.20	0.36	-0.84
Province	Manicaland	District	Buhera	43.70	0.55	46.10	0.53	-0.02	43.70	0.75	46.10	0.26	-0.49
			Chimanimani	23.40	0.45	23.10	0.46	0.01	23.40	0.80	23.10	0.19	-0.61
			Chipinge	32.90	0.66	30.70	0.65	-0.01	32.90	0.67	30.70	0.52	-0.16
	Masvingo		Bikita	29.80	0.72	28.90	0.60	-0.11	29.80	0.49	28.90	0.18	-0.31
			Chivi	54.20	0.53	49.70	0.36	-0.16	54.20	0.82	49.70	0.93	0.11
			Masvingo	13.70	0.57	17.60	0.30	-0.26	13.70	1.20	17.60	1.93	0.73
			Zaka	2.30	0.22	3.70	0.40	0.18	2.30	0.60	3.70	0.29	-0.31
	Mat. South		Gwanda	51.40	0.74	47.40	0.70	-0.05	51.40	1.73	47.40	0.34	-1.39
			Mangwe	48.60	0.37	52.60	0.34	-0.03	48.60	0.64	52.60	0.38	-0.26

Treatment farmers had a higher loss of yield per hectare of soghum as compared to counterparts. Farmers in Chimanimani experienced the highest loss in yield per hectare of sorghum as compared to the other districts.

Table 68: Crop production index - Pearl millet [Units

Pearl Millet				hectarage 20/21		hectarage 21/22			Yield 20/21		Yield 21/22		
				Prop %	Mean	Prop %	Mean	Change in Hectarage	Prop %	Mean	Prop %	Mean	Change in Yield
Overall				22.50	0.51	24.10	0.45	-0.06	22.50	0.71	24.10	0.43	-0.28
Household type	treatment			39.70	0.52	52.10	0.40	-0.12	39.70	0.84	52.10	0.47	-0.38
	pure control			27.80	0.46	22.00	0.43	-0.03	27.80	0.66	22.00	0.46	-0.19
	control			32.50	0.55	25.90	0.57	0.02	32.50	0.60	25.90	0.33	-0.27
Sex of farmer	Male			34.10	0.55	33.00	0.50	-0.05	34.10	0.74	33.00	0.54	-0.21
	Female			65.90	0.49	67.00	0.42	-0.07	65.90	0.70	67.00	0.38	-0.32
Age of farmer	youth			24.80	0.51	24.60	0.45	-0.06	24.80	0.76	24.60	0.37	-0.39
	middle age			23.90	0.55	25.30	0.43	-0.11	23.90	0.66	25.30	0.49	-0.17
	elderly			51.30	0.50	50.10	0.46	-0.05	51.30	0.71	50.10	0.43	-0.28
household size	1-5 members			48.00	0.48	48.90	0.39	-0.09	48.00	0.67	48.90	0.42	-0.25
	6-8 members			42.30	0.54	41.00	0.50	-0.04	42.30	0.77	41.00	0.38	-0.39
	>8 members			9.80	0.55	10.10	0.54	-0.01	9.80	0.65	10.10	0.65	0.01
Province	Manicaland			28.60	0.63	29.80	0.54	-0.09	28.60	0.62	29.80	0.27	-0.36
	Masvingo			34.20	0.52	36.00	0.44	-0.08	34.20	0.76	36.00	0.56	-0.21
	Mat. South			37.30	0.42	34.20	0.38	-0.04	37.30	0.73	34.20	0.42	-0.31
Province	Manicaland	District	Buhera	68.80	0.68	68.70	0.56	-0.12	68.80	0.66	68.70	0.26	-0.40
			Chimanimani	17.10	0.32	18.00	0.38	0.06	17.10	0.54	18.00	0.17	-0.37
			Chipinge	14.10	0.72	13.30	0.63	-0.09	14.10	0.53	13.30	0.56	0.03
	Masvingo		Bikita	46.00	0.63	40.10	0.64	0.01	46.00	0.46	40.10	0.18	-0.28
			Chivi	46.90	0.42	43.40	0.31	-0.11	46.90	1.11	43.40	0.79	-0.32
			Masvingo	7.10	0.45	14.90	0.19	-0.26	7.10	0.50	14.90	0.82	0.32
			Zaka	-	-	1.70	1.37	-	-	-	1.70	0.12	-
	Mat. South		Gwanda	14.50	0.75	14.00	0.67	-0.08	14.50	0.53	14.00	0.31	-0.22
			Mangwe	85.50	0.37	86.00	0.33	-0.03	85.50	0.76	86.00	0.44	-0.32

On average, only farmers in Masvingo district increased their yields per hectare of pearl millet between 2020/21 and 2021/22 season.

Table 69: Crop production index - Groundnut

Groundnut				hectarage 20/21		hectarage 21/22			Yield 20/21		Yield 21/22		
				Prop %	Mean	Prop %	Mean	Change in Hectarage	Prop %	Mean	Prop %	Mean	Change in Yield
Overall				53.00	0.60	52.90	0.39	-0.21	53.00	1.24	52.90	0.66	-0.58
Household type	treatment			37.60	0.56	36.00	0.39	-0.17	37.60	1.49	36.00	0.90	-0.60
	pure control			29.10	0.60	30.70	0.45	-0.15	29.10	1.06	30.70	0.48	-0.58
	control			33.30	0.65	33.30	0.35	-0.30	33.30	1.10	33.30	0.57	-0.53
Sex of farmer	Male			34.50	0.48	34.90	0.51	0.03	34.50	1.27	34.90	0.86	-0.41
	Female			65.50	0.67	65.10	0.33	-0.33	65.50	1.22	65.10	0.54	-0.68
Age of farmer	youth			25.10	0.56	25.80	0.32	-0.24	25.10	1.32	25.80	0.83	-0.49
	middle age			24.30	0.45	24.10	0.34	-0.11	24.30	1.21	24.10	0.52	-0.69
	elderly			50.60	0.70	50.10	0.46	-0.24	50.60	1.20	50.10	0.63	-0.57
household size	1-5 members			53.60	0.66	54.30	0.41	-0.25	53.60	1.30	54.30	0.73	-0.57
	6-8 members			37.90	0.42	37.20	0.35	-0.07	37.90	1.08	37.20	0.52	-0.55
	>8 members			8.50	1.04	8.50	0.51	-0.54	8.50	1.55	8.50	0.73	-0.82
Province	Manicaland			30.90	0.45	30.10	0.35	-0.10	30.90	1.25	30.10	0.42	-0.83
	Masvingo			45.20	0.53	45.80	0.36	-0.17	45.20	1.25	45.80	0.84	-0.41
	Mat. South			23.90	0.93	24.10	0.52	-0.41	23.90	1.19	24.10	0.48	-0.71
Province	Manicaland	District	Buhera	77.50	0.47	79.10	0.36	-0.11	77.50	1.35	79.10	0.45	-0.90
			Chimanimani	15.90	0.38	15.00	0.27	-0.11	15.90	0.92	15.00	0.29	-0.62
			Chipinge	6.60	0.37	5.90	0.35	-0.02	6.60	0.81	5.90	0.32	-0.49
	Masvingo		Bikita	20.00	0.37	19.00	0.41	0.04	20.00	0.67	19.00	0.24	-0.44
			Chivi	47.50	0.75	48.60	0.37	-0.38	47.50	1.21	48.60	0.90	-0.31
			Masvingo	26.30	0.30	26.20	0.30	0.00	26.30	1.88	26.20	1.03	-0.86
			Zaka	6.30	0.40	6.30	0.38	-0.02	6.30	0.80	6.30	0.58	-0.22
	Mat. South		Gwanda	55.80	1.50	56.90	0.77	-0.73	55.80	1.47	56.90	0.53	-0.94
			Mangwe	44.20	0.21	43.10	0.20	-0.01	44.20	0.84	43.10	0.43	-0.40

Across the districts the average size of land used for cultivating groundnuts reduced except in Bikita though the yield of the crop reduced across all areas.

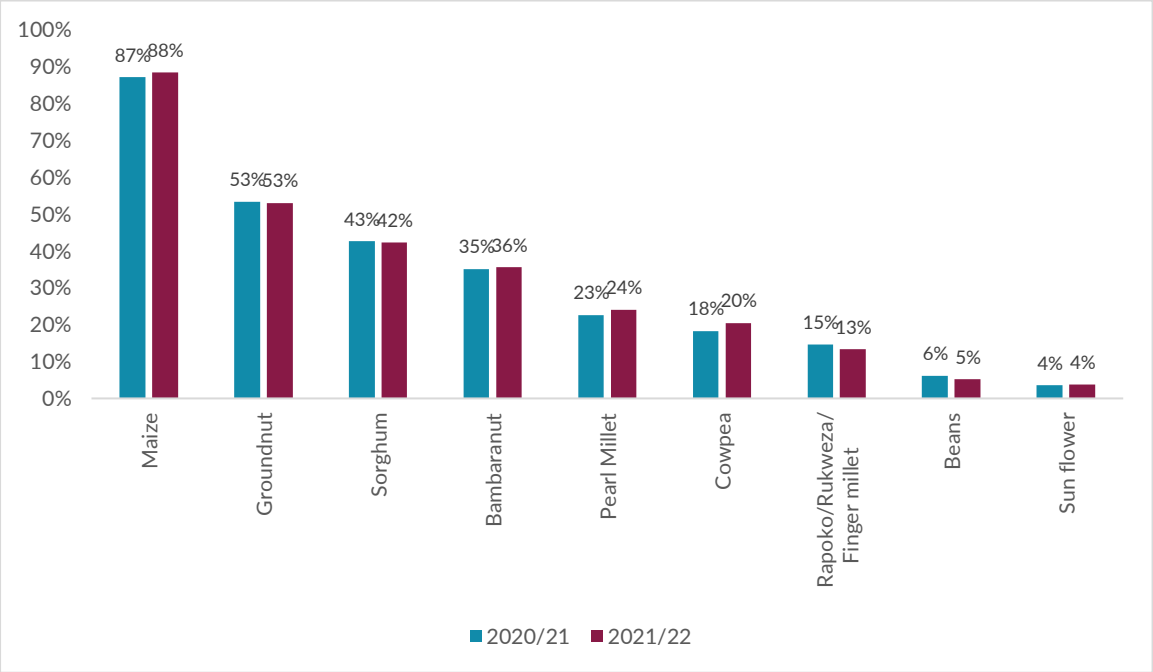
Table 70: Crop production index - Cowpea

Cowpea				hectarage 20/21		hectarage 21/22			Yield 20/21		Yield 21/22		
				Prop %	Mean	Prop %	Mean	Change in Hectarage	Prop %	Mean	Prop %	Mean	Change in Yield
Overall				18.20	0.26	20.50	0.23	-0.03	18.20	0.68	20.50	0.67	-0.02
Household type	treatment			46.30	0.31	53.00	0.25	-0.06	46.30	0.74	53.00	0.66	-0.08
	pure control			25.70	0.20	22.60	0.20	-0.01	25.70	0.79	22.60	0.44	-0.35
	control			28.00	0.22	24.40	0.20	-0.02	28.00	0.49	24.40	0.94	0.45
Sex of farmer	Male			35.10	0.32	34.20	0.29	-0.03	35.10	0.56	34.20	0.84	0.28
	Female			64.90	0.22	65.80	0.20	-0.03	64.90	0.75	65.80	0.57	-0.18
Age of farmer	youth			25.80	0.22	27.30	0.18	-0.04	25.80	0.58	27.30	0.83	0.25
	middle age			26.10	0.23	24.70	0.21	-0.02	26.10	0.68	24.70	0.32	-0.36
	elderly			48.20	0.29	48.10	0.27	-0.03	48.20	0.74	48.10	0.76	0.02
household size	1-5 members			49.70	0.22	51.20	0.19	-0.03	49.70	0.66	51.20	0.57	-0.10
	6-8 members			41.10	0.23	39.60	0.21	-0.02	41.10	0.76	39.60	0.84	0.08
	>8 members			9.20	0.60	9.10	0.56	-0.05	9.20	0.45	9.10	0.47	0.03
Province	Manicaland			29.50	0.26	31.30	0.21	-0.04	29.50	0.51	31.30	0.30	-0.21
	Masvingo			39.10	0.21	44.80	0.19	-0.02	39.10	1.01	44.80	0.63	-0.38
	Mat. South			31.40	0.32	23.90	0.33	0.01	31.40	0.43	23.90	1.19	0.76
Province	Manicaland	District	Buhera	55.40	0.24	56.30	0.22	-0.02	55.40	0.58	56.30	0.28	-0.29
			Chimanimani	26.30	0.24	25.70	0.17	-0.07	26.30	0.47	25.70	0.25	-0.22
			Chipinge	18.30	0.32	17.90	0.24	-0.08	18.30	0.39	17.90	0.46	0.07
	Masvingo		Bikita	19.20	0.26	23.50	0.20	-0.06	19.20	0.36	23.50	0.15	-0.21
			Chivi	58.20	0.19	50.70	0.18	-0.01	58.20	0.61	50.70	0.77	0.15
			Masvingo	18.20	0.22	20.60	0.17	-0.05	18.20	3.13	20.60	0.81	-2.33
			Zaka	4.40	0.25	5.20	0.24	-0.01	4.40	0.30	5.20	0.43	0.13
	Mat. South		Gwanda	66.90	0.37	68.60	0.38	0.01	66.90	0.51	68.60	1.77	1.26
			Mangwe	33.10	0.21	31.40	0.21	0.00	33.10	0.27	31.40	0.14	-0.13

Farmers in control areas increase the land used for Cowpeas production between 2021 and 2022. By location, farmers in Mat. South especially Gwanda district increased the hectares used in cultivating cowpeas at the same time average yield increase by 1.26 tonnes/ha.

7.1.2. Crops production in 2020/21 season

Figure 18: Proportion of farmers planning specific crops in 2020-2021



In 2020/21 and 2021/22 season, maize was the commonly planted crop among majority of the farmers. The number of farmer households that planted maize, pea millet and cowpeas slightly improved between 2020/21 to 2021/22 season.

7.1.3. Crops production in 2020/21 season by household type

Table 71: Crops cultivated in 2020/2021 and 2021/22 season

	Treatment (%)		Pure control (%)		Control (%)		Total (%)	
	2020/21	2021/22	2020/21	2021/22	2020/21	2021/22	2020/21	2021/22
Maize	86.9	87.1	93.5	95.0	80.8	82.8	87.2	88.4
Groundnut	7.5	7.0	6.6	5.1	4.6	3.4	6.2	5.2
Sorghum	61.6	58.9	45.1	47.2	53.6	53.4	53.3	53.1
Bambaranut	42.7	40.1	28.7	31.1	34.3	35.9	35.1	35.6
Pearl Millet	55.4	64.1	28.7	24.7	44.3	39.3	42.6	42.3
Cowpea	27.7	38.8	18.4	15.4	22.2	18.9	22.7	24.1
Finger millet	26.1	33.5	13.7	13.4	15.5	15.1	18.3	20.5
Beans	20.8	20.0	8.1	6.6	15.2	13.8	14.6	13.3
Sunflower	5.1	5.1	3.0	3.8	2.8	2.7	3.6	3.8

** highlighted to show increase between the two seasons*

Overall, the proportion of farmers planning maize, cowpeas, finger millet, bambaranut, and sunflower increased across the 2020/21 and 2021/22 seasons. More households in the pure control and control areas had planted maize as compared to those in treatment areas. There was a notable increase in the proportion of farmers farming maize among the household types over the two seasons while on the contrary the proportion of farmers planting ground nuts reduced among the household types across the two seasons. The proportion of farmers planting beans and sunflower remained low across the two seasons.

7.1.4. Crops production in 2020/21 and 2021/22 season by province

Table 72: Proportion of farmers cultivating crops in 2020/2021 season across provinces

	Manicaland (%)		Masvingo (%)		Mat. South (%)	
	2020/21	2021/22	2020/21	2021/22	2020/21	2021/22
Maize	83.1	83.6	94.5	96.4	83.3	85.0
Groundnut	38.2	37.1	68.7	69.4	58.1	58.2
Sorghum	35.3	34.5	35.5	38.4	68.2	63.9
Bambaranut	23.0	24.3	48.4	47.8	37.6	38.3
Pearl Millet	15.0	16.7	22.1	24.8	38.6	37.5
Finger millet	15.0	15.0	19.8	16.6	5.4	4.7
Cowpea	12.5	14.9	20.4	26.2	26.3	22.2
Beans	9.4	6.7	3.8	4.6	3.8	3.1
Sunflower	5.0	5.1	3.4	3.9	1.2	1.2

** highlighted to show increase between the two seasons*

Majority of the farmers reported maize to be the most planted crop in the three provinces where the study was conducted. Masvingo had the highest proportion of farmers who planted maize followed by Matabeleland South and Manicaland in 2020/2021.This proportion slightly increased in 2021/22 across the provinces. While groundnut was the second most planted crop in Masvingo (68.8 percent) and Manicaland (38.2 percent) in between 2020-2022, Sorghum was the second most planted crop in Matabele south (68.2 percent).

7.1.5. Use of fertilizer to increase yield

Table 73: Maize value chain production analysis among farmers who used fertilizer

Mean tonnage/ hectare of farmers who used fertilizer										
				Maize		Sorghum		Pearl Millet		Finger millet	
				2020/21	2021/22	2020/21	2021/22	2020/21	2021/22	2020/21	2021/22
Household type	treatment			1.15	0.46	1.01	0.47	0.94	0.58	1.02	0.38
	pure control			3.77	0.83	0.75	0.22	0.59	0.24	39.72	0.25
	control			0.91	0.30	0.65	0.27	0.73	0.44	0.90	0.24
Province	Manicaland			3.38	0.69	0.89	0.39	0.84	0.47	16.85	0.28
	Masvingo			1.09	0.47	0.91	0.47	0.92	0.81	1.03	0.37
	Matabeleland South			0.71	0.34	0.76	0.28	0.67	0.36	0.83	0.20
Province	Manicaland	District	Buhera	1.06	0.24	0.99	0.25	1.03	0.31	1.15	0.26
			Chimanimani	1.87	0.92	0.81	0.26	0.56	-	-	-
			Chipinge	6.57	0.97	0.82	0.56	0.55	0.73	37.18	0.33
	Masvingo		Bikita	0.66	0.23	0.63	0.28	0.55	0.19	0.68	0.44
			Chivi	0.97	0.45	1.03	0.44	1.16	0.87	1.11	0.29
			Masvingo	1.31	0.54	0.79	0.67	0.81	1.82	1.10	0.50
			Zaka	1.35	0.79	0.97	-	-	-	1.03	0.25
	Mat. South		Gwanda	0.74	0.34	0.78	0.19	0.74	0.36	0.41	0.20
			Mangwe	0.65	0.35	0.74	0.34	0.67	0.36	1.54	-

Upon application of fertilizer, there was no evidence of increase in average yield between 2020/21 and 2021/22 seasons among maize, sorghum and finger millet farmers. There was increase in average yield among pearl millet farmers in Chipinge and Masvingo districts between 2020/21 and 2021/22 seasons.

7.1.6. Livestock revenue

To cushion farmers against climate hazards and increase resilience, value gained from livestock rearing is key especially among farmers practicing mixed farming. The baseline aimed at understanding the number of livestock in operation within the year and establish the income earned from the practice among the 3960 of the 4180 (95 percent) sampled households.

Table 74: Type of livestock reared

K1_1. Type of livestock reared?															
		Household type			Gender		Age			HH Size			Province		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Cattle	54.5	59.7	51.1	52.8	60.1	51.6	52.1	52.1	57.2	50	57.6	69	45.3	66.3	53.3
Guinea fowl	6.7	9.4	4.8	5.9	7.8	6.1	6.5	7.3	6.5	5.3	7.9	9.7	6	9.7	3.1
Goat	69.7	77.6	64.1	67.5	70.5	69.4	67.9	68.7	71.4	65.2	75.2	74.1	63.5	67	85.7
Sheep	4.8	7.5	2.8	4.3	5.1	4.7	4.4	4.7	5.2	3.5	6.4	6.5	3.9	3.4	8.8
Donkey	16.4	21.3	12.7	15.1	18.2	15.4	13.9	16	18	12.7	19	27.3	2.9	12.9	46.8
Pig	2.1	2.8	1.5	2	3.3	1.5	2.4	2.4	1.8	2	1.8	3.7	0.8	4.4	0.8
Indigenous chicken	87.1	88.5	87	85.9	87	87.2	85.2	88.8	87.4	86.3	87.8	89.5	85.8	88.8	87
Broiler/layers	3.2	3.2	2.9	3.4	2.8	3.4	3.3	2.6	3.4	3.4	3.1	2.6	3.5	3.6	1.9
Turkey	13.8	18.9	10.5	12.1	16.6	12.4	15.6	13.7	12.9	11.9	15.9	17.3	12.9	22.5	2

	Province			District								
				Manicaland			Masvingo				Mat. south	
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Cattle	45.3	66.3	53.3	81.6	76.0	90.5	87.5	98.2	98.9	100.0	95.5	71.5
Guinea fowl	6.0	9.7	3.1	7.0	10.2	4.4	0.3	2.6	9.5	7.6	4.1	1.7
Goat	63.5	67.0	85.7	68.6	26.0	6.1	66.9	78.5	58.4	69.6	59.3	56.9
Sheep	3.9	3.4	8.8	49.2	8.3	4.2	64.1	46.9	37.2	55.4	39.6	36.6
Donkey	2.9	12.9	46.8	37.2	37.2	29.6	56.4	44.5	21.8	22.8	54.2	76.2
Pig	0.8	4.4	0.8	26.9	14.1	6.2	50.5	25.0	11.9	6.5	9.4	73.3
Indegenous chicken	85.8	88.8	87.0	19.7	18.0	7.5	31.4	30.9	17.4	21.7	27.3	15.8

Most of the farmers keep chicken, goats and cattle which can be used to generate extra revenue to hedge against climate hazards hence improving climate resilience. More farmers in the treatment group as compared to their counterparts' kept cattle, guinea fowl, goat, sheep, and turkey.

Cattle and pig rearing was more common in Masvingo as compared to Manicaland and Mat. South while goat and donkey keeping were more common in Mat. South as compared to other provinces. Near all farmers in Chivi, Masvingo, Zaka and Gwanda districts kept cattle. On the lower side, only 6 percent of the farmers in Chipinge district kept goats followed by Chimanimani (26 percent). Donkeys and pig rearing was commonly practiced in Mangwe district as compared to other districts.

Table 75: Livestock value chain analysis

K8: Total income from livestock sale- Mean USD.														
Household type			Province			Province								
Treatment	pure control	control	Manicaland	Masvingo	Mat. South	Manicaland			Masvingo				Mat. South	
						District								
						Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
1011	663	1040	545	160	3556	91	143	1352	176	183	144	99	4142	1912

On average, farmers in pure control made lower livestock revenues as compared to their counterparts. Considering location, on average livestock farmers in Mat. South made more than 6.5 times revenue compared to those in Manicaland and Masvingo provinces. Gwanda district in Mat. South province had the highest average revenue while Zaka and Buhera districts had the lowest revenue generated over the year (**Error! Reference source not found.**)

Table 76; Average Income per livestock value chain

K8: Total income from livestock sale												
				Cattle	Goat	Sheep	Donkey	Pig	Indegenous chicken	Broiler/ layers	Turkey	Guinea fowl
				Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Household type	treatment			1470	1158	3923	2553	1020	969	521	533	724
	pure control			1514	938	3264	4439	36	538	629	293	238
	control			1245	1042	1228	2227	16	982	4215	323	1667
Province	Manicaland			935	546	441	907	3983	482	837	591	1392
	Masvingo			228	170	550	379	58	160	224	255	256
	Matabeleland South			4760	3753	8673	4112	810	3298	8869	1325	2286
Province	Manicaland	District	Buhera	150	112	171	125	-	89	258	88	139
			Chimanimani	284	168	40	25	-	126	2700	564	1925
			Chipinge	2545	1344	1625	2300	3983	1236	744	2387	3500
	Masvingo		Bikita	249	187	590	125		173	254	222	303
			Chivi	212	170	905	181	53	191	314	333	78
			Masvingo	242	184	61	834	61	143	131	263	478
			Zaka	158	57	336	-	53	73	55	128	62
	Mat. South		Gwanda	5451	4301	9534	4792	810	3848	8869	1325	2700
			Mangwe	2859	2107	2650	1496	-	1795	-	-	1250

On average sheep and donkeys made high returns across the household types. Average income for sheep per farmer in both treatment and pure control was more than two times that of control, while pure control farmers on average fetched close to two times revenue on donkeys in comparison to that of treatment and control farmers. Pigs had the highest average revenue (USD 3983) per farmer in Manicaland, while broilers/layers in Mat. South on average fetched the highest revenue (USD 8869) per farmer.

7.2. SMALLHOLDER FARMER USE OF CLIMATE-RESILIENT AGRICULTURAL PRACTICES

Indicator 11: *Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems*

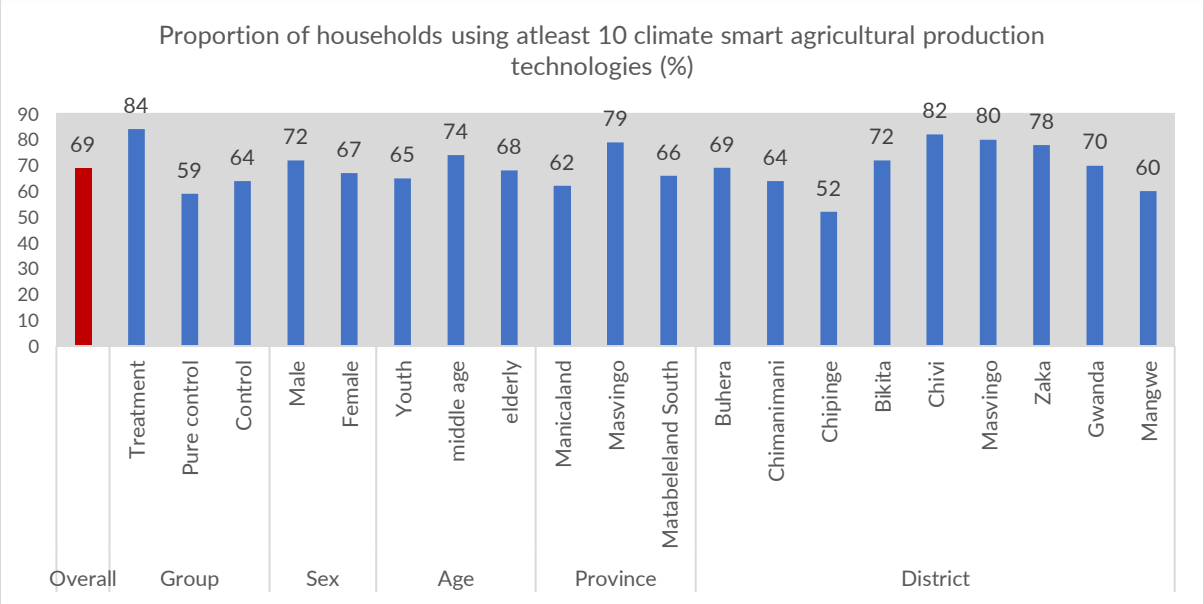
69% *of the farmers at baseline were using at least 10 climate smart agricultural production technologies*

Climate Smart Agriculture (CSA) practices are a key point of interest in monitoring success of the GCF project. Uptake of a combination of these practises is seen as a great measure to increase climate resilience as farmer households will produce effectively thought the year.

To examine the proportion of farmers practicing Climate Smart Agriculture (CSA), a total of 37 CRA practices, split into conservation agriculture, soil fertility management, livestock management and water management were considered. A score of 1 was given for every "yes" response and sum of these individual scores calculate at household level to give the household score. Farmers were then grouped into 2 categories; those using less than 10 practices and those using at least 10. Sum of individuals who practiced at least 10 was expressed as a fraction of the total sample to result to the indicator.

Figure 19: Proportion of farmer households practicing at least 10 CAS

.



As shown in **Error! Reference source not found.**, treatment households exhibited a high proportion of farmer households practicing CSA as compared to other household types. Across the districts, Chipinge had the lowest proportion of farmers adopting CSA at 52% as compared to the rest of the districts that had at least two thirds of the farmer households practicing at least 10 CSA methods.

7.2.1. Climate Smart Agriculture Practices

Table 77: Conservation agriculture practices awareness and usage across households

I14: Are you aware of any of the following conservation agriculture practices?																				
			Household type			Gender		Province			Province									
											Manicaland			Masvingo				Mat. South	
											District			District				District	
		Overall	treatment	pure control	control	Male	Female	Manicaland	Masvingo	Matabeleland South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Fallowing	Aware	68	74	63	65	71	66	70	73	55	79	72	56	72	75	73	66	61	48
	Uses	46	47	46	44	47	45	43	53	37	49	42	32	48	51	57	66	45	25
Crop rotation	Aware	93	96	90	92	94	92	93	97	85	97	91	89	99	98	94	99	89	80
	Uses	83	91	77	80	83	83	76	92	81	86	84	59	95	92	90	88	88	72
No-till/minimum tillage	Aware	77	84	71	78	79	76	76	84	70	83	66	73	77	90	78	83	65	76
	Uses	71	76	68	69	73	70	76	76	51	80	67	76	69	80	71	91	46	57
Cover cropping	Aware	74	82	68	73	76	74	70	84	67	79	64	64	85	91	79	68	73	58
	Uses	70	78	64	68	71	70	65	75	71	65	60	69	74	74	76	83	78	58
Planting basins	Aware	86	92	82	84	86	86	86	88	83	91	89	77	91	98	72	95	76	91
	Uses	83	89	81	77	83	82	84	87	74	86	82	82	88	89	82	91	71	77
Riper tine	Aware	53	62	44	52	54	52	45	54	66	60	40	31	54	64	38	63	58	76
	Uses	42	45	40	39	41	42	36	42	49	40	44	22	47	47	23	52	49	48
Change in cropping patterns in last 3 years	Aware	45	55	36	44	47	44	33	55	52	37	16	38	48	68	42	57	56	47
	Uses	54	60	47	52	56	52	52	60	45	59	27	50	45	68	52	67	45	45
Contouring	Aware	70	77	65	68	72	68	67	78	62	75	61	61	85	87	63	73	81	38
	Uses	64	68	62	64	69	62	63	69	59	68	64	55	74	64	75	61	75	16
Water harvesting	Aware	51	59	48	48	52	51	49	51	57	47	67	40	39	63	41	49	57	57
	Uses	47	49	50	44	47	48	45	41	61	44	47	44	25	39	54	42	68	52
Mulching	Aware	83	90	79	81	86	82	84	88	72	85	84	84	76	94	90	74	77	67
	Uses	60	67	57	56	62	59	55	67	59	50	56	60	43	69	80	44	65	52
Terracing	Aware	36	39	34	33	37	35	34	38	36	14	60	42	52	39	28	34	44	25
	Uses	29	30	30	25	31	27	27	29	31	5	39	26	25	41	9	26	43	4
Use of drought resistant varieties	Aware	78	84	73	77	80	77	69	81	90	71	65	70	83	89	71	74	90	90
	Uses	75	84	65	75	75	74	72	69	86	80	63	68	74	67	66	84	83	89
Use of drought resistant crops	Aware	87	94	82	86	89	86	83	89	93	88	78	81	94	95	79	78	90	97
	Uses	79	91	68	77	78	79	74	79	88	78	71	69	93	81	65	79	84	92

Crop rotation, use of planting basins, mulching, and the use of drought resistant crops were the common conservation agricultural practices that farmers were aware of and practiced. The treatment group (96 percent), pure control (90 percent) and control (92 percent), reported being aware of these practices while usage was reported at 91 percent, 77 percent, and 80 percent respectively. Awareness on the use of drought resistant crops was reported at 94 percent, 82 percent and 86 percent for the treatment, pure control, and control groups respectively. Usage of drought resistant crops was reported at 91 percent, 68 percent and 77 percent respectively.

Indicator 11: At baseline 0.8 percent of smallholder farmers were implementing climate-resilient agricultural practices/cropping systems

The indicator measures the number of dryland and irrigation farmers practicing CRA. Four categories of indices were use (1) Subscription and Active use of climate information products for crop/water management (2) Active use of climate-resilient crop varieties, crop-livestock systems, as well as water-efficient technologies; (3) Active adoption for CRA practices promoted through the FFS curriculum, and (4) Participation in O&M fund, community open learning days, and participatory planning. A score was constructed and applied to provide an understanding of the study sample. Based on the score described, the proportion of farmers implementing climate resilient agricultural practices was determined as below:

Table 78: Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems

Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems (expressed as proportion)	Proportion
0-25%	26.5
26-50%	51.9
51-74%	20.9
75-100%	0.8

The Indicator 11 focuses on proportion of households scoring at least 75-100% of the four indices described above. At baseline only 0.8 percent of all households surveyed were using between 75 percent and 100 percent of dryland and irrigation CRA practices.

7.2.2. Climate resilient practices

The baseline sought to understand the extent to which farmers in the GCF intervention areas were already adopting climate resilient practices. The focus of the baseline was to quantify the proportion of farmers using climate resilient practices, including irrigation and various land and water management practices. These are discussed as follows:

7.2.2.1. Land under irrigation by household type

The proportion of farmers using irrigation was measured by the baseline, on the basis that irrigation by its nature was seen as a key strategy for reducing household exposure to climate risks. The landholding under irrigation was the specific aspect measured, and mean area recorded as shown in **Error! Reference source not found.**

Table 79: Mean land under use (hectares)

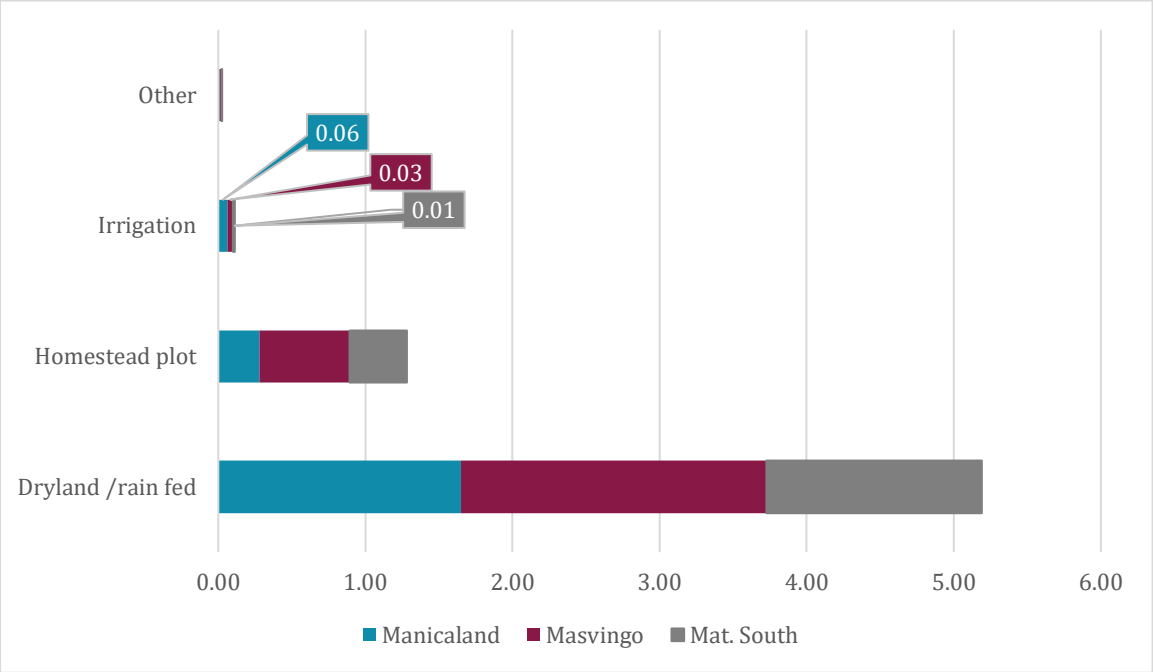
	treatment Mean	pure control Mean	control Mean
Dryland /rain fed	2.07	1.52	1.70
Homestead plot	0.45	0.43	0.39
Irrigation	0.06	0.04	0.03
Other	0.01	0.00	0.01

Survey data shows that treatment households had more access to irrigation (0.06 ha) compared to the pure control (0.04ha) and control groups (0.03). Farmers mainly kept larger portion of their land as dry land/ rain fed especially those in treatment areas. Households in treatment areas also utilized a large portion of land under irrigation as compared to those in pure control and control. It is also important to note that treatment households had more land under rainfed farming (2.07ha) compared to pure (1.52ha) and control (1.70ha). This mean landholding provides an insight with respect to what land management practices are viable, and whether intensive land management practices could be practicable. For example, conservation farming may not be very viable for 2ha of land, but suited for a smaller farm size due to its demands for manual labour.

Indicator 11 - Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems (expressed as proportion)	0.8
0-25%	26.5
26-50%	51.9
51-74%	20.9
75-100%	0.8

7.2.2.2. Land under irrigation by province

Figure 20: Mean land use by province (hectares)



Mean land under irrigation for farmers in Manicaland was more than two times greater to that of farmers in Masvingo and Mat. South. Mean land under irrigation by age and gender was not any different across the sampled households.

7.2.2.3. Proportion of farmers practicing irrigation

At baseline, only 343 (8.2 percent) of the farmers practiced irrigation.

Proportion of farmers practicing irrigation (N=343)																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No Irrigation	91.8	90.8	92.5	92.1	89.7	91.2	97.0	96.7	65.2	95.8	99.0	83.9	95.6	94.6	95.3	99.0
Irrigating	8.2	9.2	7.5	7.9	10.3	8.8	3.0	3.3	34.8	4.2	1.0	16.1	4.4	5.4	4.7	1.0
		Chi2=3.07 P-value=.216,			Chi2=44.21 P-value=.000*,			Chi2=316.37 P-value=.000*			Chi2=75.42 P-value=.000*				Chi2=10.36 P-value=.001*	

Though there were no significant differences in the proportion of farmers practicing irrigation by household type, farmers in Manicaland (10.3 percent) were more likely to practice irrigation as compared to those in Masvingo (8.8 percent) and Mat. South (3 percent). In Manicaland, Chimanimani district had the highest proportion of farmers practicing irrigation (34.8 percent) as compared to Buhera (3.3 percent) and Chipinge (4,2 percent). In Masvingo,

Chivi had three times higher number of farmers irrigating as compared to Bikita, Mavingo and Zaka districts. In Mat. South, Gwanda (4.7 percent) had a higher proportion of farmers practising irrigation though overall the proportion was too low across other districts within the project.

7.2.3. Agricultural water for irrigation

The aim of this section is to highlight how farmers use water for irrigation, the size of land under irrigation and reliability of the water being used for irrigation.

7.2.3.1. Proportion of farmers practicing irrigation

At baseline, only 343 (8.2 percent) of the farmers practiced irrigation.

Proportion of farmers practicing irrigation (N=343)																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No Irrigation	91.8	90.8	92.5	92.1	89.7	91.2	97.0	96.7	65.2	95.8	99.0	83.9	95.6	94.6	95.3	99.0
Irrigating	8.2	9.2	7.5	7.9	10.3	8.8	3.0	3.3	34.8	4.2	1.0	16.1	4.4	5.4	4.7	1.0
		Chi2=3.07 P-value=.216,			Chi2=44.21 P-value=.000*,			Chi2=316.37 P-value=.000*			Chi2=75.42 P-value=.000*				Chi2=10.36 P-value=.001*	

Though there were no significant differences in the proportion of farmers practicing irrigation by household type, farmers in Manicaland (10.3 percent) were more likely to practice irrigation as compared to those in Masvingo (8.8 percent) and Mat. South (3 percent). In Manicaland, Chimanimani district had the highest proportion of farmers practicing irrigation (34.8 percent) as compared to Buhera (3.3 percent) and Chipinge (4,2 percent). In Masvingo, Chivi had three times higher number of farmers irrigating as compared to Bikita, Mavingo and Zaka districts. In Mat. South, Gwanda (4.7 percent) had a higher proportion of farmers practising irrigation though overall the proportion was too low across other districts within the project.

7.2.3.2. Proportion of land under irrigation

On top of determining the proportion of farmers practising irrigation, the size of land under irrigation is a key component on the impact indicator value as highlighted in **Error! Reference source not found.** below.

Table 80: Proportion of land under irrigation in the last season before the baseline survey

	I3: Of this total land, how much was used in the current season? (N=343)						
				Count	Sum	Mean	Maximum	Standard Deviation
Household type	Treatment			125	235.97	1.89	10.00	1.42
	Pure control			108	140.20	1.30	7.00	1.18
	control			110	147.05	1.34	5.50	1.08
Province	Manicaland			186	214.83	1.15	5.50	1.15
	Masvingo			129	255.56	1.98	7.00	1.06
	Matabeleland South			28	52.84	1.89	10.00	2.00
Province	Manicaland	District	Buhera	25	57.00	2.28	5.50	1.63
			Chimanimani	134	122.72	0.92	5.50	0.86
			Chipinge	27	35.11	1.30	4.50	1.25
	Masvingo		Bikita	3	7.25	2.42	5.00	2.24
			Chivi	101	192.56	1.91	5.50	0.88
			Masvingo	20	47.75	2.39	7.00	1.62
			Zaka	5	8.00	1.60	2.50	0.65
	Matabeleland South		Gwanda	24	48.79	2.03	10.00	2.13
			Mangwe	4	4.05	1.01	1.21	0.17

Farmer households in the treatment area on average had more land under cultivation (1.89 ha) as compared to the pure control (1.30 ha) and control (1.34 ha). Manicaland farmer households had the lowest average size of land under irrigation. Though Manicaland had a higher proportion of farmers practicing irrigation, Masvingo farmers on average had bigger proportions of land under irrigation especially those in Bikita and Masvingo districts.

Further interviews with staff at DOI provided more information on irrigation coverage, status of irrigation schemes and the issues and challenges faced by farmers operating these irrigation schemes. With respect to coverage, **Error! Reference source not found.** evidence hows that the number and size of irrigation schemes varied significantly across the four districts, being highest in Bikita (1686ha) and Masvingo (1359ha) and slightly lower for the other two districts. Further, sizes of irrigation schemes also varied substantially within districts. In Mangwe, size ranged from 100ha apiece in Ingwizi Outgrower Scheme and Thornville, to 3ha in Ntali (Bango).

Table 81; Total area under irrigation by district- FGDs

District	Number of irrigation schemes	Total area irrigated	Crops
Buhera	16	780ha	Sugar beans, vegetables, green maize, tomatoes, watermelons, onions Green maize, tomatoes, fresh groundnuts, vegetables
Bikita	8	1686ha	Maize, tomatoes, beans, bananas
Masvingo	17	1359ha	Maize, wheat, sugar beans and horticultural crops
Mangwe	9	972ha	No crops in all irrigations except Thornville and Mpoengs that has maize and vegetables

Source: KII with Department of Irrigation

The irrigation schemes in the intervention districts also varied by number of beneficiaries or farming households. Deure and Bonda in Buhera district, for example, had 700 and 364 households, respectively, while other schemes in the same district, such as Mutunha (40 households) and Murambinda (39 households) had considerably much smaller numbers of farmers. The size of the irrigation scheme in terms of households supported also had a bearing on the nature of power structures, with implications for operational effectiveness and efficiency.

7.2.4. Irrigation water security

7.2.4.1. Reliability of source of irrigation water

Table 82: Effectiveness of water source used for irrigation

I6: How would you rate the effectiveness of the MAIN water saving feature that you are using? (N=343)																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Good	37.6	39.2	35.2	38.2	23.1	53.5	60.7	60.0	14.9	29.6	100.0	48.5	70.0	60.0	58.3	75.0
Moderate	44.6	42.4	51.9	40.0	58.6	26.4	35.7	20.0	68.7	44.4	0.0	25.7	30.0	40.0	37.5	25.0
Poor	17.8	18.4	13.0	21.8	18.3	20.2	3.6	20.0	16.4	25.9	0.0	25.7	0.0	0.0	4.2	0.0
		Chi2=4.64 P-value=.327			Chi2=44.92 P-value=.000*,			Chi2=29.85 P-value=.000*			Chi2=11.21 P-value=.082				Chi2=0.474 P-value=.789	

Among the farmer households practicing irrigation, majority (82.2 percent) have "moderate" to a "good" efficient water source for irrigation. Very farmers had a concern in efficiency of water source in Mat. South (3.6 percent) as compared to Manicaland (18.3 percent) and Masvingo provinces (20.2 percent). There were no significant differences on efficiency of water source used for irrigation by type of household.

7.2.5. Access to reliable and safe irrigation water supply

Table 83: Accessibility to reliable irrigation water

I8: How would you rate the accessibility of water for irrigation during the cropping season? (N=343)																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Good	38.5	40.8	35.2	39.1	28.0	50.4	53.6	68.0	19.4	33.3	33.3	49.5	55.0	60.0	50.0	75.0
Moderate	43.1	38.4	51.9	40.0	56.5	27.1	28.6	12.0	67.9	40.7	33.3	26.7	25.0	40.0	29.2	25.0
Poor	18.4	20.8	13.0	20.9	15.6	22.5	17.9	20.0	12.7	25.9	33.3	23.8	20.0	0.0	20.8	0.0
		Chi2=5.8 P-value=.215			Chi2=30.41 P-value=.000*,			Chi2=34.06 P-value=.000*			Chi2=2.16 P-value=.904				Chi2=1.254 P-value=.54	

In terms of accessing irrigation water during the cropping season, the baseline found no significant differences across the different types of households. More farmers in Masvingo had poos accessibility to water as compared to Manicaland and Mat.South provinces. This was more pronounced in Chipinge and Buhera districts as compared to Chimanimani. There were no differences in accessibility of water during cropping season in Masvingo and Mat.South districts.

7.2.6. Irrigation technology used by farmers

Based on key informant interviews within sampled districts were a combination of irrigation technologies with implications for water use efficiency, climate proofing potential, and operational and maintenance costs. This variation in technology used also suggests that the nature of challenges faced also varied within and across districts. For example, ARDA Ingwizi in Mangwe district uses centre pivot while other schemes in the district rely on flood irrigation.

Table 84: Type of irrigation system used for schemes across four sampled districts

District	Type of Irrigation System Used			
	Flood	Sprinkler	Centre Pivot	Drip
Buhera	Yes	Yes	No	No
Bikita	Yes	No	No	No
Masvingo	Yes	Yes	No	Yes
Mangwe	Yes	No	Yes	No

Source: KIIs with district stakeholders

Farmers in selected survey districts use a combination of technologies for irrigation. Across all sites shown in **Error! Reference source not found.Error! Reference source not found.**, only Masvingo district had some drip irrigation being used, and Mangwe was also the only site with centre pivot system. Overall, flood irrigation was the most used technology for irrigation. The relative hectarage under each type of irrigation system was, however, could not be established by the baseline.

7.2.6.1. State of functionality of irrigation by district

FGDs and KIIs conducted in the survey districts revealed that the irrigation schemes were in different states of functionality and sustainability, with size of irrigation scheme, crop produced, and management arrangements being some of the key determinants of the nature of challenges.

Case study: State of functionality of irrigation schemes in Mangwe District

At baseline, the irrigation schemes in Mangwe are at various states of functionality with the majority now dysfunctional due primarily to a lack of adequate water for irrigation and non-functional equipment as a result of depreciation over time, vandalism and poor maintenance regime. The following data was collected from KIIs with relevant district and ward level respondents:

Table 85: Irrigation scheme water assesment

Irrigation Scheme	Area	Status	Water adequacy	Issues & Challenges
Tjingababili (Tshitshi)	2ha	Functional	No	Tjingababili dam is silted/reduced full supply level
Ingwizi Outgrower (Mphoengs	100ha	90% functional	Yes	Adequate water
Puku (Brunapeg	3 ha	Non-functional	Yes	Puku dam pipes damaged
Makwakwa (Bango)	5 ha	Non-functional	No	Solar powered borehole/solar panels stolen; part of the fertile soil scheme washed away by floods
Ntali (Bango	3ha	Non-functional	No	Ntali dam has no water, dam wall breached/desilting required
Shashe Nkolongwe (Mambale)	40ha	Non-functional	Yes	Sand abstraction: Shashe river fence destroyed/no engine to power water
Majojo (Manjini	4 ha	Non-functional	No	Majojo dam has no engine and pipes/fence washed away by floods
Thornville (Marula)	100ha	Functional	Yes	Thornville dam -lack of capital for tractor loan repayment/Zinwa water bill high/no resident extension worker/flood system needs to be changed to a more efficient one
Bambanani (Sanzukwi)	70ha	Non-functional	Yes	Ingwizi dam- lack of capital to purchase and install engine/reticulation system/vandalized/more efficient system needs to be installed/needs fencing/area can be extended to 100ha

For the sampled districts for this analysis, the range of operational and management challenges faced by district were identified and recorded (Table 106):

Table 86: Challenges faced by irrigation schemes in selected survey districts

	Operational Challenges	Management Challenges
Masvingo	1. Water sources dry up in October 2. Electricity costs are too high 3. Unaffordable cost of water from ZINWA	1. Water bills not serviced 2. Plot holders not paying bills to IMC and plots lying fallow 3. Youth have no access to land in the irrigation scheme 4. Elderly not willing to pass land to youth leading to internal squabbles
Buhera	1. Dilapidated irrigation infrastructure that has not been repaired for over 2O years.	1. Failure to manage water due to poor water resource budgeting skills 2. Lack of knowledge on practices that reduce water wastage 3. Poor record keeping by IMC 4. Male domination of irrigation scheme decisions, even when women have the relevant management skills required.
Mangwe	1. High interest rates on electricity bills 2. Poor maintenance regime	1. Members fail to make contributions 2. Farmers water at different times leading to conflict, no effective scheduling
Bikita	1. ZESA bills too high, suspect being charged at commercial rates 2. Water connections cut off frequently due to non-payment of electricity	1. Incumbent members refusing to step down at end of tenure 2. Leadership meddling in politics leading to bills not being paid, disputes 3. Poor leadership in collection of payments and payments of rates

In addition to these challenges, the survey, through interviews with staff drawn from ZINWA, DOI and Agritex, complemented by FGDs with farmers, found the following strands common across most of the surveyed irrigation schemes. Focusing on the entire irrigation set-up, the baseline explored the challenges and experiences linked to the management systems in place, profitability constraints, value addition practices, and engagement of key demographic groups. **Error! Reference source not found.** summarises some of the key challenges:

Table 87: Challenges facing irrigation schemes

	Issues identified by baseline survey
Management	1. IMCs lack capacity to solve issues on the ground 2. Farmer tend to ignore existing laws regarding water use 3. Some farmers do not work towards preventing water losses. "In some schemes they see a canal leaking and they ignore it". 4. Capacity to repair broken down pumps is a problem considering that farmers are usually behind on rate payments and cannot call service providers 5. Lack of constitution to govern the functioning of some irrigation schemes 6. Uncorrected behaviours whereby there is no correcting of wrong behaviour 7. Funding is one of the main challenges. Farmers are charged for taking water from the dams, and if they use water from rivers, sub catchment councils also charge them.
Profitability	1. Some irrigation schemes do take farming as a business, most are limited to local markets 2. No profits being realised as farmers are largely subsistence-focused 3. Poor transport infrastructure increase costs and reduce profitability 4. Profitability sometimes so low that farmers fail to earn enough to pay water bills 5. Failure to service bills due to products not selling
Value Addition	1. No value addition in most cases 2. For commercialised irrigation there is evidence of value addition and produce is often directed to a secured market 3. Lack of capacity, exposure and knowledge of value addition 4. Products mostly sold as per harvesting without any value addition
Engagement of key demographic groups	1. Old irrigation schemes are still in the hands of the older generation, with no prospects of handing over to young people 2. A majority of irrigation schemes are female dominated, cases where mean are the minority in participation and decision making exist 3. Young people moving into agriculture due to lack of employment in other sectors. Most are graduates from university 4. Women do most of the work in agriculture, but some social norms restrict their participation and development impact 5. Fewer women taking leadership roles, and some in leadership may not be influential in decision making

7.2.7. Main source of drinking water

Household access to reliable and safe water supply is highly indicative of a community's level of human development and a proxy for the likely water-scarcity impacts due to increased climate variability and climate change. In the project intervention areas, boreholes were the most common source, with 48.1 percent of all households depending on these as their main source of water. Other key sources were the protected dug well (17.3 percent) and unprotected dug well (13.1 percent). About 2.6 percent of all respondents relied on piped water to their dwelling or yard. Only three respondents in the entire survey relied on rainwater harvesting as their main source of reliable and safe water.

Table 88: What is your main source of drinking water for members of your household?

O1: What is your main source of drinking water for members of your household? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Piped water into dwelling	1.0	1	1.3	0.7	0.9	1.0	1.0	1.1	0.6	1.1	1.2	0.7	0.3	2.1	1.6	3.1
Piped water to yard/plot	1.6	1.8	1.7	1.4	2.0	1.7	1.6	1.7	1.1	1.4	1.6	2.0	0.4	5.5	0.2	0.7
Public tap/standpipe	3.8	2.4	6.4	2.4	2.7	4.2	4.0	3.7	2.2	3.3	2.2	7.1	0.7	12.2	1.2	2.4
Borehole	48.2	50.5	42.8	51.5	50.4	46.2	47.5	47.6	54.8	47.8	48.9	47.8	30.2	75.3	52.3	81.2
Protected dug well	17.3	17.5	17.7	16.9	17.0	18.3	18.1	17.2	12.9	23.1	17.7	5.5	41.7	3.6	12.4	8.4
Unprotected dug well	13.1	13.8	12.5	13.1	12.5	13.8	13.1	12.8	14.3	14.0	15.7	7.3	21.5	0.3	13.2	2.4
Unprotected spring	4.0	3.8	3.6	4.5	3.6	3.8	3.4	4.7	4.1	2.6	4.6	5.7	1.8	0.0	5.1	0.3
Protected spring	0.8	0.7	0.7	0.9	0.9	0.5	0.8	0.8	0.6	0.9	1.0	0.2	0.4	0.0	2.0	0.3
Rainwater harvesting	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.3
Bottled water	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tanker-truck	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0
Surface water	10.0	8.2	13.1	8.4	9.9	10.2	10.1	10.0	9.4	5.8	6.6	23.6	3.1	1.0	11.8	0.7
Other	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
		Chi2=83.94 P-value=.000*,			Chi2=430.41 P-value=.000*,			Chi2=1640.47 P-value=.000								

Farmer households in Chivi district (23.4 percent) were two times relying on surface water (river, dam, lake, pond, stream, canal, irrigation, channel) as compared to other districts. Three quarters of farmers in Zaka rely on bore water while in Mangwe 81.2 percent of farmer households rely on borehole water for drinking.

Even when other household uses of water were considered boreholes remained the main source (41.5 percent), followed by surface water (22.2 percent). Protected and unprotected dug wells also remained as important sources, while rainwater harvesting remained one of the least used sources of water for any purpose at 0.05 percent. The baseline found significant differences in water source for other uses among the three household categories. For example, households in the pure control were the least likely to depend on boreholes (36.6 percent) compared to the control (45.7 percent) and treatment (42.4 percent) groups. In fact, the pure control group was marginally more likely to depend on surface water and public standpipe as compared to households in the other two groups (**Error! Reference source not found.Error! Reference source not found.**).

Table 89: What is the main source of water used by your household for other purposes,

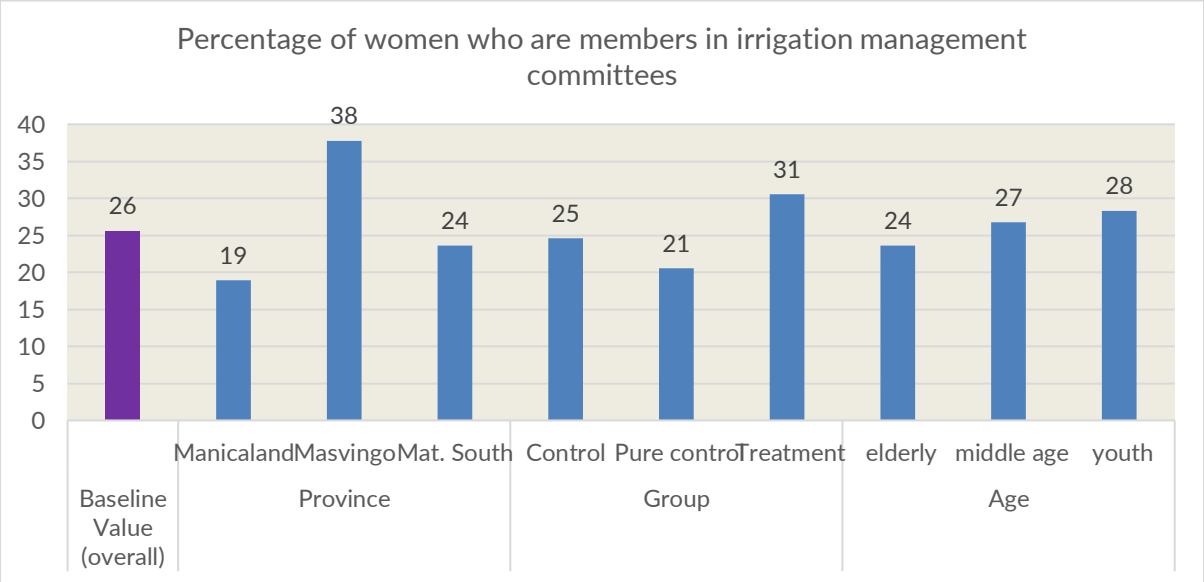
O2: What is the main source of water used by your household for other purposes? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Piped water into dwelling	1.1	1	1.5	0.6	1.0	0.9	1.1	1.1	0.6	1.1	1.2	0.9	0.3	1.8	1.6	3.5
Piped water to yard/plot	1.1	1.2	1.2	1.1	1.4	1.3	1.1	1.4	0.6	1.1	1.0	1.5	0.1	4.7	0.2	0.7
Public tap/standpipe	3.1	2.1	5.8	1.4	2.4	3.4	3.2	3.3	1.9	2.4	1.6	6.8	0.4	9.1	0.9	2.8
Borehole	41.5	42.4	36.6	45.7	43.0	39.5	41.8	39.8	46.3	41.7	39.7	44.0	27.8	62.6	45.7	77.4
Protected dug well	14.5	14.9	14.4	14.2	14.7	15.2	15.0	14.7	10.5	21.4	11.8	5.3	40.1	2.9	10.1	9.4
Unprotected dug well	11.6	12.1	12.1	10.7	11.5	11.9	11.2	11.6	14.6	12.6	13.2	7.2	19.5	0.3	11.8	2.4
Unprotected spring	4.0	3.6	3.7	4.8	3.8	4.2	3.2	5.1	4.7	2.6	4.9	5.7	1.7	0.0	5.1	0.3
Protected spring	0.6	0.5	0.5	0.7	0.4	0.5	0.7	0.5	0.0	0.8	0.5	0.2	0.5	0.0	1.6	0.3
Rainwater harvesting	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Bottled water	0.0	0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Tanker-truck	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Surface water	22.2	22	24.0	20.6	21.7	23.1	22.4	22.3	20.4	16.4	25.9	27.9	9.6	18.7	23.0	3.1
Other	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.3	0.1	0.1	0.1	0.0	0.0	0.2	0.0
		Chi2=84.39 P-value=.000*			Chi2=278.45 P-value=.000*			Chi2=1544.4 P-value=.000*								

Though borehole water remains important for other purposes such as cooking, livestock watering and such like, farmer households tend to consider other sources especially surface water for other uses except drinking water.

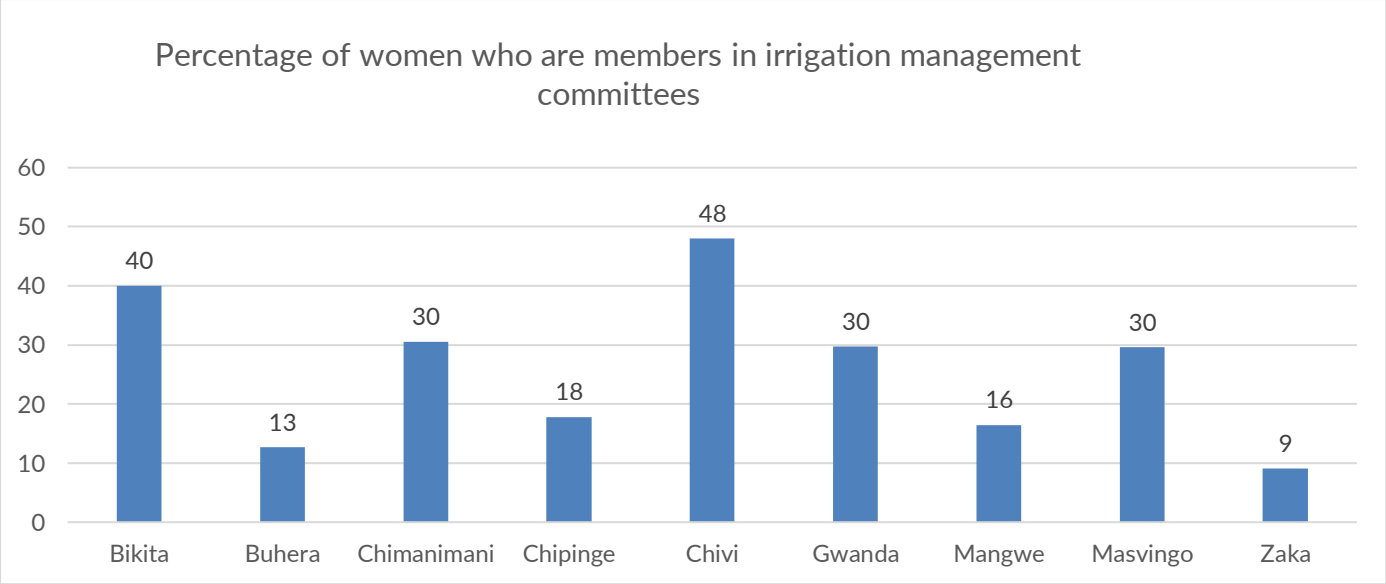
7.3. WOMEN'S PARTICIPATION IN IRRIGATION MANAGEMENT

The participation of women in strategic roles within irrigation schemes is a key determinant of the level at which they benefit from improvements in irrigation infrastructure, as well as their likelihood of effectively participating in any value chains developed around production in these irrigation scheme. The project will track the participation of women in leadership in irrigation management committees.

Indicator 14: 26 percent % of women have membership in irrigation management committees



The baseline found a significant difference in proportion of women who were members in irrigation management committees (IMCs) across the three provinces surveyed. Masvingo was the most inclusive province with 38 percent of leadership in IMCs being female, with the proportion being half as much in Manicaland, and at 24 percent in Mat South. With respect to household type, at baseline treatment households had a higher proportion of women in irrigation leadership roles (31 percent) compared to pure (21 percent) and control (25 percent). Additionally, it appears that youth had nearly as many chances if getting into IMC leadership as middle-aged individuals. Key informant interviews revealed that of the women who were members of IMCs, 56percent of them were in senior positions such as Chairperson, Secretary or Treasurer. While some FGDs lightly understood gender equality as equal participation, women interviewed reflected that it was not the number of men in the IMCs that mattered, but rather their attitude towards the participation in a meaningful way of women, men and youth in the operations and management of irrigation schemes.



The analysis of proportion of women in leadership in IMCs by district suggests that there may have been some gender awareness and responsiveness differences across the districts. Chivi (48 percent) and Bikita (40 percent) were the most gender inclusive districts, while Zaka (9 percent), Buhera (13 percent), Mangwe (16 percent) and Chipinge (18 percent) were candidates for gender training.

7.4. HOUSEHOLD FINANCIAL INCLUSION

To increase climate resilience among vulnerable farmers in South Zimbabwe, farmers will have to invest on climate -proofed irrigation systems within individual farm infrastructure to maintain constant water supply, require credit for expansion and payment of farm activities withing an agricultural cycle. To assess financial inclusion at baseline, access to credit (sources of credit and success factor) and utility was examined in this study as highlighted below.

7.4.1. Access to credit

A household's access to finance is a crucial determinant of its resilience to both covariate and idiosyncratic shocks. This baseline study sought to determine the extent of financial inclusion of households in the intervention areas, and access to finance, including credit was examined across gender, age and location divides.

> ***80%** of the farmer households had access to some financial services*

The proportion of farmers with access to financial services was determined by counting the number of households that had a member with in an informal savings and lending group or has a mobile money account or had any member of the household who had accessed a loan in the past 12 months.

A greater proportion of farmers in pure control areas had a higher access to finance as compared to those in treatment and control areas. Households in Mangwe had the lowest access to credit as compared to farmers in other districts.

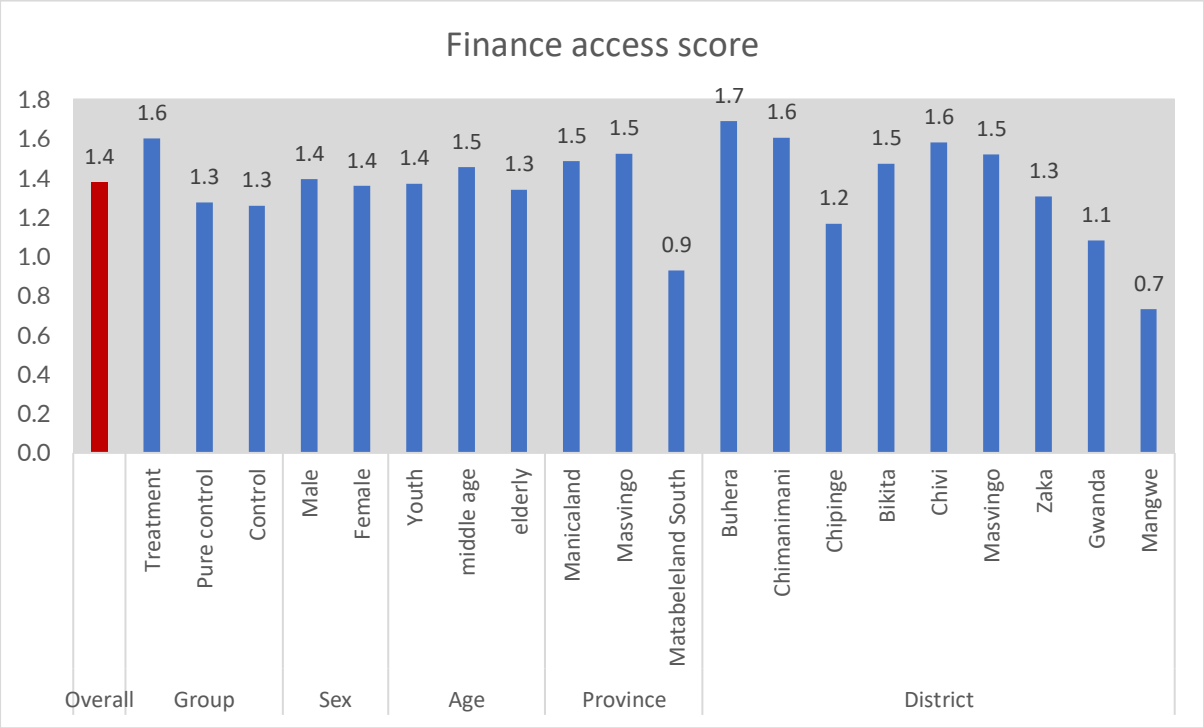
Table 90: Percentage of farmer households with access to finance

% of Households with access to financial Services																					
Baseline Value	Household type			Gender		Age			Province			District									
												Manicaland			Masvingo				Mat. south	
	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
80	86	77	77	82	79	79	83	79	85	89	56	89	95	74	88	86	93	92	63	47

7.4.1.1. Finance access core

To calculate finance access score, respondents were asked if they own a bank account, if any member of the household is a member of an informal savings and lending group, has a mobile money account and if any member of the household had access to a loan in the past 12 months. If the household had access to any, a score of one "1" is assigned and zero "0" otherwise. A sum of the individual scores are added to give the total score. The maximum possible score is 4. Results show that the average access to finance index is 1.376. Only 3.3% of the households had a score of 4 and 77.4% of the households had a score between 1 and 3. A total of 19% of the households had a zero score.

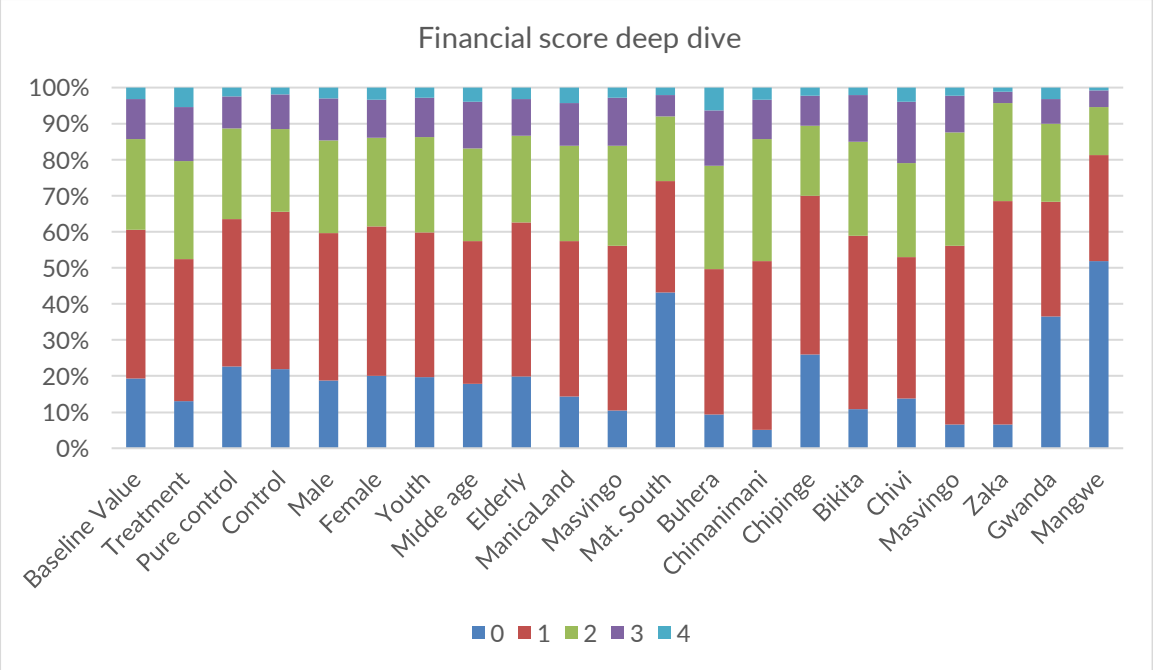
Figure 21: Proportion of farmer households with access to financial services



Household in Matabele South especially those in Mangwe district had the lowest finance access score as compared to the rest of the districts Figure 21)

*Access to finance score at baseline **1.4***

Figure 22: Financial score further analysis



A greater proportion of farmers in in Mat. South province especially those in Mangwe district had a higher financial score as compared to the rest. Across all the units, low proportions of farmers had a score of 0-2 laying a good basis for investing in climate smart agriculture.

7.4.1.2. Household ownership of bank account

Table 91: Bank account ownership within household

E1: Does any member of this household have a bank account? N=4180															
		Household type			Gender		Age			HH Size			Province		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Yes	24.1	27.5	23.2	21.7	27.5	22.3	25.1	24.1	23.5	23.9	24.4	24.2	21.6	29.4	20.5
No	75.9	72.5	76.8	78.3	72.5	77.7	74.9	75.9	76.5	76.1	75.6	75.8	78.4	70.6	79.5
		Chi2 13.47 P-value=.001*			Chi2 1 P-value=.000*		Chi2 1.02 P-value=0.599			Chi2 0.1 P-value=0.952			Chi2 34.87 P-value=.000*		

At baseline less than a quarter (24.1 percent) of all households (N=4181) surveyed in the intervention areas had a member owning a bank account. Owning a bank account varied with household type, with a higher proportion of households in the treatment group (27.5 percent) owning accounts compared to 23.2 percent for the pure control and 21.8 percent for the control group. Respondents reported that the long distance to the bank, high volatility and inflation of the local currency, and challenges with accessing cash at the bank, were some of the factors that were dis-incentivising bank account ownership. In fact, prevailing economic conditions at baseline were said to be encouraging immediate spending rather than any form of saving.

Bank ability varied significantly across Manicaland and Matabele South Provinces with Chipinge (15.2 percent) and Mangwe (12.3 percent) showing low operations of banking accounts while Chimanimani (31 percent) and Masvingo (33.3 percent) districts had close to one third of the households having operated a bank account.

7.4.1.3. Household access to mobile money account

Table 92: proportion with access to mobile money account

E3: Do you E3: Do you have access to a mobile money account? N=4180															
		Household type			Gender		Age			HH Size			Province		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Yes	74.9	79.8	73	72.1	77.7	73.4	74.6	77.6	73.7	73.8	76.1	76.3	81.8	85.9	43.9
No	25.1	20.2	27	27.9	22.3	26.6	25.4	22.4	26.3	26.2	23.9	23.7	18.2	14.1	56.1
		Chi2 26.11 P-value=.000*			Chi2 1 P-value=.002*		Chi2 5.43 P-value=0.066			Chi2 2.91 P-value=0.234			Chi2 608.8 P-value=.000*		

Nearly three quarters (75 percent) of households have access to a mobile money account. Treatment households had statistically higher likelihood of having access to a mobile money account (79.8 percent) compared to pure control (72.9 percent) and control group (72.1 percent). Mat Sount had the lowest access to mobile money (43.9 percent) as compared to other provinces that had more that 80 percent of the farmers accessing mobile money account. The high access to mobile money account was attributed to the high mobile network penetration in the project districts, albeit with some locations such as Mangwe (32.3 percent) being underserved or with local traders preferring to transact in cash (local or foreign currency).

7.4.1.4. Proportion of households requiring and accessing credit

Table 93: proportion requiring credit

E4: In the last twelve months, did you ever need to get a loan/credit for whatever reason N=4180																
		Household type			Gender		Age			HH Size			Province		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Yes	16.6	21.5	14.8	13.8	17.1	16.4	17	19.2	15.1	15.3	18.4	17.6	19.7	18.2	8.2
No	83.4	78.5	85.2	86.2	82.9	83.6	83	80.8	84.9	84.7	81.6	82.4	80.3	81.8	91.8
		Chi2 35.05 P-value=.000*			Chi2 1 P-value=0.565		Chi2 8.13 P-value=.017*			Chi2 6.72 P-value=.035*			Chi2 62.41 P-value=.000*		

Demand for loans was generally perceived by most respondents as an indicator of household income stress, with some households reporting that taking a loan was the last resort. In the twelve months prior to the survey, 16.6 percent of all households (N=4180) surveyed had required a loan or some form of credit. Demand for credit was highest for households in the treatment group (21.5 percent) relative to the pure control (14.8 percent) and control (13.8 percent) groups. Mid aged farmers (19.2 percent) were more likely to desire credit as opposed to youth (17 percent) and elderly (15.1 percent) although the appetite for credit did not significantly vary by gender. A year prior to the survey, the desire for credit among Mat South farmers was the least at 8.2 percent as opposed to Manicaland (19.7 percent) and Masvingo (18.2 percent). Zaka (3.3 percent) and Mangwe (5.4 percent) districts had the least appetite for loans as compared to the other districts whose more that 10 percent of farmers desired credit. Buhera (28.1 percent) and Chivi (25.8 percent) districts led on appetite for loans with the same period. Across the wards, no one desired credit in Mangwe-2, Mangwe-10, Bikita-1 and Buhera-22.

Of the 16.6 percent of all households that reported ever needing to take a loan in the 12 months prior to this survey, 39 percent were successful in securing all the credit they required, while a further 11.7 percent were able to access part of the loan they required. Almost half (49.4 percent) of households that sought credit were unable to access it, with households in the pure control group (58.7 percent) being the least likely. Households in the treatment group were the most likely to secure all credit required if they ever needed any (44.3 percent). Table 93 that in comparison to the treatment group, fewer households were able to secure all the credit they required for the pure control (32.9 percent) and control (37.7 percent) groups.

Despite the high desire for credit in Manicaland as compared to other districts loan success remains a big issue in the area. Less than one third of households in Buhera (31 percent) and

Mangwe (27.3 percent) districts indicated low access to credit.

Access to credit did not vary with the size of household.

7.4.2. Main barriers to accessing credit

In developing countries, regulated financial products are tailored to meet specific needs within a group or locality. These financial products face specific barriers related to the sized and structure of the unbanked population, financial literacy, financial infrastructure, and consumer protection and regulations. In this section, we have highlighted some of the main barriers to accessing credit among the vulnerable farmer population in Southern Zimbabwe.

Table 94: Main reason for not accessing credit among the population that failed to access credit

Percentage of the main reason for not accessing credit N=343															
Category		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Not interested	18.9	16.9	20.4	19.3	19.9	18.4	19.9	16.8	19.4	20.3	17.1	17.8	18.5	20.2	17.8
Not in a club do not qualify	4.4	4.3	4.5	4.5	4.5	4.4	4.0	5.1	4.3	4.1	5.1	3.7	2.6	3.8	8.6
No opportunities for credit	11.7	12.0	12.8	10.9	13.8	10.6	12.0	13.2	10.8	11.9	11.6	11.1	12.0	13.7	8.2
Missing documents	2.3	2.6	2.2	1.9	2.4	2.2	1.9	2.9	2.2	1.9	2.8	2.2	1.5	2.0	3.9
Did not have a guarantor	1.4	1.5	1.1	1.5	1.1	1.5	2.0	1.2	1.0	1.2	1.6	1.5	1.2	1.0	2.2
No collateral	12.6	13.9	12.0	12.1	12.1	12.9	12.2	12.2	13.1	11.7	13.3	15.7	14.3	7.0	18.1
Fear of not being able to pay back	48.1	47.9	46.5	49.9	45.1	49.7	47.1	48.4	48.5	48.5	47.6	47.4	49.6	51.4	40.4
Others	0.6	1.0	0.5	0.5	1.1	0.4	0.8	0.2	0.7	0.4	0.9	0.6	0.3	0.9	0.9
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Chi2 = 17.81 Prob = 0.219			*Chi2 = 21.29 Prob = 0.03*		*Chi2 = 19.43 Prob = 0.149*			*Chi2 = 19.52 Prob = 0.146*			*Chi2 = 161.2 Prob = 0.000*		

Surveyed respondents who had failed to access the credit they needed reported that they had faced multiple barriers to accessing finance. The baseline study examined the extent and for whom these barriers were significantly higher. Data from the survey shows that barriers to accessing credit were similar across the three household types, age and household size. Across the study sample for households that failed to secure credit as required (N=343) the dominant barriers included 'fear of not being able to pay back' (48.1 percent), 'lack of interest in getting credit' (18.9 percent), and 'not having collateral' (12.6 percent). The baseline found that 11.7 percent of households felt that they had no opportunities for accessing credit, while a further 1.4 percent failed to get a guarantor to secure their loan.

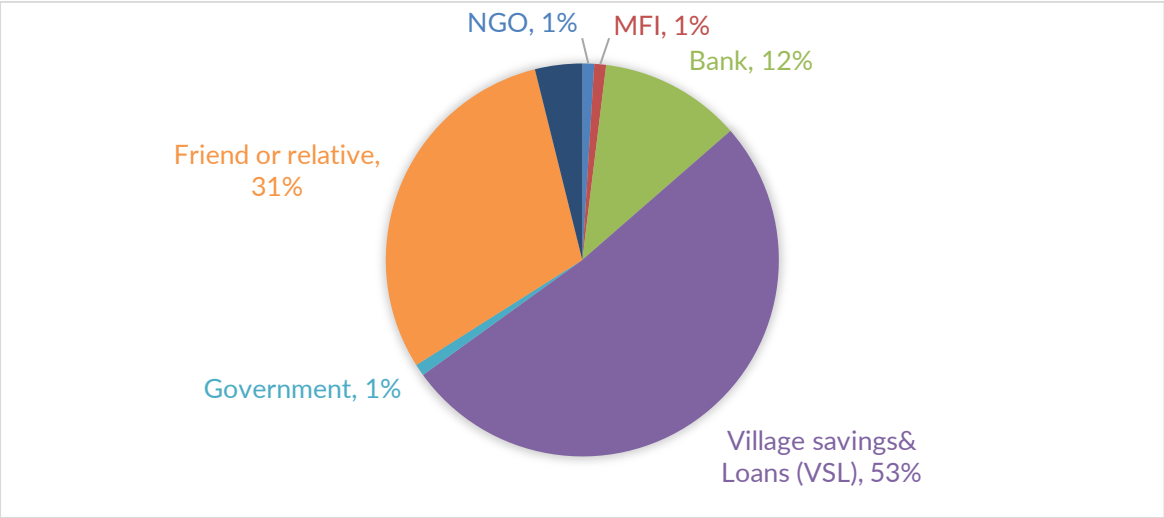
Half of the women (49.7 percent) had a higher fear of not repaying back as compared to the male counterparts (45.1 percent).

Among farmer households that failed to acquire credit, more Mat South farmers felt that they had no opportunity for credit, and also not being in a group contributed to their exclusion. Lack of collateral to secure credit had less impact among farmers in Masvingo as compared to other areas.

7.4.3. Source of credit

7.4.4. Main source of credit

Figure 23: Source of credit among the households



Across all household types, VSLs were the main source of credit accounting for 53 percent of all credit obtained by respondents. Second in order of importance as credit source were friends and relatives (31 percent). Banks provided credit to 12 percent of all households that received credit in the last 12 months to the survey, while informal lenders issued loans to 4 percent of the survey sample that obtained loans.

Table 95: Sources of credit

Proportion of source of credit; Column % N=379															
Category		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
NGO	1.8	1.8	1.0	0.9	2.5	0.9	1.8	2.4	0.6	1.0	1.4	2.9	0.9	1.8	2.4
MFI	0.0	0.0	2.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.4	0.0	0.0	1.8	0.0
Bank	10.7	10.7	13.9	10.9	15.8	8.0	15.2	21.4	10.3	10.7	10.9	20.0	8.0	15.2	21.4
VSL	65.5	65.5	38.6	48.2	43.3	57.3	43.8	57.1	53.8	52.3	55.1	51.4	57.3	43.8	57.1
Government	0.6	0.6	1.0	1.8	0.8	1.3	0.9	0.0	1.9	1.0	1.4	0.0	1.3	0.9	0.0
Friend or relative	22.6	22.6	36.6	40.0	36.7	33.8	28.6	26.2	32.7	33.0	30.6	25.7	33.8	28.6	26.2
Informal money lender	2.4	2.4	10.9	1.8	5.0	1.8	11.6	0.0	5.1	4.6	4.1	5.7	1.8	11.6	0.0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

There were major differences on access of credit from VSL, friends/family and informal lenders for the three household types surveyed. Treatment households were nearly twice as likely to obtain a loan from a VSL compared to a pure control household. Households in the control group were also nearly twice as likely to source credit from friends or relative as peers in the treatment group. Differences by household type were insignificant for loans sourced from banks and MFIs, but substantial for loans accessed from informal money lenders. Pure control households were more than four times as likely to obtain loans from informal lenders as peers in the treatment or control groups (Table 95).

The baseline found a gender disparity with regards to the main source of credit for households in the intervention areas. Male respondents were more likely to access credit from banks (15.8 percent) and friends/relatives (36.7 percent) compared to female respondents (9.7 percent and 29 percent, respectively). Women were, however, more likely to access credit from village savings and loans groups (VSLs) than men, with 57.9 percent of women reporting having accessed credit from these, compared to 43.3 percent for their male counterparts. Males were also slightly more likely to access credit from informal money lenders (5 percent) compared to 4.2 percent for women. Microfinance institutions were the least used sources of finance with less than a percent of all respondents reporting having sourced credit from them.

Families with more than eight members were two times likely to source from credit from Banks as compared to smaller families.

Survey data also shows that there were significant differences in sources of loans by location. Respondents in Mat South (21.4 percent) were more likely to access credit from a bank compared to peers in Masvingo (15.2 percent). VSLs were slightly less important in Masvingo (43.8 percent) compared to Manicaland and Mat South (57 percent), while informal lenders were more frequently used as sources of credit in Masvingo relative to the other two provinces.

VSLs are common across all districts; most of the farmer households in Chipinge (71.4 percent) and Mangwe (73.7) seem to have a heavy reliance the VSL among other informal banking methods. This calls for measures of intervention targeting the unbanked within the region.

7.4.5. Membership to a village savings and loans group

Village savings and loan group structures form basis of interventions in developing countries as they provide ready quorum for convening meetings to design intervention mechanisms.

Table 96: Proportion of households where the household head or any other household member belonged to a village savings and loans group

Does the household head or any other household member belong to a village savings and loan group N=4180															
Category		B5: Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Yes	21.9	31.4	16.6	18.3	19.5	23.2	20.4	24.9	21.3	20.7	23.4	24.0	25.4	18.8	20.2
No	78.1	68.6	83.4	81.7	80.5	76.8	79.6	75.1	78.7	79.3	76.6	76.0	74.6	81.2	79.8

Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Chi2 = 104.9 *Prob = 0.000*			*Chi2 = 7.66* *Prob = 0.006*		*Chi2 = 7.215* *Prob = 0.027*			*Chi2 = 4.93* *Prob = 0.085*			*Chi2 = 22.25* *Prob = 0.000*	

Households in the treatment group were nearly twice as likely (31.4 percent) to belong to a village savings and loans group than peer households in the pure control (16.6 percent) and control groups (18.3 percent). In total, the evaluation found that 21.9 percent of households in the project intervention districts had a household head or any member of their household who was a member in these community-based social protection organisations.

Female household heads were more likely to exist in VSLs as opposed to male household heads. Efforts encouraging membership into VSLs in Masvingo province ~ Zaka and Masvingo districts would yield better access to credit.

7.4.6. Main use of credit

7.4.6.1.1. Reason for getting loan

Across all intervention areas respondents resorted to loans primarily for the purpose of income and consumption smoothing in response to shocks and stresses experienced by the household. The most cited reason for taking a loan was for the purpose of buying food (28.3 percent) and paying school fees for children (20.7 percent). Almost 14 percent took credit to start a business, and a further 10.6 percent to purchase farm inputs. There were no statistically different reasons for taking a loan across the three household groups.

Table 97: Main purpose of loan

	Province												
		HH type			Manicaland districts (N=234)			Masvingo districts (N=119)				Mat. South districts (N=43)	
Response	Total	Treatment	Pure control	Control	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
To buy farm inputs	10.6	9.0	12.7	11.2	8.4	31.0	12.0	6.7	3.1	34.8	0.0	8.7	0.0
To purchase assets	2.3	2.2	3.9	0.9	1.9	0.0	0.0	0.0	0.0	13.0	0.0	8.7	5.0
To start/finance business	13.9	16.9	9.8	12.9	18.1	10.3	16.0	0.0	9.2	21.7	100	8.7	10.0
Hospital costs	7.1	8.4	3.9	7.8	5.8	3.4	12.0	6.7	12.3	0.0	0.0	8.7	0.0
Meet transport costs	6.6	7.3	8.8	3.4	9.7	0.0	0.0	3.3	7.7	0.0	0.0	4.3	20.0
To buy food	28.3	23.6	35.3	29.3	28.4	24.1	34.0	40.0	21.5	26.1	0.0	17.4	40.0
School fees	20.7	21.3	18.6	21.6	20.0	20.7	14.0	33.3	24.6	4.3	0.0	30.4	20.0
To construct a house	3.8	3.9	2.0	5.2	1.9	6.9	4.0	0.0	7.7	0.0	0.0	8.7	5.0
To pay off debts	1.8	2.2	1.0	1.7	3.2	3.4	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	5.1	5.1	3.9	6.0	2.6	0.0	6.0	10.0	13.8	0.0	0.0	4.3	0.0
Total	100	100	100	100	100	100	100	100		100	100	100	100
		Chi2 = 16.27 Prob = 0.57			*Chi2 = 104.9 Prob = 0.000*			*Chi2 = 104.9 Prob = 0.000*				*Chi2 = 104.9 Prob = 0.000*	

However, Table 97 shows that fewer treatment households, relative to the other groups, took loans to buy inputs, and more of the treatment group than the other two, took loans to start a business. Treatment households were more likely to get a loan to finance or start a business (16.9 percent) than peers in the pure control (9.8 percent) and control (12.9 percent) groups. Loans were used by nearly 2 percent of the sampled households for clearing debts, for clearing debts suggesting that there was a high possibility of unsustainable debt for some respondents. A further 3.8 percent of respondents used loans to construct a house.

To shed light on seed security, the survey asked if respondents had taken a loan specifically for the purchase of seed.

Table 98: Did you get a loan to buy seed?

Did you get a loan to buy seeds N=1058															
Category		B5: Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Yes	11.6	11.2	12.3	11.7	13.5	10.8	11.0	14.3	10.5	15.6	10.0	7.6	13.1	11.1	5.0
No	88.4	88.8	87.7	88.3	86.5	89.2	89.0	85.7	89.5	84.4	90.0	92.4	86.9	88.9	95.0
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Chi2 =0.359 Prob = 0.836			*Chi2 = 3.578 Prob = 0.059*		*Chi2 = 5.429 Prob = 0.066*			*Chi2 = 21.853 Prob = 0.000*			*Chi2 = 13.11 Prob = 0.001*		

About 11.6 percent of all households surveyed for this question reported that they had in fact taken a loan to buy seeds. The likelihood of taking a loan to buy seedling reduced as the size of the family increased.

Farmer household in Chimanimani (48 percent) and Masvingo (34.8 percent) districts had a high likelihood of taking loans to purchase seedlings.

Total loan received by household type, gender, age and location

For households that sought loans, the amount of credit secured was up a max of US$10000. The mean loan size was US$148.05, while the median value of US$31.50 reflects the large inequality in access to credit for the sampled households.

Table 99: Total loan received by members of household

Minimum	Mean	Standard Deviation	Median	Maximum
0.00	148.05	632.07	31.50	10000.00

The mean value of total loan secured varied for the different household types. The mean for the treatment group was US$116.26, while for the control it was calculated at US$106.63, increasing to US$250 for the pure control. The median value, as shown in Table 100, did not vary much, ranging from US$26.55 in the control group, to US$30,00 in the pure control and highest in the treatment group at US$40.00.

Table 100: Mean and median total loans received by household members

How much was the total loans received by members of this household? by HH type								
Treatment			Pure control			Control		
Mean	Standard Deviation	Median	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
116.26	316.45	40.00	250.62	1134.77	30.00	106.63	273.06	26.55

The mean loan size received varied by gender of the farmer, with male respondents reporting a mean loan size of US$120.46 and females US$160.63. The median value for women

respondents was, however, lower at US$30 compared to US$50 suggesting that while on average women received larger loans, very few women received high amounts of money as loans and a large proportion received very little, compared to the situation for male respondents.

Table 101: Mean and median total loans received by household members by gender of respondent

	Sex of farmer					
	Male			Female		
	Mean	SD	Median	Mean	SD	Median
	120.46	301.56	50.00	160.63	735.21	30.00

The baseline also found a relationship between the age of the farmer and the total amount of money in loans secured. The elderly farmers accessed the least amount of credit at US$96.38. Youth farmers reported a mean loan size of US$144.91 while middle-aged farmers received the highest loan size at US$225.78. The median loan size, however, was not significantly different for the three age categories.

Table 102: Mean and median total loans received by household members by age of respondent

Youth			Middle age			Elderly		
Mean	Standard Deviation	Median	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
144.91	388.76	37.80	225.78	1052.81	37.80	96.38	281.57	31.25

The median loan size was not statistically different across the three provinces at slightly above US$30. The mean loan size, however, varied substantially ranging from US$95.17 in Mat South to US$106.34 in Manicaland, and was highest in Masvingo at US$249.18. The standard deviation in Masvingo, more than thrice the value in Manicaland is testament to the high degree of skewness in loan access in that province.

Table 103: Mean and median total loans received by household members by province

Manicaland			Masvingo			Matabeleland South		
Mean	Standard Deviation	Median	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
106.34	310.71	31.50	249.18	1058.88	30.00	95.17	173.57	31.50

7.5. FARMER RISK ATTITUDE AND BEHAVIOUR

7.5.1. Farmers insuring crops

The proportion of farmers who had insured crops across at baseline was below 2 percent highlighting the need of intervention mechanisms aimed at improving insurance. The variation in adoption of insurance as a risk mitigation measure did not vary significantly with gender, household size or religion.

Figure 24: Proportion of farmers who had subscribed to crop insurance

H1: Do you ever purchase crop insurance? N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
Response	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	0.9	1.3	1.0	0.4	0.8	1.2	0.5	1.0	0.0	0.9	1.0	1.1	1.3	2.2	1.0	0.0
No	99.1	98.7	99.0	99.6	99.2	98.8	99.5	99.0	100.0	99.1	99.0	98.9	98.7	97.8	99.0	100.0
		Chi2=7.52 P-value=.023*			Chi2=3.45 P-value=0.178			Chi2=10.5 P-value=.232								

At baseline, the uptake of crop insurance across treatment pure control and control areas was very low creating an interesting metric to closely monitor in the preceding midline and endline studies. There were no significant differences on purchase of crop insurance by household ty or location.

7.5.2. Farmers adopting new technology

On the risk of exposure to new technology, three out of ten farmers believed they adopted production technology easily.

Table 104: Proportion of first adaptors of new technology

H2: Are you always one of the first producers in my area to adopt new technology? N=4180																
		Household type			Gender		Age			HH Size						
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members				
Yes	30.3	46.4	20.3	25	32	29.4	26.6	33.8	30.8	28.6	31.8	30.3				
No	69.7	53.6	79.7	75	68	70.6	73.4	66.2	69.2	71.4	68.2	69.7				
		Chi2=253.72 P-value=.000*			Chi2= 1 P-value=0.080		Chi2=13.75 P-value=.001*			Chi2=7.59 P-value=.022*						
		Province			District											
					Manicaland			Masvingo				Mat. south				
		ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe			
Yes		24.9	32.8	37.0	29.4	17.9	23.6	30.3	37.6	26.1	41.3	45.2	26.4			
No		75.1	67.2	63.0	70.6	82.1	76.4	69.7	62.4	73.9	58.7	54.8	73.6			
		Chi2=48.92 P-value=.000*			Chi2=124.31 P-value=.000*											

Treatment households were more likely to adopt to new production technology within their area comprising half of those who indicated they easily adopt, while households in the pure control and the control formed 23 percent and 27 percent, respectively (). Adoption to new production technology varied significantly across the household types, religion and household size.

Farmers in Mat. South province was more likely to adopt new production technology as compared to those in Manicaland and Masvingo provinces. There was a higher likelihood of more than one third of adopting new technology in Chivi (37.6 percent), Zaka (41.3 percent) and Gwanda (45.2 percent) as compared to other districts. This provides an avenue for utilizing technology to extend farming information and sensitizing crop insurance as a measure to de-risk climate hazards.

7.5.3. Capacity to pay bills and meet household needs

To understand the ability to meet family needs an recurrent expenses, farmers were asked whether they had enough cash or assets that could be converted to cash to pay bills or meet household needs. Only one of ten farmer households (11 percent) were able to meet bills and household needs.

Table 105: Proportion of farmers with enough cash on hand or convertible assets to pay bills

H3: Do you ever have enough cash on hand or assets that can be easily converted to cash to pay all your bills or buy what your household needs N=4180												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
Yes	11.3	15.3	9.5	9.2	12.7	10.6	11.7	12	10.7	10.9	12	10.5
No	88.7	84.7	90.5	90.8	87.3	89.4	88.3	88	89.3	89.1	88	89.5
		Chi2=32.27 P-value=.000*			Chi2= 1 P-value=.043*		Chi2=1.36 P-value=0.5057			Chi2=1.44 P-value=0.4861		
	Province			District								
				Manicaland			Masvingo			Mat. south		
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	9.2	12.3	13.7	7.3	12.5	9.6	9.1	15.2	8.8	20.7	16.5	10.1
No	90.8	87.7	86.3	92.7	87.5	90.4	90.9	84.8	91.2	79.3	83.5	89.9
	Chi2=14.44 P-value=.001*			Chi2=50.87 P-value=.000*								

Households that were able to pay bills and meet household bills had a significant variation whereby treatment households were highly likely to meet their needs as compared to pure control and control households (Table 105). This variation was also significantly different by gender of the farmer and province. Female farmers and those from Manicaland provinces were highly likely to pay bills and meet the family needs.

7.5.4. Sale of commodities and utility of market information

Only 19% of the farmers utilize information from the government reports and private market news services to make market decisions.

7.5.4.1. Utility of market information by the type of household

Table 106: Utility of market information

H8: Do you rely heavily on market information (for example government reports, private market news services) in making marketing decisions? N=4180												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
Yes	18.8	27	13.4	16.4	21.4	17.4	17.7	21.3	18.1	18.4	18.7	21.2
No	81.2	73	86.6	83.6	78.6	82.6	82.3	78.7	81.9	81.6	81.3	78.8
		Chi2=92.67 P-value=.000*			Chi2= 1 P-value=.002*		Chi2=5.82 P-value=0.055			Chi2=1.6 P-value=0.450		
	Province			District								
				Manicaland			Masvingo			Mat. south		
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	24.6	17.9	8.9	27.8	19.7	23.6	15.3	22.5	9.6	34.8	10.1	7.4
No	75.4	82.1	91.1	72.2	80.3	76.4	84.7	77.5	90.4	65.2	89.9	92.6
	Chi2=99.24 P-value=.000*			Chi2=159.39 P-value=.000*								

Treatment households (27 percent) were more likely to make use of the information as compared to those in pure control (13.4 percent) and control (16.4 percent).

Further analysis indicated this variation was significant across gender and by geography whereby female farmers, and those from Manicaland were highly likely to utilize market information share through government reports and other private institutions. There was no difference of market information utilization by household size or age of the farmer.

7.5.4.2. Sale of commodities within a year

Table 107: Proportion of farmers who spread sale of commodities across the year

H7: Do you ever spread the sale of my commodities over the year? N=4180												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
Yes	19.7	27.2	15	17.3	20.6	19.2	19.5	21.1	19.1	19.3	19.9	21.5
No	80.3	72.8	85	82.7	79.4	80.8	80.5	78.9	80.9	80.7	80.1	78.5
		Chi2=74 P-value=.000*			Chi2= 1 P-value=0.2769		Chi2=1.88 P-value=0.389			Chi2=1.06 P-value=0.5890		

	Province			District								
				Manicaland			Masvingo				Mat. south	
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	19.4	23.9	13.6	22.6	19.5	15.4	22.6	32.2	8.8	46.7	6.8	22.2
No	80.6	76.1	86.4	77.4	80.5	84.6	77.4	67.8	91.2	53.3	93.2	77.8
	Chi2=99.24 P-value=.000*			Chi2=159.39 P-value=.000*								

As part of cash flow management, only 20 percent of the farmer households spread the sale of commodities across the year. Households within the treated sample were more likely to spread sale of items across the year (27.2 percent) as compared to those in pure control (15 percent) and control (17.2 percent).

Farmer households in Masvingo and Manicaland were more likely to spread their sale of commodities across the year as compared to those in Matabeleland South. Farmer gender or age, the size of the household did not affect the spread sale of commodities across the year by the farmer households.

7.5.5. Off-farm sources of income

At baseline, six out of ten farmers (60 percent) interviewed considered gaining income from off-farm sources as critical for their family financial survival.

Table 108: Farmers who considered off-farm income as key for their livelihood

H7: Do you ever spread the sale of my commodities over the year? N=4180												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
Yes	60.4	60.4	62.5	58.1	59.3	61	60	60.8	60.4	59.7	61	62
No	39.6	39.6	37.5	41.9	40.7	39	40	39.2	39.6	40.3	39	38
		Chi2=5.68 P-value=0.0582			Chi2= 1 P-value=0.283		Chi2=0.14 P-value=0.933			Chi2=1.01 P-value=0.604		

	Province			District								
				Manicaland			Masvingo				Mat. south	
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	59.7	53.1	73.4	60.9	68.6	53.0	67.2	62.7	29.6	59.8	67.2	81.2
No	40.3	46.9	26.6	39.1	31.4	47.0	32.8	37.3	70.4	40.2	32.8	18.8
	Chi2=97.85 P-value=.000*			Chi2=296.92 P-value=.000*								

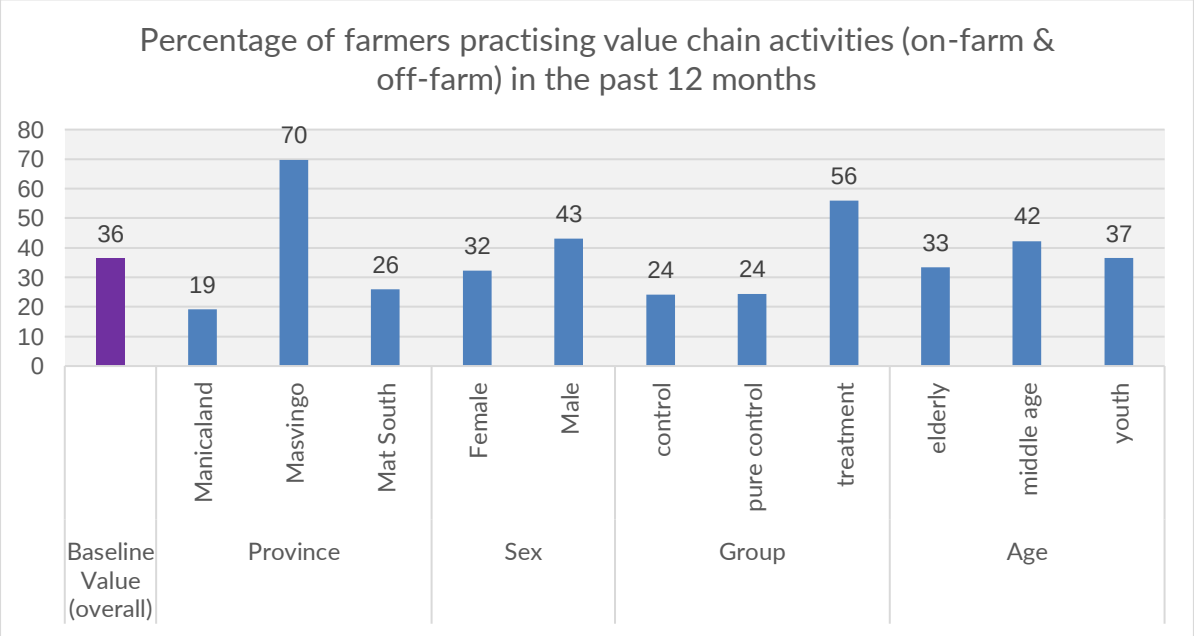
Farmer households in Matabeleland South (73.4 percent) were more likely to consider off-farm income for survival as compared to farmer households in Masvingo (53.1 percent) and Manicaland (59.7 percent).

Type of household, gender or age of the farmer, religion, or the size of the household did not matter when deciding to consider off-farm income to supplement farming income.

7.5.6. AGRICULTURE VALUE CHAINS

To determine households' participation in value chains, the survey asked if they had been involved in storage and handling, value chains and marketing and distributions. A score of 1 was assigned for every value chain used and the maximum possible score was 12. Individual who participated in at least a 5 value chains were reported.

At baseline 36 percent of all households surveyed were practicing some value chain activity on-farm or off-farm in the 12 months to the current survey. This level of participation is indicative of the proportion of households across all districts surveyed with access to markets for their produce. Evidence from FGDs and KIIs points to the observation that if farmers are weakly linked to viable value chains, then they do not have sufficient market-based incentive to participate in the production of those commodities (crops and livestock) that have low off-take capacity.



Focusing at the provincial level, Masvingo had 70 percent of its respondents linked to value chains. This proportion was nearly three times the values for the other two provinces. Also, more males (43 percent) were practicing value chain activities on farm and off-farmm compared to 32 percent for female. The implication for this is that if the GCF project were to strengthen value chains, a possible capture of value chains could be possible along gender lines. This means that any programme for value chain development would need to be preceded by gender training. Treatment housheolds had the highest access to value chains (56 percent) of all household types, while middle aged (42 percent) and youth (37 percent) were slightly better off than the elderly (33 percent), and this could have been determined by the nature of control and use of assets.

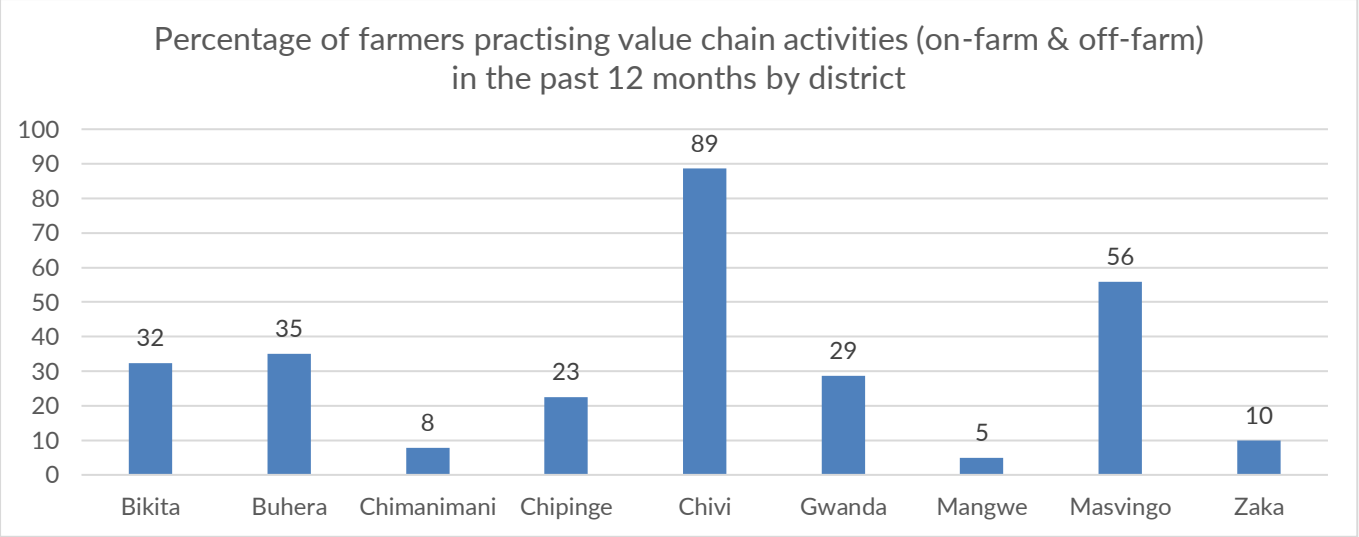


Table 109: Percentage of farmers practising value chain activities (on-farm & off-farm) in the past 12 months by district

Analysis of field data shows that value chains were most used in Chivi (89 percent) and Masvingo (56 percent), while other districts such as Mangwe (5 percent), Chimanimani (8 percent) and Zaka (10 percent) were very poorly linked to product value chains on-farm or off-farm. The latter constitute the priority areas for programmatic interventions in value chain development.

7.5.7. Contract farming

7.5.7.1. Household participation in contract farming

Table 110: Proportion involved on contractual farming

N1: Are you involved in contract farming?															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Yes	6.2	10.1	4.9	3.8	7.6	5.5	6.9	6.9	5.5	5.6	6.5	9.4	6.8	9	0.7
No	93.8	89.9	95.1	96.2	92.4	94.5	93.1	93.1	94.5	94.4	93.5	90.6	93.2	91	99.3
		Chi2 53.07 P-value=.000*			Chi2 1 P-value=.008*		Chi2 3.79 P-value=0.150			Chi2 7.87 P-value=.020*			Chi2 69.6 P-value=.000*		

Most of the households (94 percent) did not have any contract farming arrangements. Of the 6 percent involved in contract farming, the survey showed that a higher proportion of treatment households (10.1 percent) was engaged in contract farming, slightly higher than in pure control (4.9 percent) and Control (3.8 percent) households. Further, results show that male respondents (7.6 percent) were slightly more likely to have a contract to supply crop or livestock products ahead of their female counterparts (5.5 percent). A closer review of the 6 percent of farmers in contract farming revealed that the mean was derived from a relatively higher proportion of contracted farmers in Masvingo (9 percent) and Manicaland (6.8 percent) and almost a negligible number for Mat South (0.7 percent). Contractual farming is common in Chiminani and Chivi districts.

7.5.7.2. Type of contract

The majority of respondents were involved in input-based contract farming (70 percent), with less than 6 percent involved in output contractual arrangements (Table 111). Pure Control households (83.1 percent) were likely to be involved in input-based contracts compared to Treatment (65.0 percent) and control (64.2 percent) households. Across aggregation by gender, age, household size and location, less than 10 percent of households were involved in output-based contractual arrangements.

Table 111: Proportion of respondents with contract farming by contract type

N2: What type of contract is this?															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Input based	69.7	65	83.1	64.2	67.3	71.5	73.5	62.9	71.3	76.6	62.6	64.7	72.4	68.2	50
Output based	5.7	5.8	4.2	7.5	4.5	6.6	3.6	7.1	6.5	5.5	7.1	2.9	4.1	6.1	33.3
Both	24.5	29.2	12.7	28.3	28.2	21.9	22.9	30	22.2	18	30.3	32.4	23.6	25.8	16.7
		Chi2 8.68 P-value=.070			Chi2 2 P-value=0.431		Chi2 2.86 P-value=.582			Chi2=6.92 P-value=0.140			Chi2=9.35 P-value=.053		

Most households were contracted for maize production (70 percent), followed by sorghum (26 percent) and pearl millet (23 percent). An insignificant proportion of households were contracted for livestock production (beef 0 percent and poultry 2 percent). This is reflected in 98.3 percent of Pure Control, 66.7 percent of Control and 54 percent of Treatment households were contracted for maize, with similar corresponding trends for sorghum and pearl millet.

Table 112: Commodity contracted

N2: What crop commodity is farmer contracted for? N=189															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Maize	70.4	54.6	98.3	66.7	69.9	70.8	74.6	71.4	66.2	73.3	62.5	87.5	64.5	75.7	50
Beans	9.5	16.5	0	6.1	10.8	8.5	6.3	14.3	9.1	7.9	12.5	6.3	9.2	9.3	16.7
Groundnut	5.3	6.2	1.7	9.1	6	4.7	4.8	8.2	3.9	7.9	2.8	0	3.9	5.6	16.7
Cowpea	16.4	22.7	3.4	21.2	13.3	18.9	12.7	18.4	18.2	14.9	18.1	18.8	27.6	6.5	50
Bambara nut	1.1	2.1	0	0	2.4	0	0	4.1	0	1	1.4	0	0	1.9	0
Sorghum	25.9	36.1	10.2	24.2	25.3	26.4	23.8	26.5	27.3	23.8	30.6	18.8	39.5	15	50
Pearl millet	23.3	41.2	1.7	9.1	27.7	19.8	20.6	28.6	22.1	24.8	22.2	18.8	13.2	29	50
Beef	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poultry	1.6	2.1	0	3	1.2	1.9	1.6	2	1.3	2	1.4	0	2.6	0.9	0

While a similar trend was observed when the crop/commodity type contractual data was aggregated by gender and age, the contractual proportions were equitable across these

factors. Over 90 percent of households were likely to enter short term (1 – 12 months) across factors age, gender, province, and household size.

Masvingo had the highest proportion of farmers contracted for maize (75.7 percent) and the least for sorghum (15 percent) and cowpeas (6.5 percent). Mat South had the highest proportion of farmers in groundnut (16.7 percent), pearl millet (50 percent), sorghum (50 percent) cowpea (50 percent) and bean contracts. Manicaland had, in contrast, very minimal proportion of farmers producing groundnut (3.9 percent), pearl millet (13.2 percent) and beans (9.2 percent), and also had the highest proportion of households in poultry farming (2.6 percent), although this translated to only 2 farmers. In Mangwe and Bikita farmers only contracted for groundnut and Bambara nut

7.5.8. Market accessibility

7.5.8.1. Access to input and output markets

Almost half (48.5 percent) and slightly less (43 percent) of all household types found it difficult to access input and output markets, respectively. In both input and output markets, close to a quarter (18.0 percent -32.4 percent) found it equally easy or very difficult to access them. Treatment households had a slightly higher (7.5 percent) 'very easy' access to input markets, however, they had the least proportion of households that had 'easy access' to output markets. Similar trends were observed when the access to input and output markets were disaggregated by gender, age, household size and location, with similar levels of difficulty or ease of access to markets across these factors.

Table 113: Ease of accessing input markets

N6: How do you rate your access to Input markets (to buy farm inputs)- INPUT MARKETS															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Very easy	5.7	7.5	4.3	5.4	6.1	5.5	5	8.2	4.9	5.8	5.4	6.9	5.8	5.4	6
Easy	23.6	27.4	19.6	24	22.2	24.3	23.8	21.8	24.4	22.5	24.9	24.8	23.2	23.7	24.2
Difficult	48.5	47	49.1	49.4	48.8	48.4	50.2	48.7	47.4	48.3	49.3	46.6	48.9	54.2	38.8
Very difficult	22.2	18	27	21.2	23	21.8	21	21.2	23.4	23.4	20.4	21.8	22.1	16.8	31
		Chi2=59.03 P-value=.000*			Chi2= 3 P-value=0.396		Chi2=19.92 P-value=.003*			Chi2=7.79 P-value=0.254			Chi2=79.78 P-value=.000*		

Table 114: Distance to the nearest input market

N7: How far is the nearest input market in km							
		Household type			Province		
Response	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South
Less than a km	4.4	4.1	3.8	5.3	5.6	2.3	5.3
1km to 5km	15.3	14.3	17	14.6	15.9	9.5	23.4
5.1km to 10km	12	12.8	11	12.3	12.2	12.2	11.3
10.1k to 20km	15.1	16.1	12.8	16.5	15.1	19.2	8.6
		Chi2=59.03 P-value=.000*			Chi2=79.78 P-value=.000*		

Table 115: Ease of accessing output markets

N6: How do you rate your access to Input markets (to buy farm inputs)- OUPUT MARKETS															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Very easy	6.7	5.8	6.3	7.8	7.7	6.1	6.5	7.5	6.3	6.7	6.4	7.2	6	8.9	4.3
Easy	23.5	26.9	19.1	24.6	22	24.3	24.3	21.3	24.1	23.3	24.2	21.8	26.7	19.2	24
Difficult	43	44.5	42.1	42.6	44.3	42.4	43.3	44.5	42.2	42.2	44.1	43.8	43.3	49.1	32.8
Very difficult	26.8	22.8	32.4	25	26	27.3	25.9	26.7	27.5	27.8	25.3	27.3	24	22.8	38.8
		Chi2=59.03 P-value=.000*			Chi2= 3 P-value=0.396		Chi2=19.92 P-value=.003*			Chi2=7.79 P-value=0.254			Chi2=79.78 P-value=.000*		

Table 116: Distance to the nearest output market

N9: How far is the nearest OUTPUT market in km							
		Household type			Province		
Response	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South
Less than a km	9.2	9.6	7.6	10.3	9.9	9.8	6.6
1km to 5km	18.1	16.9	19.7	17.5	17.6	14.4	24.8
5.1km to 10km	12	12.3	11.6	12.1	13.4	10.4	11.6
10.1k to 20km	14.3	15	12.1	15.8	14.8	16.1	10.3
		Chi2=20.95 P-value=.007*			Chi2=66.85 P-value=.000*		

The majority (53.2 percent) of input markets were over 20 kilometres away from households, 15.1 percent and 12.0 percent of households being 10.1 to 20 kilometres and 5.1 to 10kilometres away from input markets respectively, this statistic being consistently similar across household type, age, gender, location, and household size. Similarly, the majority (46.5 percent) of output markets were over 20kms away from households, 14.3 percent and 12.0 percent of households being 10.1 to 20 kilometres and 5.1 to 10 kilometres away from output markets respectively, this statistic being consistently similar across household type, age, gender, location, and household size.

7.5.8.2. Barriers to input market access

Price (too expensive – 36 percent) and transport (30 percent) are ranked highest as barriers to market access. Transport is ranked as the highest factor by Treatment households, while Pure Control rank price (too expensive) as the highest barrier factor to input market access. These two factors (transport and price) are ranked highest and equally so across household gender, age and household size. Distance to markets is ranked moderately across household types, gender and location. Transport is ranked highest by much more households in Matabeleland South (45.9 percent) compared to Masvingo (26.7 percent) and Manicaland (24.9 percent), while price (too expensive) is ranked highest by households in Manicaland (44.4 percent0 compared to Masvingo (37.8 percent) and Matabeleland South (16.6 percent).

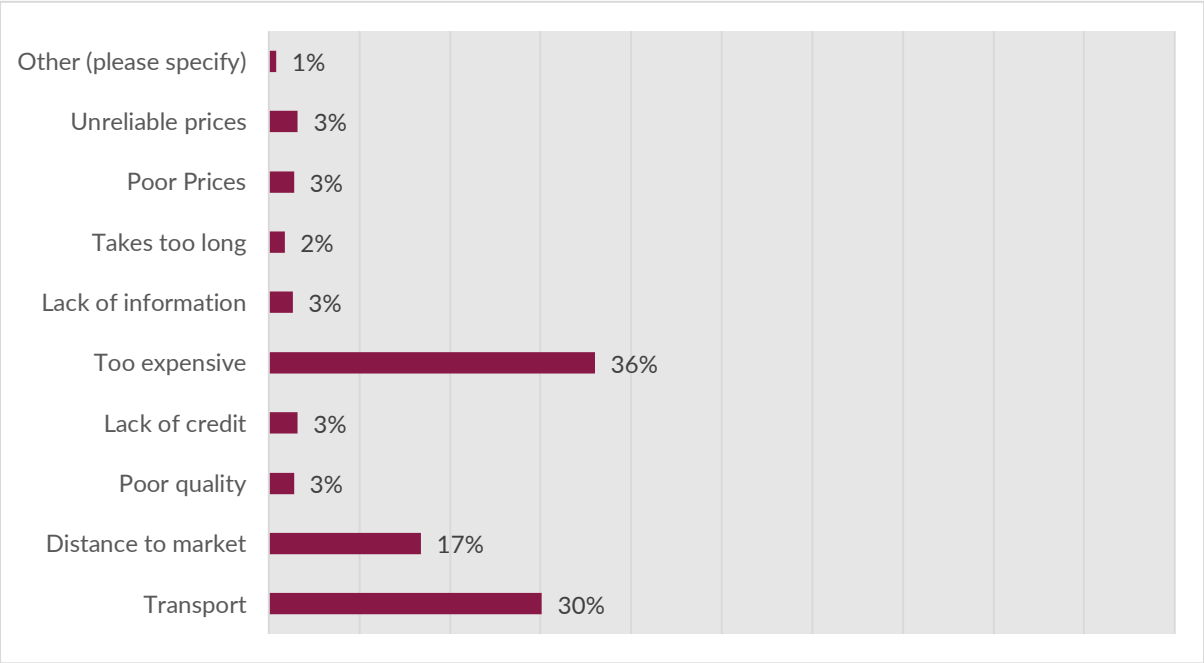


Figure 25: Barriers to input market access

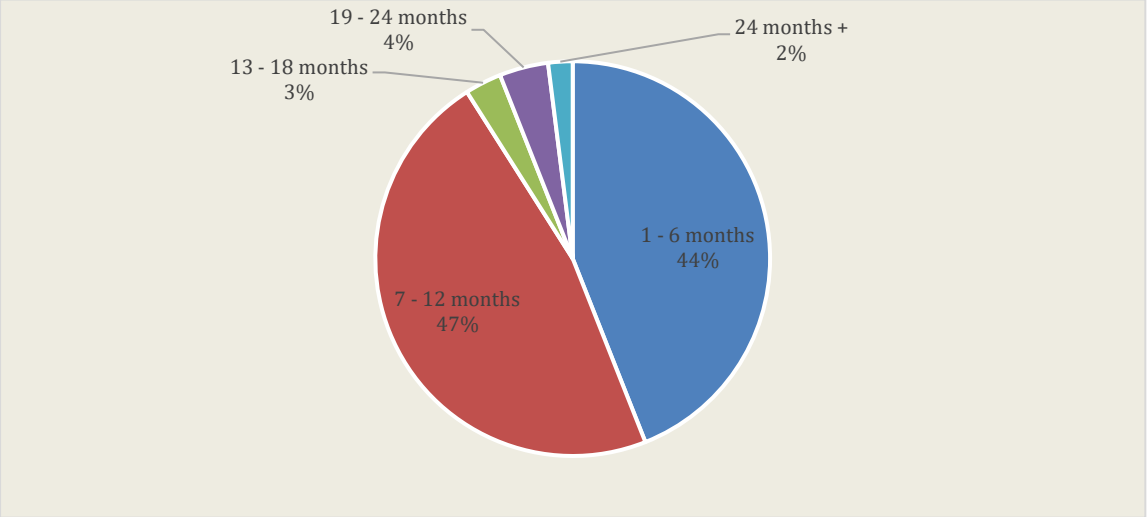
7.5.8.3. Barriers to output market access

Similar factors (prices, and transport) are dominant barriers to produce market access, although at a lower scale compared to input market access barriers. Here, too expensive is less of a price factor (10.2 percent) across household types compared to the combined effect of poor and unreliable process (26.4 percent). However, distance to markets (21 percent) is slightly more pronounced as a barrier to produce markets (21 percent) compared to input markets (17 percent). These trends are consistent across gender, household size and age of respondents. Transport is ranked highest by much more households in Matabeleland South (31.0 percent) compared to Masvingo (28.5 percent) and Manicaland (24.0 percent), while a combination of poor price and unreliable prices rank higher in households in Manicaland (30.2 percent).

7.5.8.4. Length of contract

The baseline found that most of the surveyed households had contracts running for between 7 and 12 months (47 percent) and 1 to 6 months (44 percent), most of which were associated with seasonal crops. About 3 percent and 4 percent of respondents reported having contracts between 13 to 18 months, and 19 to 24 months. A minority 2 percent of all respondents with contracts had agreements going for beyond 24 (Figure 26).

Figure 26: Duration of contract



7.5.9. Awareness and Use of post-harvest processing, handling, storage and marketing practices for value addition

7.5.9.1. Awareness of processing, storage, handling and marketing practices

This baseline survey assessed the level of respondent awareness of the different postharvest storage, handling and processing activities across the project areas. Most respondents were aware of storage in bag with chemical (70 percent) and drying, packing and storage (70 percent). Respondents were also well aware of agrodealers/contractors or input schemes (62 percent) and a further 57 percent had an improved granary. Very few farmers reported awareness of marketing produce through commodity associations, producer groups, etc (26 percent) and even fewer respondents reported being aware of temperature ad humidity control (10 percent). About 54 percent of respondents were aware of food processing including for peanut butter, oils, jams and honey. With regards to access to information for decision making, at baseline 40 percent of sampled households had access to market information on prices, demand and product quality.

Table 117: Respondent awareness of postharvest processing, handling, storage and marketing practices

Postharvest handling, storage and processing practices	Yes		N
Improved granary at household	57%	2379	4181
Store in bag with artificial chemicals at the household	70%	2944	4181
Community Granaries	27%	1124	4181
Temperature and humidity control (hermetic bag, air-tight box, metal silos	19%	797	4181
Improved quality control technologies (sorting, grading)	45%	1895	4181
Drying, packaging, storage	70%	2946	4181
Food processing (peanut butter, oils, amarula jam, honey)	54%	2256	4181
Branding and labelling (e.g. of honey, peanut butter)	30%	1274	4181
Agriculture inputs through agro-dealers and/or agriculture cooperatives, contract farming, government input schemes, loans	62%	2596	4181
Receiving market information on prices, demand or product quality requirements through collection centres, traders, Pvt sector, extension officers, E platforms or other market actors	40%	1667	4181
Use of formal organised marketing systems for crops and/ vegetables /fruits etc.	27%	1145	4181
Marketing produce through commodity associations/producer groups/ cooperatives/ farmer organization	26%	1088	4181

7.5.9.2. Awareness of processing, handling, storage and marketing practices by household type

Across all household types the Treatment households fared much better in terms of awareness of the various postharvest storage, processsing and handling practices. For example, 62 percent of treatment hosueholds had improved granaries relative to 57 percent and 52 percent for the pure control and control households. Treatment households were also more likely to dry, pack and store (76 percent) compared to their counterparts (Pure control 66 percent; control 69 percent). Figures across all household types were lower for practices such as using formal organised market systems; marketing through commodity associations or group marketing approaches, as well as awareness and use of market information on prices and commodity prices and quality.

Table 118: Awareness of postharvest processing, handling and storage and marketing practices by household type

	Treatment N=1352	Pure Control N=1443	Control N=1386
Improved granary at household	62	57	52
Store in bag with artificial chemicals at the household	75	69	67
Community Granaries	31	26	24
Temperature and humidity control (hermetic bag, air-tight box, metal silos	21	20	16
Improved quality control technologies (sorting, grading)	54	39	43
Drying, packaging, storage	76	66	69
Food processing (peanut butter, oils, amarula jam, honey)	60	49	53
Branding and labelling (e.g., of honey, peanut butter)	35	28	28
Agriculture inputs through agro-dealers and/or agriculture cooperatives, contract farming, government input schemes, loans	66	65	54
Receiving market information on prices, demand or product quality requirements through collection centres, traders, Pvt sector, extension officers, E platforms or other market actors	49	37	34
Use of formal organised marketing systems for crops and/ vegetables /fruits etc.	35	24	23
Marketing produce through commodity associations/producer groups/ cooperatives/ farmer organization	34	22	22

7.5.9.3. Awareness of processing, handling, storage and marketing practices by location

Overall households in Masvingo had the highest level of awareness of the various postharvest practies, followed by Manicaland and then Mat South trailing. As shown in the Table, 81 percent of households in Masvingo were aware of use of drying, packaging and storage as opposed to 65 percent apiece for the other two provinces. Farmers in Mat South were the least likely to get market information, and the least organised for group marketing relative to those in the other two provinces. About a fifth of respondents in Mat South were aware of marketing produce through groups or associations as compared to 32 percent in Masvingo and 24 percent in Manicaland. At 35 percent, half as many respondents in Mat South as they were in Masvingo (68 percent) were aware of food processing practices. There were no significant differences in awareness of practices on the basis of respodent's age or gender.

Table 119: Awareness of postharvest processing, handling and storage and marketing practices by location

Are you aware of any of the following storage and handling practices?	Manicaland % N=1352	Masvingo % N=1463	Mat South % N=920
Improved granary at household	50	68	53
Store in bag with artificial chemicals at the household	67	76	69
Community Granaries	29	28	22
Temperature and humidity control (hermetic bag, air-tight box, metal silos	10	25	29
Improved quality control technologies (sorting, grading)	42	56	35
Drying, packaging, storage	65	81	65
Food processing (peanut butter, oils, amarula jam, honey)	52	68	35
Branding and labelling (e.g., of honey, peanut butter)	29	41	17
Agriculture inputs through agro-dealers and/or agriculture cooperatives, contract farming, government input schemes, loans	63	67	52
Receiving market information on prices, demand or product quality requirements through collection centres, traders, Pvt sector, extension officers, E platforms or other market actors	42	43	30
Use of formal organised marketing systems for crops and/ vegetables /fruits etc.	26	34	19
Marketing produce through commodity associations/producer groups/ cooperatives/ farmer organization	24	32	20

7.5.9.4. Use of processing, handling, storage and marketing practices by location

Across the majority of practices assessed by the baseline, the proportion of household using the practices was much lower than that of respondents that were aware of that particular parctice. This is consistent with findings from the qualitative interviews which showed that there were challenges in putting knowledge or awareness into practice, including training, access to services, and resourcing. About 62 percent of treatment households were aware of the improved granary yet 27 percent were presently using this method. Also, while treatment households dominated in terms of awaress of various practices, pure control households were generally more likely to use these methods than the former.

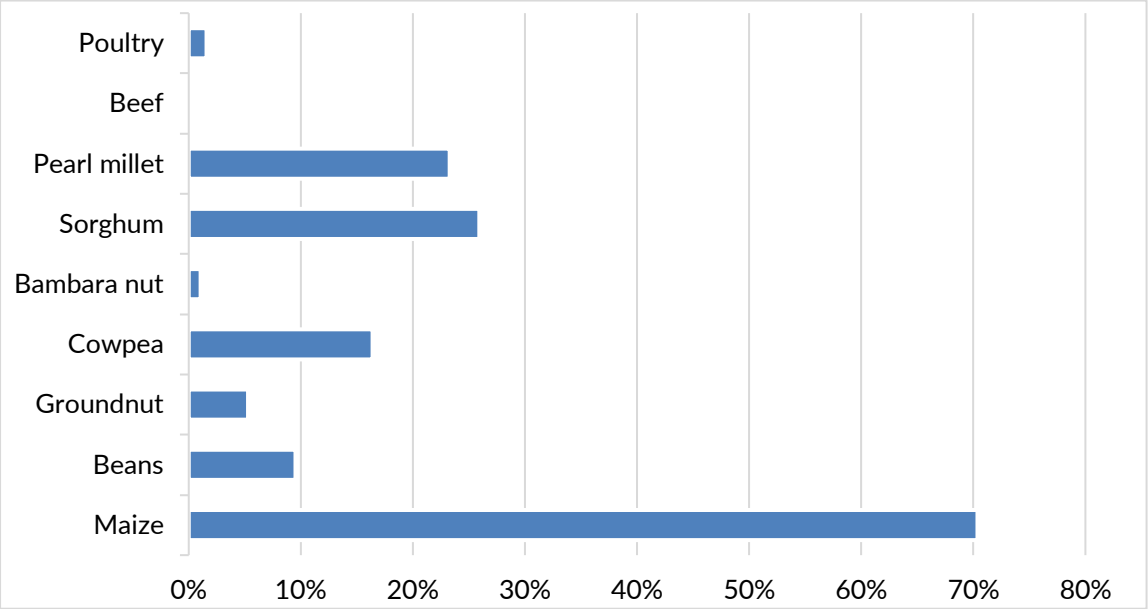
Treatment households were more likely to receive market information (59 percent) compared to pure control (49 percent) and control (47 percent) households. Treatment household were also more likely to access inputs through agrodealers or input schemes, be engaged in group marketing and use formal marketing systems, compared to the other two groups. Branding and labelling were used by 9 percent across all household types, showing caapcity gaps particularly in terms of value addition. Pure control group also had the least proportion of respondents that were using group marketing or using the improved granary.

Table 120: Use of postharvest processing, handling and storage and marketing practices by household type

Are you presently using any of the following storage and handling practices?	Treatment		Pure Control		Control	
	%	N	%	N	%	N
Improved granary at household	27	836	18	819	22	724
Store in bag with artificial chemicals at the household	80	1013	76	998	79	933
Community Granaries	12	420	20	378	15	326
Temperature and humidity control (hermetic bag, air-tight box, metal silos	42	288	43	284	40	225
Improved quality control technologies (sorting, grading)	59	725	51	569	57	601
Drying, packaging, storage	77	1028	81	956	79	962
Food processing (peanut butter, oils, amarula jam, honey)	40	817	30	705	41	734
Branding and labelling (e.g., of honey, peanut butter)	9	477	9	409	6	388
Agriculture inputs through agro-dealers and/or agriculture cooperatives, contract farming, government input schemes, loans	79	897	73	945	65	754
Receiving market information on prices, demand or product quality requirements through collection centres, traders, Pvt sector, extension officers, E platforms or other market actors	59	664	49	529	47	474
Use of formal organised marketing systems for crops and/ vegetables /fruits etc.	26	476	20	345	18	324
Marketing produce through commodity associations/producer groups/ cooperatives/ farmer organization	29	454	14	323	20	311

Branding and labelling were consistently the practice that households were least aware of or applied across household types, gender and location. Post-harvest and handling technologies were likely to be applied in Maize (44 percent), groundnut (24 percent) and sorghum (12 percent) compared to other crops. Pure Control households were more likely (54.3 percent) to apply post-harvest and handling technologies on maize, groundnuts, cattle, goats and chickens than other households, while female respondents were likely to apply these technologies compared to male respondents. The probability of applying these technologies was similar across location, household size and age groups. However, larger households (>8 members) were more likely to apply handling and value addition technologies to large livestock (cattle and goats) than smaller households which were more likely to apply these technologies to chickens i.e., 60.2 percent for chickens for 1-5 household members compared to 42.4 percent for >8 household members. The Table below shows commodities for which value addition activities were being used.

Figure 27: Commodities for which processing, and value addition are practiced



7.5.9.5. Value addition in livestock

Among 1145 respondents who added value to livestock, value addition was mostly done for chickens (55 percent); goats (42 percent) and cattle (41 percent). There were very minimal value addition activities done, with a lot of gaps for potential improvement. For example, cow and goat skins were not linked to the leather value chain, and the state of livestock skin did not reflect any incentives for farmers to manage their livestock better.

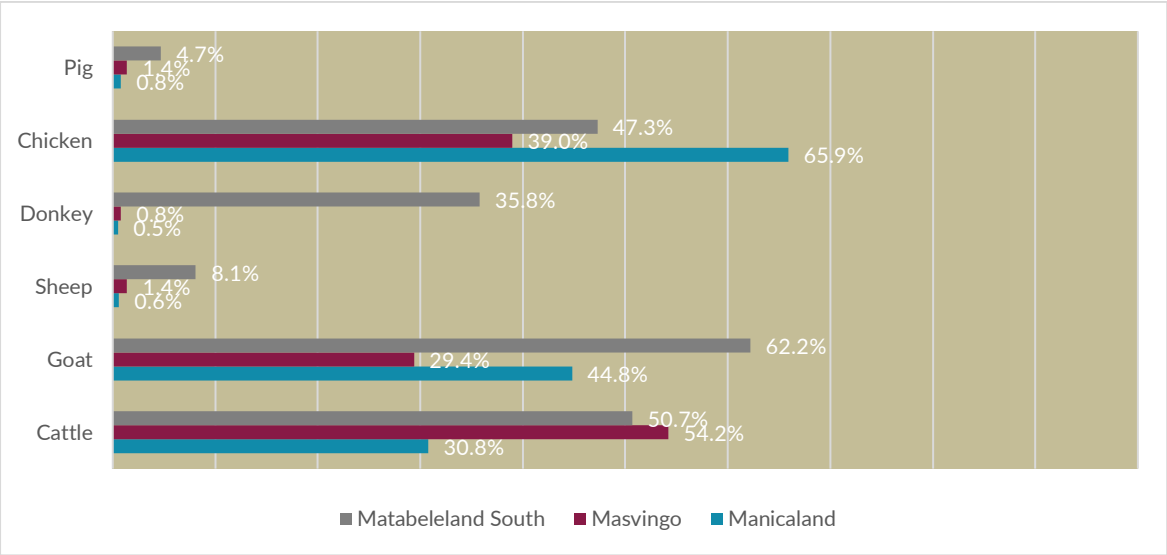
Table 121: Type of livestock for which value addition was done

N24: For which livestock do you use each of the value addition approaches mentioned? N=1145																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Cattle	40.6	43.5	40	38.3	30.8	54.2	50.7	28.2	28.3	36	30	60.6	50	43.3	50.9	50
Goat	42.3	49.7	32.9	45.1	44.8	29.4	62.2	45.3	43.2	46.9	15	18.7	56	20	69.3	38.2
Sheep	1.8	2.9	0.7	2	0.6	1.4	8.1	1.7	0.3	0.5	0	1	2	3.3	9.6	2.9
Donkey	5.2	7.3	2.9	5.4	0.5	0.8	35.8	0.9	0.6	0	0	1.5	0	0	45.6	2.9
Chicken	55.2	54.7	56.9	53.7	65.9	39	47.3	71.8	63.5	66.4	60	32	44	56.7	57.9	11.8
Pig	1.5	1.8	0.7	2	0.8	1.4	4.7	0	0.3	1.9	0	0.5	4	0	6.1	0

Masvingo (54.2 percent) and Mat South (50.7 percent) had slightly more value addition work for cattle than Manicaland (30.8 percent). In goat farming however, Mat South fared the best at 62.2 percent and ahead of Manicaland (44.8 percent) and Masvingo (29.4 percent). Donkeys were more prominent in Mat South, as were pigs although these value chains were poorly developed with limited product value addition work happening. Manicaland scored

highest for poultry value addition (65.9 percent) way ahead of Mat South (47.3 percent) and Masvingo (39 percent).

Figure 28: Proportion of respondents using value addition practices by location

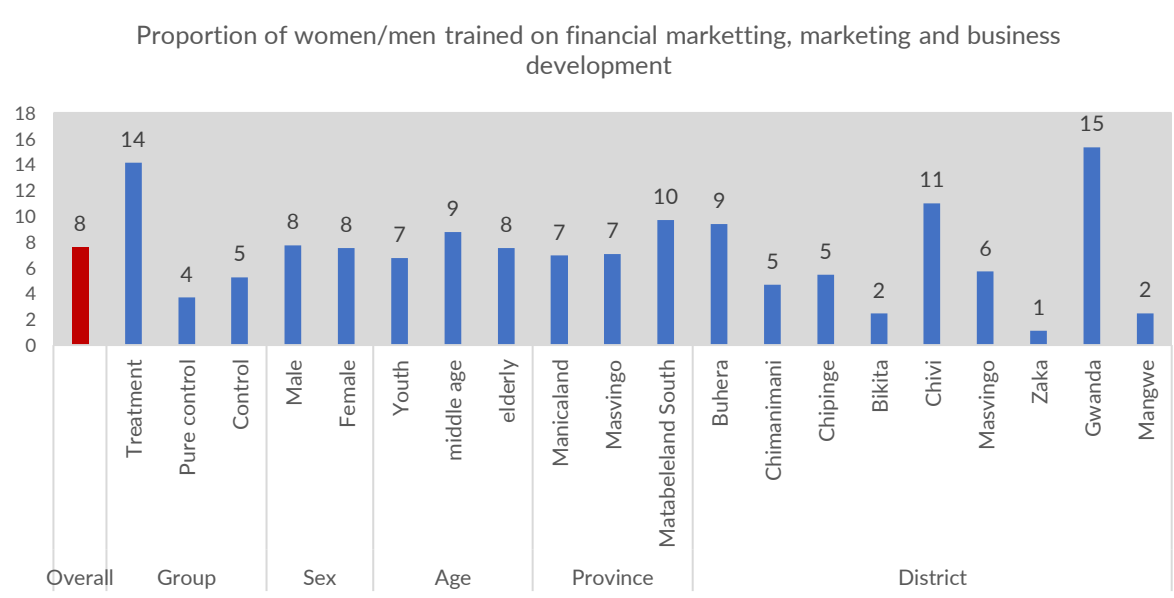


7.6. FARMER CAPACITY BUILDING

At baseline, the proportion of farmers training in different skills was examined to help gauge farmer knowledge on the topics of interest. Having knowledge in the topics like financial management, marketing and business development ensures the farm runs on a going concern principle hence enabling smooth operations of farming activities over time. An indicator was calculated by giving a score of 1 if the farmer responded "yes" to the following 3 questions; (i) In the last three years, did you or any member of your household receive any training in Financial management? (ii) In the last three years, did you or any member of your household receive any training in Marketing ? (iii) In the last three years, did you or any member of your household receive any training in Business development? The maximum possible score was 3 and the minimum 1. To get result of the indicator, the number of households with a score of 3 were expressed as a proportion of the whole sample and multiplied by 100 to convert to a percentage.

Indicator 16**- proportion of women and men trained in financial management, and marketing and business development, with a specific focus on women targeting existing women producers' groups and savings and loans groups.* ***Baseline value =8% of farmer households were traine on all of the three topics.

Table 122: proportion of women/men trained on specific topics of interest.



There was no difference in the proportion of male and female farmers trained on all of the three topics of interest to the GCF program. Households in the treatment areas were close to three times likely to have been trained on the three topics as compared to their counterparts. Gwanda district farmer household led on the proportion of the farmers trained on all of the three topics at 15 percent while in Zaka only 1 percent had been trained all of the three courses.

7.6.1. Training received by farmers

7.6.1.1. Proportion of households trained by household type

The baseline assessed the capacity of communities to undertake a range of entrepreneurial activities. Areas of competence assessed were financial management, marketing, business development and value chain development. Of the three household types, the treatment group had the largest proportion of households trained across these four competence areas. In fact, there were nearly three times as many trained households in the treatment group as they were in the pure control and almost twice as many trained households in the treatment group as there were in the control group. Of the four competence areas, most respondents were trained in financial management (15.5 percent), with business development having the least. The pure control group had the least proportion of households trained in business development.

Table 123: Proportion of households trained

P1 In the last three years, did you or any member of your household receive any training in the following areas?												
		Household type			Gender		Age			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	ManicaLand	Masvingo	Mat. South
Financial Management	15.5	27.3	8.4	11.3	15.6	15.4	14.2	16.9	15.5	14.2	14.9	18.7
Marketing	13	22.8	6.5	10.2	13.3	12.8	11.5	14.3	13.2	12.9	12.6	13.7
Business development	11.8	20.6	6.3	8.9	11.3	12	11.5	12.9	11.3	10.5	12	13.9
Value chain development	12.2	20.5	7.6	8.8	12	12.3	11	13.6	12.1	14	9.4	13

The baseline did not find any evidence of a difference in access to training based on one's gender. Male and female respondents had an equal chance of participation in training activities (Table 123).

While there were generally very small differences in proportion of households trained across age groups, the middle-aged respondents had a slightly higher probability of having previously received some training in the assessed competence areas. This could be explained on the grounds that this was the group most likely to be the household heads, of which most interventions tended to focus. Youth were the least trained of all age groups, with value chain development being the weakest point.

Across all four competence areas, Mat South had the highest proportion of households trained across all competence areas. For example, the province had 18.7 percent of its households trained in financial management with other provinces having less than15 percent. Masvingo had the least proportion of households trained in value chain development (9.4 percent) in comparison with Manicaland (14 percent) and Mat South (9.4 percent).

7.6.2. Source of training

Table 124: Sources of training overall

N	Financial Management (%) 634	Marketing (%) 540	Business development (%) 488	Value chain development (%) 506	Mean (%)
Extension officer	39	47	38	52	44
Other government department	13	12	13	11	12
NGO/CBO	39	32	39	28	35
Private sector company	5	6	7	5	6
Vocational/TVET institution	4	3	4	4	4
Total	100%	100%	100%	100%	100%

Training across competence areas was provided by several institutions. Extension officers were responsible for 44% of all training provided to households, while NGOs and CBOs trained a further 35 percent. Vocational institutions trained the least proportion of households (4 percent), with private sector companies, mostly through contract farming, training slightly more (6 percent).

For financial management, most of the training was provided by NGOs and extension officers (39 percent apiece). In marketing, the extension officer was once again the main trainer, as was the case with value chain development (52 percent). Private companies were present across all competence areas, reaching about 5 percent mean proportion of trained households.

Table 125: Sources of training across provinces

P7: From whom was this training received on Value chain development?																
	Financial Management (N=634)				Marketing (540)				Business Development (N=488)				Value Chain development (n=506)			
	Total	ManicaLand (254)	Masvingo (209)	Mat. South (634)	Total	ManicaLand (231)	Masvingo (183)	Mat. South (126)	Total	Manicaland (188)	Masvingo (172)	Mat. South (128)	Total	ManicaLand (250)	Masvingo (138)	Mat. South (118)
Extension officer (%)	54.4	57.5	51.7	53.2	65.2	78.4	56.8	53.2	53.5	62.8	48.3	46.9	75.5	87.2	58.7	70.3
Other government department (%)	18.9	18.5	23.0	14.6	17.2	13.9	24.0	13.5	17.6	11.7	26.7	14.1	15.4	9.6	28.3	12.7
NGO/CBO (%)	54.4	54.7	54.5	53.8	44.6	36.8	42.6	61.9	54.3	51.6	50.6	63.3	40.9	36.0	58.0	31.4
Private sector company (%)	7.3	2.0	13.9	7.0	7.8	3.0	14.2	7.1	9.4	3.2	16.9	8.6	7.9	2.4	17.4	8.5
Vocational / TVET institution (%)	5.2	2.0	12.9	0.6	4.3	0.9	10.9	0.8	5.7	3.2	11.6	1.6	6.3	3.2	16.7	0.8

Extension officers provided major support in training skills in Manicaland as opposed to other sources especially in value chain and marketing skills. NGO/CBO trained more of Masvingo farmer households on value chains as opposed to other provinces.

7.7. GROUP MEMBERSHIP

Social capital based on membership and participation in various social networks or groups is a strong predictor of a household's resilience. Respondents reported that through the various groups in their communities they were able to mobilise resources to help them cope with shocks and stresses, including those related to climate change. The baseline asked whether the respondents were aware of the various groups, and whether anyone in their households was a member of these. In relation to the GCF project target of leaning towards women strategic leadership, the baseline identified women leadership as a key indicator which could be measured by calculating the proportion of women participating in different groups related

Indicator 14 *- Increased % of women's membership in irrigation management committees*
Baseline value =26% *of members in irrigation management committees were women.*

to climate resilience.

Table 124 shows the baseline value of women membership in irrigation committees across different areas of interest.

Table 126: Proportion of women members in irrigation management committees

Indicator 14 - Increased % of women's membership in irrigation management committees																				
Baseline Value	Household type			Gender		Age			Province			District								
												Manicaland			Masvingo				Mat. south	
	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
26	31	21	25			28	27	24	19	38	38	13	30	18	40	48	30	9	30	16

A quarter of the women were members of an irrigation management committees, whereby the beneficiaries were more likely (31 percent) to exist in an irrigation committee as compared to the pure control (21 percent) and control (25 percent). More women in Bikita (40 percent) and Chivi (48 percent) were members of irrigation management committees as compared to other districts.

7.7.1. Awareness of social groups

Table 127: Percentage pf awareness of social group

Are you or anyone in this household a member of this group. These can be either formal or informal and customary groups N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total (n=4180)	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Agricultural / livestock/ fisheries	43.4	49	43	38.1	42.5	47	40	36.7	34	54.7	48.1	48.5	47.4	26.1	51.8	24.9
Water users	34.8	39.7	32	33.3	30.1	29	53.9	25.9	32.7	33.5	27.2	28.1	32.7	16.3	55.7	51.6
Forest users'/ Environmental management group	40.9	45.3	41	36.2	33.7	47	44.9	35	38.7	29.2	51.6	50.7	45.6	19.6	54.6	32.6
Credit or microfinance group	62.9	67.5	62	60	70.4	51	67.7	79.8	64.2	62.7	40.4	55.2	55.9	28.3	58.1	80
Mutual help or insurance group	56.2	60.7	54.3	54.0	54.3	50.5	69.1	68.9	53.2	37.6	44.9	61.7	45.0	18.5	61.0	79.5
Trade and business association group	8.1	10.3	5.5	8.6	6.1	9.2	10.0	3.1	9.1	7.9	11.1	11.2	6.8	2.2	12.4	6.9
Civic groups	13.6	15.3	11.5	14.0	7.2	18.1	18.8	6.4	4.2	9.9	9.8	34.6	4.2	1.1	14.8	24.0
Religious group	59.3	59.8	59.9	58.0	67.0	51.2	57.1	63.1	82.3	62.4	24.7	63.5	48.5	63.0	45.4	71.9
Other [women's/men's] group	16.3	18.9	14.0	16.3	16.6	12.9	21.4	14.4	7.3	24.7	2.1	23.0	5.5	14.1	26.0	15.6
Other	1.4	1.8	1.3	1.1	0.6	2.7	0.8	0.5	0.0	1.1	0.7	4.1	2.4	1.1	0.8	0.7

The baseline found that across the project areas there were several community-based groups, including those providing social protection in the face of shocks. Across all sampled locations, respondents were most aware of credit and microfinance groups (62.9 percent) which included village savings and loans groups (VSLs), as well as internal savings and loans groups (ISALs), and rotational savings clubs (ROSCAs) among others. Second place were religious groups (59.2 percent) followed closely by mutual help and insurance groups, such as burial societies, which often helped members to deal with illness and death as shocks, and provided coping resources, both physically and emotionally. Other known groups included agricultural and livestock groups, including farmer field schools (43.4 percent) and forest users and environmental management groups (40.9%). Water user groups were also found and known (34.8%) and managed irrigation water as well as local water points, including boreholes. The least prominent groups were the trade and business groups (8.1%) and civic groups (13.6%).

7.7.2. Awareness of social groups by household type

Across the three household types, treatment households were the most aware of community social groups relative to the other household types. For example, 67.5 percent of treatment households were aware of credit or microfinance groups, compared to 61.5 percent for the pure control and 60 percent for the control groups. 60.7 percent of treatment households were aware of mutual help groups compared to 54 percent in the control and pure control groups. The difference between control and pure control groups was in most cases very minimal and insignificant across the two household types.

7.7.3. Awareness of social groups by location

Households surveyed in Manicaland were the most aware of credit and microfinance institutions (70.4 percent) compared to the other provinces, with Masvingo at 50.8 percent and Mat South at 67.7 percent. Manicaland also dominated on respondent awareness of religious groups, while respondents in Masvingo were ahead forest user/ environmental management groups and agricultural and livestock associations, at 47.3 percent and 46.6 percent, respectively. The province had the lowest figures for awareness of water user groups, religious groups and water user association. Mat South was strongest around water user groups (53.9 percent), and mutual health or insurance groups (69.1 percent). There were no differences in awareness of social groups based on age of respondent. Within the districts, awareness of groups in Zaka is wanting which can form basis strengthening existing groups or initiate project groups. More than half of the farmers in Mat. south districts are aware of existing water groups hence leveraging on existing water groups in Mat. south would increase climate resilient irrigation measures.

7.7.4. Awareness of social group by gender of respondent

There is no statistically significant difference in proportion of households aware of social groups based on gender of the respondent. As shown in Table 128, there were some differences in proportions between men and women respondents, for example, with respect to credit or microfinance institutions, where women were slightly more aware (64.5 percent) than men (60.5 percent), as well as religious groups, where women comprised 61.4 percent ahead of men at 55.1 percent of respondents aware of such social groups.

Table 128: Proportion of respondents by gender aware of social groups

N=4180	Gender of farmer	
	Male	Female
Agricultural / livestock/ fisheries	43.3	43.5
Water users	32.6	36.0
Forest users'/ Environmental management group	41.6	40.6
Credit or microfinance group	60.5	64.2
Mutual help or insurance group	54.7	57.1
Trade and business association group	7.9	8.2
Civic groups	13.6	13.5
Religious group	55.1	61.4
Other [women's/men's] group	15.6	16.7
Other	1.9	1.1

7.8. Participation in social groups

Awareness of the existence of social groups is insufficient in as far as determining a household's resilience to climate change and other shocks is concerned. The baseline then asked respondents if they were members of the various social groups, to ascertain the proportion that could potentially benefit from the social capital generated through these informal and formal institutions.

Table 129: Proportion of households participating in community social group

Are you or anyone in this household a member of this group. These can be either formal or informal and customary groups N=4180																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total (n=4180)	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Agricultural / livestock/ fisheries	49.6	66.8	44	35	44.3	53	53.8	56.7	46.6	33.5	51.4	59.2	45.8	54.2	59.2	39.6
Water users	29.1	34.3	25	27.5	22	40	27.4	17.1	34.9	19	43.6	50.6	28.2	26.7	32.1	21.1
Forest users'/ Environmental management group	16.8	19.6	16	14.1	14.2	18	17.9	16.4	8.7	15.4	11.5	17.9	22.6	33.3	23.5	6.1
Credit or microfinance group	45.2	59.3	36	39.1	44.9	39	53.3	47.9	40.5	43.1	38.8	44.8	28.6	61.5	56.5	50.3
Mutual help or insurance group	59.3	67.9	52.8	56.5	54.2	56.4	70.3	63.2	47.8	40.1	50.4	66.4	40.5	64.7	72.9	67.7
Trade and business association group	28.8	33.8	20.3	28.6	29.1	25.2	33.7	45.8	40.0	13.7	15.6	27.1	29.0	50.0	37.5	25.0
Civic groups	39.5	38.6	34.9	44.3	44.2	51.7	17.3	59.2	43.8	32.8	46.4	54.4	31.6	0.0	27.6	9.3
Religious group	86.2	86.4	89.5	82.5	86.8	91.6	77.1	83.5	91.5	87.1	94.4	93.0	88.2	91.4	77.8	76.6
Other [women's/men's] group	56.5	59.6	57.9	51.8	52.3	54.8	64.5	56.8	67.9	46.5	33.3	59.0	28.0	69.2	68.7	55.6
Other	79.3	83.3	73.7	80.0	81.8	82.5	57.1	50.0	0.0	100.0	50.0	96.2	54.5	100.0	50.0	66.7

7.8.1. Participation in social group by household type

Treatment households were generally more likely to belong to the various social groups compared to households in the pure and in the control groups. Treatment households were more likely to belong to trade and business associations (33.8 percent) than the pure (20.3 percent) and control groups (28.6 percent). Also, a higher proportion of treatment households were in credit and microfinance groups (59.3 percent) compared to pure control (36.4 percent) and control (39.1 percent). Almost a fifth of treatment households belonged to a forest users or environmental management committee or group in their local areas, relative to 16 percent and 14 percent for pure control and control groups, respectively. The pure control

dominated in terms of participation in religious activities, while the control group had higher proportion of respondents belong to civic groups.

7.8.2. Participation in social group by location

The baseline found significant differences in participation in social groups across locations. As shown in Table 129 Mat South had the highest proportion of households belonging to mutual help or insurance groups (70.3 percent) compared to the other provinces, as well as the highest proportion of households belonging to credit or microfinance groups (53.3 percent). Relative to the other provinces, Masvingo had the highest proportion of respondents belonging to water user groups (40.4 percent); civic groups (51.7 percent) and religious groups (91.6 percent). Manicaland had the lowest proportion of households in forest user groups, trade and business associations, water user and agricultural associations and groups (Table 129). The age of respondents was not associated with their membership to social groups.

7.8.3. Participation in social group by gender

The baseline found gender differences in participation in social groups. Males (51.2 percent) were more likely to belong to agricultural clubs than females (48.7 percent), while females were more likely to dominate credit or microfinance groups (47.8 percent) than males (40 percent). Males also dominated water user groups, often associated with water point maintenance, as well as forest user and environmental management groups. Trade and business associations had slightly more males than females, with dynamics around control over household income being a determinant factor.

Table 130: Proportion of households participating in community social group by gender

Proportion of farmers participating in community social groups by gender (N=4180)			
	Male (%)	Female (%)	N
Agricultural / livestock/ fisheries	51.2	48.7	1188
Water users	36.4	25.6	983
Forest users'/ Environmental management group	23.8	13.0	1109
Credit or microfinance group	40.0	47.8	1756
Mutual help or insurance group	58.5	59.6	1561
Trade and business association group	34.2	26.0	223
Civic groups	47.7	35.1	370
Religious group	84.8	86.8	1680
Other [women's/men's] group	51.8	58.9	457
Other	78.6	80.0	30

Conclusion

At baseline, the survey found that yields of the main crops grown were low and had in fact declined over the last year. A majority of farmers still plant maize ahead of small grains, and this behaiour by farmers is partly driven by lack of strong offtake capacity for the crops that are most suited for the climatic areas. Climate-smart practices are being used by a significant proportion of farmers, but the yields attained suggest that the intensity of use may be low and the GCF project can scale up on some of these, both under irrigation and in rain-fed farming systems. In irrigation, there is evidence of inefficient water use and lacking operations and management capacity, with women taking a smaller share of all leadership. Skills in business, such as business development, financial management and lacking are generally lacking, and with poor participation in value chain, opportunities for building resilience are constrained unless these hurdles are addressed. Strategies would have to include increasing access to finance, helping link farmers to viable value chains, and transfer skills and experience.

8. OUTPUT 3: IMPROVED ACCESS TO WEATHER, CLIMATE, AND HYDROLOGICAL INFORMATION FOR CLIMATE-RESILIENT AGRICULTURE

Farmer access to agricultural information is sharing knowledge relevant to enhancing knowledge for sustainable and resilient agriculture. The baseline examined whether farmers had received information generated by agricultural stakeholders and established key indicator aimed at understanding proportion of farmers receiving the agricultural information and highlighted the channels used for the communication.

> ***Indicator 13*** *- Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio.*

8.1. CLIMATE INFORMATION AND ADVISORY SERVICES

8.1.1. Use of climate information, product, and services

The number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio: This indicator counts the number of smallholder farmers receiving new advisories and warnings through various media developed for both agriculture and water management. The numerator is the sum of all individuals receiving warnings and denominator is the total number of households surveyed. This proportion was multiplied by 543,620 population of farmers GCF is targeting obtained from project documents.

At baseline **66 percent** of all households were receiving seasonal climate information and using it for farm decision making in the last 12 months received information on how to adapt their farming to climate change. Of these, **82 percent** used the seasonal forecast received to make some decision regarding their farming.

> ***Indicator 13*** *- **66 %** of the farmers received new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio*

Further, most of these households (86 percent) were dependent on their agricultural extension officer for climate information, products and services. This sub-section provides data from the field study regarding the extent of use of climate information, products and services as a basis for informing how the GCF project should tailor support structures for climate resilience building in agriculture.

8.1.1.1. Farmer access to climate information

At baseline, 66 percent of all households (N=4180) surveyed had in the last 12 months received information on how to adapt their farming to climate change. Households in the treatment group were the most likely to have received seasonal climate information (88

percent) compared to those in the pure control (55.5 percent) and control (55.2 percent) groups.

Table 131: Proportion of farmers that received information on adapting farming practices to climate change in the last 12 months

F6: In the last 12 months did you receive any information on how to adapt your farming to climate change? N=4180												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
No	34.1	12	44.5	44.8	32.9	34.7	37.1	28.3	35.2	37.4	30.5	27.8
Yes	65.9	88	55.5	55.2	67.1	65.3	62.9	71.7	64.8	62.6	69.5	72.2
		Chi2=433.96 P-value=.000*			Chi2= 1 P-value=0.254		Chi2=21.17 P-value=.000*			Chi2=26.35 P-value=.000*		
	Province			District								
				Manicaland			Masvingo				Mat. south	
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No	38.8	26.5	36.7	31.9	53.8	38.2	29.6	23.0	28.9	29.3	29.7	45.7
Yes	61.2	73.5	63.3	68.1	46.2	61.8	70.4	77.0	71.1	70.7	70.3	54.3
	Chi2=57.9 P-value=.000*			Chi2=144.91 P-value=.000*								

With respect to gender, there was no significant difference as to whether men or women farmers were more likely to have received climate information. The baseline found that 64.4 percent of male respondents and 64.4 percent of all female respondents surveyed (N=4180) had received climate information. Middle-aged farmers were more likely to have received climate information (70.7 percent) compared to elderly (63.3 percent) and youth farmers (60.7 percent).

When locations were compared, the baseline found that farmers in Masvingo were the most likely to have received climate information (73.5 percent) compared to peers in Mat South (63.3 percent) and Manicaland (61.2 percent). To shed more insight, the analysis looked at district level picture with respect to farmer access to climate information. District level comparisons indicate that overall Masvingo districts had the highest proportion of households that received climate information, with no statistically significant difference between them (Chi^2=7.228; p value=0.065). within Manicaland, Buhera was leading at 68.1 percent, ahead of Chipinge at 61.8 percent while Chimanimani trailed at 46.2 percent, suggesting that information accessibility in the latter was relatively lower. over In Mat South, Gwanda farmers were more likely to have received climate information (70.3 percent) than their peers in Mangwe (54.3 percent).

With respect to gender, there was no statistically significant difference (p=0.254) as to whether men or women farmers were more likely to have received climate information. The baseline found that 67.1 percent of male respondents and 65.3 percent of all female respondents surveyed (N=4180) had received climate information.

Middle-aged farmers were more likely to have received climate information (71.7 percent) compared to elderly (64.8 percent) and youth farmers (62.9 percent). FGDs revealed that this group of middle-aged people was dominant in most programmes, especially in farmer field schools, and also more receptive to ideas. In contrast, youth farmers were the least represented with respect to access to seasonal climate forecast information.

8.1.1.2. Access to seasonal climate forecast

At baseline, 66 percent of all households (N=4180) surveyed had in the last 12 months received information on how to adapt their farming to climate change. Households in the treatment group were the most likely to have received seasonal climate information (88 percent) compared to those in the pure control (55.5 percent) and control (55.2 percent) groups.

Table 132: Proportion of farmers that received seasonal forecast in the last 12 months

F12: In the last 12 months did you receive the seasonal climate forecast? N=4180												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
No	40.7	24.3	50.9	45.9	37.3	42.4	41.6	37.8	41.6	42.7	38.2	38.3
Yes	59.3	75.7	49.1	54.1	62.7	57.6	58.4	62.2	58.4	57.3	61.8	61.7
		Chi2=228.37 P-value=.000*			Chi2= 1 P-value=.001*		Chi2=4.41 P-value=0.1100			Chi2=8.34 P-value=.015*		
		Province			District							
					Manicaland			Masvingo			Mat. south	
		ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No	37.8	41.6	42.7		35.2	63.6	37.6	47.0	24.9	45.4	42.4	43.7	44.4
Yes	62.2	58.4	57.3		64.8	36.4	62.4	53.0	75.1	54.6	57.6	56.3	55.6
	Chi2=15.34 P-value=.000*				Chi2=174.38 P-value=.000*								

There was a very slight difference in seasonal forecast access by gender, with 62.7 percent of males reporting having received it in the last 12 months compared to 57.6 percent for female farmers. Farmers in Chivi (75.1 percent) were more likely to receive seasonal forecast in the last 12 months before the baseline. However, access to seasonal climate forecast did not vary by age of the farmer.

8.1.1.3. Access to seasonal climate forecast

At baseline, 85 percent of households that received seasonal climate forecast in the last twelve months (N=2480) did use this information to facilitate their planning.

Table 133: Use of seasonal climate forecast information for planning

F13: If Yes, did you use the seasonal climate information for planning your farming? =2480												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
No	15.3	9.2	21.6	17.6	15.7	15.1	13.6	13.2	17.4	15.8	15.9	9.8
Yes	84.7	90.8	78.4	82.4	84.3	84.9	86.4	86.8	82.6	84.2	84.1	90.2
		Chi2=54.41 P-value=.000*			Chi2= 1 P-value=0.681		Chi2=7.74 P-value=.021*			Chi2=5.68 P-value=0.058		

	Province			District								
				Manicaland			Masvingo				Mat. south	
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No	13.2	17.4	15.8	17.7	33.6	13.7	27.6	7.2	8.0	3.8	13.1	23.6
Yes	86.8	82.6	84.2	82.3	66.4	86.3	72.4	92.8	92.0	96.2	86.9	76.4
	Chi2=25.13 P-value=.000*			Chi2=109.21 P-value=.000*								

Use of seasonal climate forecast information varied with household groups. 90.8 percent of treatment households had used seasonal forecast in 2020/21 compared to 78.4 percent in the pure control and 82.4 percent in the control groups. The gender, age and location of the respondent did not have any effect on use of seasonal climate forecast.

The three surveyed districts in Masvingo had the highest proportion of households that reported having used seasonal climate information received. Zaka, Chivi and Masvingo had 96.2 percent; 93 percent and 92 percent, respectively, with Bikita, which also reported lower access to climate information, trailing behind on its use (72.4 percent). In Manicaland, Chimanimani district, which also had the least proportion of respondents that had received climate information, had the least proportion using it at 66.4 percent. Chipinge and Buhera had significantly higher use of climate information (86.3 percent and 82.3 percent), and at about the same level as Gwanda (86.9 percent) and Mangwe (76.4 percent) in Mat South. Overall, these figures suggest that a high percentage of households were indeed using information they were receiving across GCF districts, with potential for increasing use in Chimanimani, Bikita and Mangwe.

Focusing on the gender of the respondent, evidence from the baseline suggests that use of seasonal climate forecast information was not predicted by the gender of the farmer. Across all districts, 84.3 percent of all males against 84.7 percent for females had used seasonal

forecast information. The was no statistically significant difference by sex (Chi=0.169; p=0.681).
Analysis of survey data shows that household size was not a predictor of use of climate information for planning decisions in agriculture (Chi=5.680; p=0.058).
To shed insight into the mechanism through which seasonal climate information produces resilience in smallholder farming systems, the survey asked respondents to state what decisions they had made in light of the climate information received. This analysis showed that overall, given seasonal forecast information, the most common response was changing planting date (81.6 percent). Almost two thirds (62.7 percent of farmers changed their crop choice while a further 60.9 percent changed the variety of crop cultivated. These were the three main decisions. Other decisions made though to a lower extent included purchasing food reserves (7.8 percent) and reducing income expenditure (8.6 percent).

Table 134: Decision made following climate information

F14: If Yes, which of the following, did you do in response to the information that you had received?																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Changed the planting date	81.5	82.3	84.1	78.1	79.9	81.9	81.7	74.4	87.1	82.7	91.8	88.5	88.2	76.5	76.7	68.6
Changed choice of crop	62.6	65.7	62.9	57.6	63.8	61.1	60.0	56.4	69.9	68.0	28.2	59.1	66.8	72.5	70.7	72.7
Changed variety of crop	59.0	63.5	55.9	55.2	61.4	57.9	56.3	46.3	66.7	66.6	24.5	60.3	61.6	82.4	53.4	86.6
Purchased food reserves	8.6	9.3	5.6	10.1	7.2	8.2	8.3	2.2	7.5	18.7	0.0	7.4	12.7	7.8	12.4	1.2
Purchased weather-indexed crop insurance	1.2	2.2	0.5	0.5	0.7	0.7	1.1	0.0	1.1	3.7	0.0	0.7	0.9	2.0	1.6	1.2
Purchased weather-indexed livestock insurance	1.0	1.4	0.7	0.6	0.9	1.0	0.9	0.2	1.1	1.7	0.0	0.9	0.9	0.0	1.2	2.3
Reduced income expenditure	8.5	9.7	9.0	6.3	6.3	9.6	8.0	5.4	4.3	10.4	0.0	2.5	9.2	13.7	29.7	1.7

Changing the planting date was mostly a response used by respondents in Masvingo province (Bikita, 91.8 percent; Chivi 88.5 percent and Masvingo 88.2 percent). The response was also most common in Chimanimani (87.1 percent). Farmers in Mangwe (68.6 percent) were the least likely to change planting dates given seasonal forecast information. However, farmers in Gwanda and Mangwe were more likely to switch crops than peers in other districts, with Bikita having the least likelihood of crop switches (28.2 percent). Again, switching variety of crop was least likely to be done by farmers in Bikita (24.5 percent), with other districts having more than half their populations being likely to switch crop varieties. Reducing income expenditure was an important response in Gwanda (29.7 percent), while farmers across all districts were highly unlikely to purchase either crop insurance (1.2 percent) or livestock insurance (0.9 percent).

With respect to household types, the baseline found that there were no significant differences based on whether or not the household had been earmarked for targeting with

project intervention. For example, 35.8 percent of treatment households changed planting date, compared to 38.4 percent and 37.5 percent for the pure control and the control groups.

8.1.1.4. Reliability of seasonal forecast

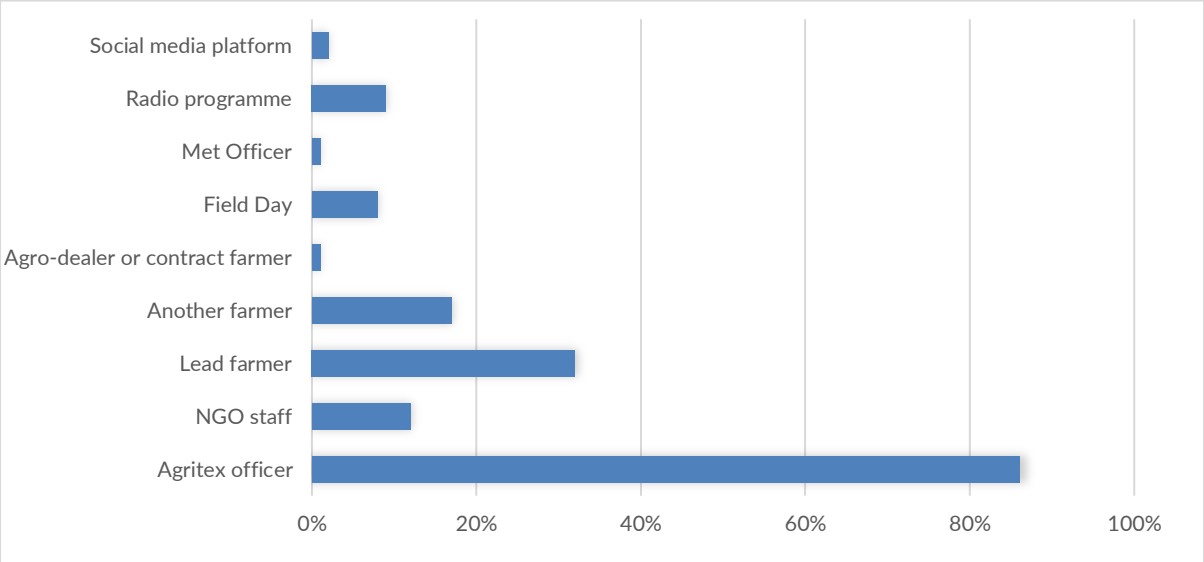
Across all household groups, less than half (40.6 percent) of respondents (N=25=2481) that had used the seasonal climate forecast in the 2020/21 season had found it to be reliable. Perception of reliability of the seasonal forecast was lowest for the pure control (29.8 percent) and control (39.7 percent) and slightly higher for the treatment group at 48.8 percent. Perception of reliability of the seasonal forecast varied with location: Respondents in Masvingo found the forecast the least reliable (34.9 percent), while Manicaland was at 41.6 percent and Mat South was at a modest 48.9 percent. The level of reliability of climate information was linked to the generalise seasonal forecasts that farmers were receiving, and therefore, not necessarily suited for their specific wards, given variations in climatic experiences within districts. Also, qualitative analysis revealed that low reliability of climate forecast data was a deterrent to future use of seasonal forecasts, and any measure to increase climate resilience through seasonal forecast use would have to be built on trust. Increasing the number of local weather data collection points would increase the level of accuracy, allowing for tailored information. From the MSD perspective, farmers were not fully appreciating the concept of probability in the forecasting, treating information given as fact.

8.1.1.5. Source of climate change adaptation information

Farmers in the intervention areas depended predominantly on locally accessible sources for information on how to cope with and adapt to climate change. The local extension officer (Agritex Officer) was the source of information for 86 percent of all surveyed households (N=2751). Lead farmers provided climate adaptation information to 32 percent of farmers. The baseline also found evidence of farmers sharing climate information, with 17 percent of respondents reporting having received this information through another farmer.

Other important sources include NGO staff (12 percent), while events like field days (8 percent) were also valued. Radio was a source of climate information for 9 percent, with poor radio reception and low ownership of radios being key determinant factors. The MET office does not seem to interact directly with farmers at the local level with respect to provision of climate information for facilitating climate coping and adaptation. Only 24 respondents (1 percent) had received information directly from the MET Office.

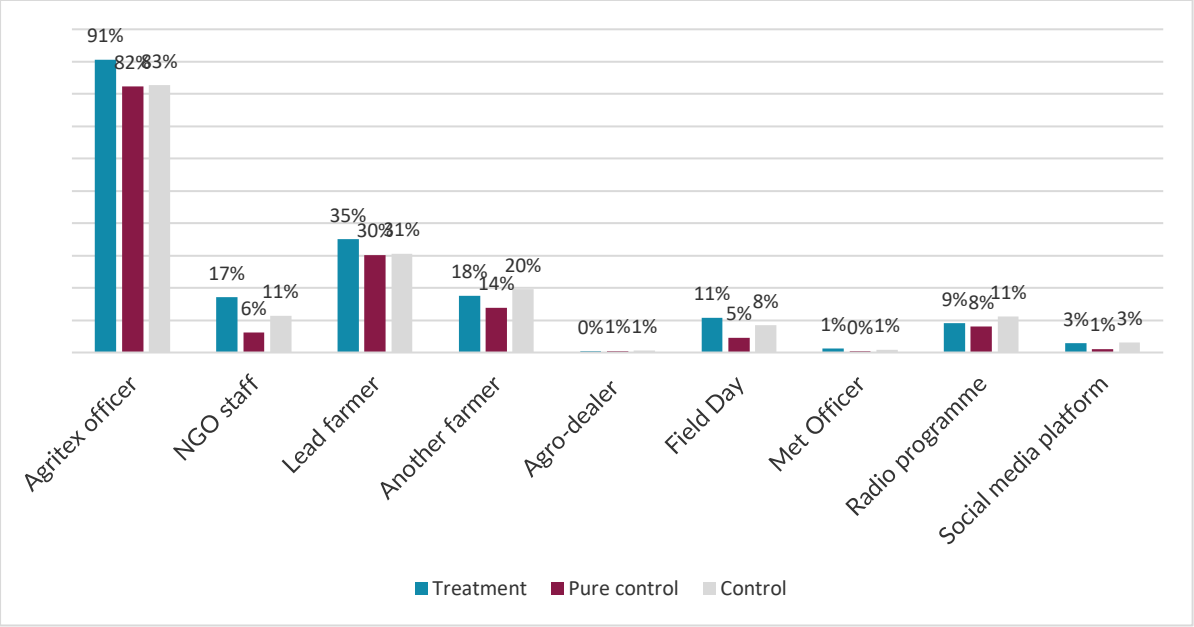
Figure 29: Sources of climate information



Households in the treatment group were more reliant on the Agritex officer, lead farmer and NGO staff than their peers in the pure and control groups. Treatment households were also more likely to attend and access climate information from field days than control and pure control households.

Transversely, non-treatment households that had lower likelihood of directly accessing extension officers, lead farmers and NGO staff had relatively higher proportions of their members relying on information sourced through other farmers and via the radio. Social media was one of the least used sources, with only 2.9 percent of respondents reporting sourcing climate information through this source. The baseline study found that the gender and age of the respondent did not have any effect in determining which sources they relied on for climate information.

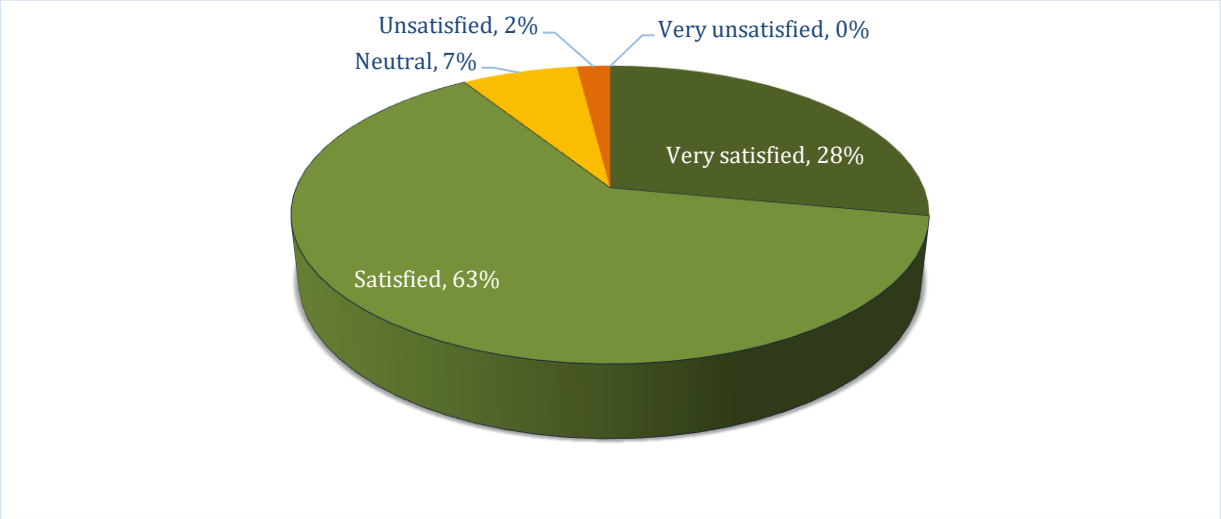
Figure 30: Sources of climate information for sampled households



8.1.1.6. Quality of climate information received

The quality of climate information received determines whether that information leads to positive decisions that help build a farmer's resilience in the face of shocks. To make smart decision, the information should be clear to the farmer and relevant to their local circumstances. Across all districts sampled, the main measure of quality of climate information provided was whether that information led to the farmer minimising loss as a result if following the advice given. Respondents were asked to comment on their level of satisfaction with the effectiveness of the information they had received to help them adapt to climate change. Of the 2757 respondents to this question, 28 percent were very satisfied and a majority 63 percent satisfied. A further 2 percent was not satisfied, while 7 percent remained neutral in their opinion.

Figure 31: Satisfaction with effectiveness of the information received on adapting farming practices to climate change



The probability of being very satisfied was highest for treatment households (37.9 percent) and lower in the control and pure control groups as these groups had less access to interpretation of such information. Treatment households were also least likely to be neutral or unsatisfied about the effectiveness of the information.

Table 135: Respondent satisfaction about effectiveness of climate information received?

F9: How satisfied are you with the effectiveness of the information you received? N=2756																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
Response	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Very satisfied	28.5	37.9	20.2	22.5	29.9	29.5	26.7	28.2	9.0	45.5	29.2	25.3	28.1	24.6	17.4	40.5
Satisfied	62.5	57.9	66.2	65.9	62.5	60.8	64.6	63.5	86.0	46.0	55.0	66.5	58.3	61.5	77.3	51.4
Neutral	7.0	2.9	10.1	10.1	5.8	7.7	6.9	7.6	2.2	7.5	7.4	7.0	11.7	12.3	2.2	7.3
Unsatisfied	1.6	1	2.7	1.4	1.4	1.8	1.5	0.4	2.8	0.5	6.9	0.8	1.9	1.5	2.5	0.9
Very unsatisfied	0.4	0.3	0.7	0.1	0.4	0.2	0.2	0.2	0.0	0.5	1.5	0.4	0.0	0.0	0.6	0.0
		Chi2 85.32 P-value=.000*			Chi2 10.63 P-value=.005*			Chi2 83.64 P-value 0.000								

Focusing on the district picture, the baseline found that the districts with low level of use of climate forecasts were also the ones with the least proportion of households that were not satisfied by the climate information provided, especially where the highest level of satisfaction was concerned. Chimanimani had the least proportion of 'very satisfied' respondents at 9 percent, while peers in the province recorded 45.5 percent (Chipinge) and 28.2 percent (Buhera). Just over a quarter of all respondents in Masvingo province were very satisfied, while the figure was two fifths for Mangwe, and less than half as much in Gwanda (17.4 percent). Of the 62.8 percent of respondents that were 'satisfied' with the climate information provided, districts with the highest proportions were Chimanimani (86 percent), Gwanda (77.3 percent) and Buhera (63.5 percent). Bikita had the highest proportion of unsatisfied recipients of climate information (6.9 percent) followed by Chimanimani (2.8 percent) and Gwanda (2.5 percent).

8.1.1.7. Quality of climate Information received

At baseline, more than half the sample size (52.1 percent) (N=4181) found it easy to access climate information. A further 12.2 percent, with treatment households contributing the highest proportion, found it extremely easy to access climate information for coping and adaptation. The data also shows that households in the pure control (36.9 percent) were three times more likely to report finding it difficult to access climate information compared to those in the treatment group. The control group had the highest proportion of respondents who found accessing climate information very difficult (13.3 percent) compared to the pure control (9.8 percent) and treatment group (1.8 percent).

Table 136: Ease of accessing information for climate change adaptation

	Extremely easy (%)	Easy (%)	Difficult (%)	Very difficult (%)	Total (% N)	
Treatment	21.7	63.2	13.2	1.8	100.0	1352
Pure control	7.1	46.2	36.9	9.8	100.0	1443
Control	8.3	47.3	31.0	13.3	100.0	1386
Total	12.2	52.1	27.3	8.4	100.0	4181

The study found that age, gender, or location of the respondent did not have an influence in the ease with which they could access climate information to support adaptation and coping decision making. At baseline, across all locations, gender and age categories, 90 percent of all surveyed households expressed an interest in receiving more information related to adaptation to climate change.

8.1.1.8. Barriers to use of seasonal climate forecasts by farmers

KIIs and FGDs identified a number of barriers to use of seasonal forecasts by farmers.

9. There appears to be no systematic recording of feedback from farmers on how they are using information. In fact, MSD is not fully aware of how farmers use seasonal forecasting and what further tailoring would make it more appropriate to farmer needs. Information appears to flow in one direction only.
10. Preference for traditional rather than 'western science' generated seasonal forecasts.
11. Historically, forecasts have been intended for commercial rather than communal farmers, and therefore, limited collective experience of reliability of forecasts
12. Farmers consider and trust forecasts if they have been accurate for their specific farm, while the Met Office considers as accurate if the forecast has been accurate at district level. Information disseminated is not fully tailored to the district or ward.
13. Farmers do not understand the concept of probability when it comes to forecasts, they interpret and share information as if it were definite. This leads to mistrust of seasonal climate forecast information.
14. Limited farmer access to smart phones to receive more comprehensive climate information. For those with smartphones, reception and money for internet data may limit ability to access this climate information or share it.
15. Communication boosters are few within some districts so much that some farmers may not be able to access updated information on a regular basis.
16. Information provided may not always be relevant to the farmer's needs. Farmers are concerned with knowing how the rainfall will be distributed rather than the total seasonal rainfall amount (below, normal or above normal). In Chipinge, for example, while 1000mm is normal, 650mm distributed evenly with 20mm per week would be sufficient for crops to reach maturity.

8.1.2. Beneficiary capacity for generation and use of climate information products and services

The baseline investigated the extent to which community respondents had been prepared for the role of contributing towards generation of field data to inform the development of tailored forecasts, as well as their capacity to make use of the climate forecast and other climate information to make farming decisions. To this end, the following sections look at what training has been received and identifies gaps for further capacity development if farmers in intervention areas are to support implementation around this output as envisaged. as envisaged.

8.1.3. Beneficiary capacity for generation and use of climate information products and services

The baseline investigated the extent to which community respondents had been prepared for the role of contributing towards generation of field data to inform the development of tailored forecasts, as well as their capacity to make use of the climate forecast and other climate information to make farming decisions. To this end, the following sections look at what training has been received and identifies gaps for further capacity development if farmers in intervention areas are to support implementation around this output as envisaged. as envisaged.

8.1.3.1. Farmer training in application of climate information for decision making

At baseline, close to two thirds (64.4 percent) of the respondent households had received training on climate change coping and adaptation. There was a significant difference in the proportions of those trained across the treatment and control households, with the treatment households having the highest likelihood at 88.7 percent, while fewer households had been trained in the pure control (53.7 percent) and control (51.7 percent) households (Table 137)

At baseline respondents in Masvingo were more likely to have ever received any training on climate coping or adaptation to climate change. At least 72.2 percent of respondents in Masvingo had been trained, the highest proportion of the three intervention provinces, while Matabeleland South has 64.5 percent and Manicaland the least at 57.9 percent.

Table 137: Proportion of farmers trained in climate change coping or adaptation

F1: Have you ever received any training in climate change coping and or adaptation?												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
No	35.6	11.3	46.3	48.2	35.6	35.6	39.2	29.3	36.7	39.3	31.8	28.1
Yes	64.4	88.7	53.7	51.8	64.4	64.4	60.8	70.7	63.3	60.7	68.2	71.9
		Chi2=515.94 P-value=.000*			Chi2= 1 P-value=0.994		Chi2=24.9 P-value=.000*			Chi2=32.39 P-value=.000*		
		Province			District							
					Manicaland			Masvingo			Mat. south	
		ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No	42.1	27.7	35.5		38.5	50.9	41.1	36.2	23.3	26.1	39.1	28.5	44.4
Yes	57.9	72.3	64.5		61.5	49.1	58.9	63.8	76.7	73.9	60.9	71.5	55.6
	Chi2=72.92 P-value=.000*				Chi2=135.76 P-value=.000*								

Within Masvingo province, Chivi and Masvingo districts, for example, had more than 70 percent of respondent households trained, while the other two districts in the same province had at least 60 percent apiece. In Mat South, Mangwe had the least proportion of trained households (44.4 percent) with Gwanda leading at 71.5 percent. Of all districts, Chimanimani had the least proportion of trained farmers (49.1 percent) with the other districts in the province averaging 60 percent (Table 137).

Middle aged respondents were more likely to have received training in climate change coping and adaptation than of the other age groups, with 70.7 percent of respondents in this age group reporting ever receiving some training. In contrast, youth respondents at 60.8 percent were the least likely to have ever been trained, while 63.3 percent of elderly respondents had previously received training. The baseline did not find any statistical difference in the proportion of respondents by gender of recipient of training. Field data shows that as many males (64.3 percent) as females (64.4 percent) had been capacitated through training to cope with and adapt to climate change.

8.1.3.2. Focus of climate change coping and adaptation training

To shed an insight into the nature of capacity strengthening already provided in the intervention areas in the twelve months prior to this survey, the baseline asked what area of farming the training on climate change coping and adaptation had focused on.

Table 138: Aspect of climate change trained on

F8: If you received climate adaptation information in the last twelve months, what aspect of your farming was it in relation to?												
		Household type			Gender		Age			HH Size		
	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members
Crop production	97.7	97.8	97.4	97.9	97.5	97.8	97.3	98.1	97.7	97.1	98.7	97.3
Horticulture	19.3	23	18	14.9	20.4	18.7	20.1	21.2	17.7	17.9	20.1	23.4
Livestock feeding	28.7	34.6	23.4	25.2	29.5	28.3	28.1	27.3	30	27.1	30.4	31
Market information	13	13.7	12.3	12.5	15.6	11.5	14.6	12	12.5	12.8	12.7	15.3
Disease management in crops	41.4	46.8	40.4	34	42.8	40.6	42.2	41	41.1	39.5	41.9	49.8
Disease management in livestock	27.9	31.2	28.9	21.6	29.2	27.1	28.8	27	27.8	26.3	28.6	33.7
	Province			District								
				Manicaland			Masvingo				Mat. south	
	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Crop production	97.3	97.7	98.6	98.9	98.9	94.5	99.5	98.5	96.0	93.8	98.1	99.5
Horticulture	24.7	19.3	9.0	17.6	21.3	35.7	5.4	26.6	17.6	16.9	6.7	12.7
Livestock feeding	24.1	30.0	35.2	13.9	24.7	37.2	20.8	31.0	37.7	13.8	39.4	28.2
Market information	13.0	14.7	9.7	3.6	8.4	27.4	8.9	18.9	12.7	12.3	8.3	11.8
Disease management in crops	31.3	49.3	45.9	18.1	21.9	52.8	31.7	57.0	51.2	38.5	45.0	47.3
Disease management in livestock	22.1	33.6	28.3	10.7	15.7	39.9	20.8	41.0	34.0	16.9	34.7	17.7

Based on a sample of 2753 respondents to this question, the survey found that most training programmes had focused on crop production techniques (98 percent) and disease management in crops (41 percent). Other important aspects that were covered had included livestock feeding in response to droughts mostly, participated in by 29 percent of all

respondents interviewed, and disease management in livestock, in which 28 percent of respondent households had participated in (Table 138)

Some 19 percent of farmers were capacitated in addressing climate change issues in horticulture, and 13 percent reported that they had been equipped with skills for using market information to help them cope better and adapt to climate change.

Apart from training in crop production, across all climate change training areas provided to communities in intervention districts, treatment households were more likely to have received training compared to the pure control and the control groups. Focusing on all training provided, the data suggests that the training provided had largely focused on crop production, including managing crop pests and diseases, as well as livestock disease management. The proportions trained in livestock were also lower across all household types as this training was likely most attended by those who owned some livestock units. In crop disease management, 46.8 percent of treatment households were trained, compared to 40.4 percent in the pure control and 34 percent in the control groups (Table 138)

Crop production training was generally very high across all districts, with at least 90 percent of all households being trained. Training in horticulture, however, varied by district, with Chipinge and Chivi leading at 35.7 percent and 26.6 percent respectively. Training in livestock feeding was highest in Gwanda (39.4 percent), Masvingo district (37.7 percent) and Chipinge (37.2 percent), and Chipinge also had the highest proportion trained in market information (27.4 percent).

Training in climate change as it relates to livestock disease management was mostly done in Masvingo and Mat South with Chivi (41 percent) and Masvingo (34 percent) leading. Chipinge (39.9 percent) had a high proportion trained in disease management.

The baseline did not find any difference in training participation by sex of farmer. Across all training areas, the proportion of men and women trained was the same statistically as shown in Table 138

There was no statistically significant difference in gender of farmer with respect to their training in various aspects of agriculture in which climate change topics were covered (Table 138). Similarly, as shown in Table 138 there was no difference in climate change training attendance by age group of the farmer.

8.1.3.3. Focus of climate change training by province

Considering the variation in climatic experiences across the project intervention areas, baseline data was analysed by location to determine if at all there were location specific trainings that had been delivered. Results in Table X show that while crop production was an area of focus for all three provinces, horticulture and livestock feeding were slightly more location biased. Manicaland had 24.7 percent of respondents reporting receipt of climate change training as it relates to horticulture, consistent with the province's relatively higher water availability status for horticulture. As expected, livestock feeding training was less in Manicaland (24.1 percent) compared to Masvingo (30 percent) and Mat. South (35.2 percent), with the latter two provinces being generally understood as more competitive for livestock farming than the former.

	Crop production (%)	Horticulture (%)	Livestock feeding (%)	Market information (%)	Crop disease management (%)	Livestock disease management (%)
Manicaland	97.3	24.7	24.1	13.0	31.3	22.1
Masvingo	97.7	19.4	30.0	14.7	49.3	33.6
Mat. South	98.6	9.0	35.2	9.7	45.9	28.3
Total	97.7	19.3	28.7	13.0	41.4	27.9

Table 139: Focus of climate change training by province

Disease management in crops was more important as a topic in Masvingo (49.3 percent) and Mat. South (45.9 percent) compared to Manicaland (31.3 percent), while training in disease management in livestock was also least popular in Manicaland relative to the other two provinces.

8.1.3.4. Focus of duration since training was received

About 90 percent of respondents (N=2691) who had received training in climate change adaptation had been trained in the last twelve months to the survey. A further 8 percent had been trained at least two years prior, while 17 of the farmers interviewed reported that they had received climate change training more than five years ago.

Table 140: Period when training was conducted

	Column %	N
Last 12 months	90	2417
1 to 2 years ago	8	214
3 to 5 years ago	2	43
More than 5 years ago	1	17
Total	100	2691

Regarding the geographic spread 12 of the 17 respondents trained over 5 years ago had been trained in Masvingo with the remainder 4 in Mat South and 1 in Manicaland. Manicaland had a slightly higher proportion of farmers trained in the last 12 months (93.1 percent) than the other two provinces, with Masvingo at 89.2 percent and Mat South at 85.2 percent.

Despite training received, 31 percent of respondents reported that they felt that there was a skills gap that the project needed to address. Survey data shows that 35.4 percent of

treatment households reported that they had a skills gap that the project had to address, while 29.8 percent of control and 28.6 percent of pure control households reported requiring further training on climate-related topics. The baseline did not find any significant differences in likelihood of reporting a skills gap based on age and gender of the respondent.

The qualitative survey further examined the training specific to generation of climate data and its subsequent dissemination and use. It emerged that training in managing a weather station, such as collecting rainfall data, had not been provided at community level for the majority of GCF districts.

8.2. Access to and Use of Advisory Services

8.2.1. Communication across households

At baseline, the number of small holder farmers receiving new advisories and warnings through various media developed for both agriculture and water management by the GCF programme was tracked. The media included short message services (SMS) and Radio among others. Overall, close to half of the households (49 percent) received advisory and warnings on agriculture and water management. Two third (67.5 percent) of the treatment households were highly likely to receive the advisory/warnings as compared to 39.6 percent and 40.6 percent from the pure control and control areas, respectively.

Table 141: Advisory messaging by households' membership

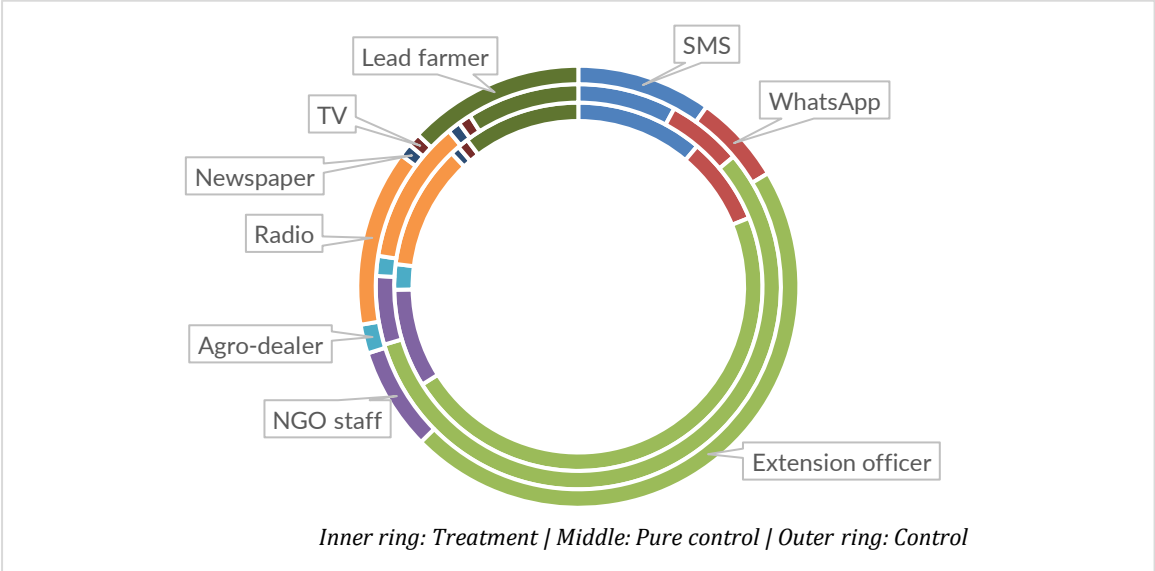
HH size	No		Yes		Total	
	%	N	%	N	%	N
1-5 members	53.4	1224	46.6	1066	100.0	2290
6-8 members	48.6	742	51.4	785	100.0	1527
>8 members	46.0	167	54.0	196	100.0	363
Total	51.0	2133	49.0	2048	100.0	4181

Pearson chi2 (2) = 12.5639 P-value = 0.002

Farmer households with 1-5 members were highly likely to receive advisory notifications forming about half (52 percent) of recipients as compared to households with more than five members. 39 percent of the households in Manicaland were highly likely to receive advisory as compared to 37 percent and 34 percent of smallholder farmers from Masvingo and Matabeleland South, respectively. Receiving advisory was not affected by age, gender or religion of the farmer.

8.2.1.1. Channels of communication among households

Figure 32: Means of communicating advisory and warnings information by household type



Inner ring: Treatment | Middle: Pure control | Outer ring: Control

Extension officers were key in relaying agricultural advisory, and warnings messages across smallholder farmers. There was a fair cut among the households who received advisory

through mainstream media (Radio, newspaer, TV) as cmpared to other channels with major differences being observed on communication through Whatsup, lead farmer, SMS and extension officers.

8.2.1.2. Channels of communication among by gender

Table 142: Agricultural advisory communication channels by gender

	Male (%)	Female (%)	Total (%)
SMS	18.5	16.8	17.4
WhatsApp	12.3	12.2	12.2
Extension officer	85.5	85.9	85.7
NGO staff	14.8	12.3	13.2
Agro dealer	4.6	3.0	3.6
Radio	24.5	17.9	20.2
Newspaper	2.6	1.0	1.6
TV	2.2	1.4	1.7
Lead farmer	15.1	20.5	18.6
Total	100.0% 717	100.0% 1331	100.0% 2048

Female farmers were more likely to receive agricultural advisory through lead farmer as compared to male farmers, while the male counterparts were more likely to receive advisory through radio when compared to their female counterparts.

8.2.1.3. Channels of communication among by province

Table 143: Agricultural advisory communication channels by province

	Manicaland (%)	Masvingo (%)	Mat. South (%)	Total (%)
SMS	30.5	11.1	6.3	17.4
WhatsApp	12.8	9.5	15.3	12.2
Extension officer	85.8	88.3	81.9	85.7
NGO staff	8.9	14.7	17.7	13.2
Agro dealer	1.8	5.2	4.0	3.6
Radio	22.5	24.0	10.9	20.2
Newspaper	0.8	2.9	0.8	1.6
TV	1.4	2.7	0.8	1.7
Lead farmer	14.6	16.7	27.8	18.6
Total	100.0% 794	100.0% 750	100.0% 504	100.0% 2048

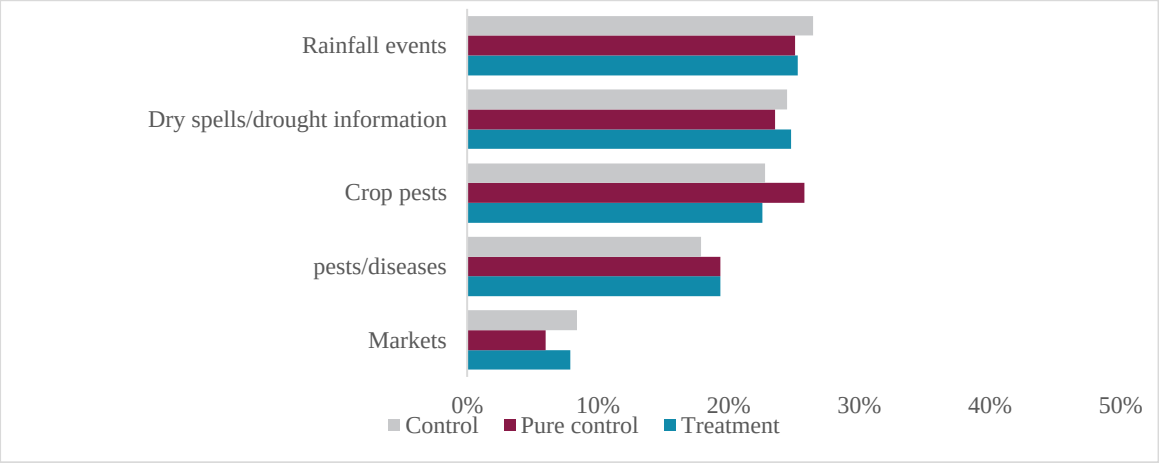
Extension officers had a fair communication across all the provinces. SMSs achieved a greater outreach in Manicaland as compared to the other provinces, while lead farmer communication was more successful in Mat. South as compared to the other provinces of the study. In Masvingo, Mainstream media (Radio, TV and newspaper) were doing better in communication. NGO staff had a greater outreach in Mat. South and Masvingo as opposed to Manicaland.

There were no major differences across the channels of communication by age of the farmer and the number of members per household.

8.2.2. Advisory message content

8.2.2.1. Advisory message content by household type

Figure 33: Content of the advisory message by household



Pearson chi2 (72) = 115.6775 P-value= 0.001

Regarding the content of the advisory information received, a quarter of farmers accessed information about rainfall and dry spell information. Information on crop pests was commonly shared among households in the pure control areas as compared to those on treatment and control areas.

8.2.2.2. Advisory message content by province

Table 144: Content of the advisory message by province

	Manicaland (%)	Masvingo (%)	Mat. South (%)	Total (%)
Markets	23.3	24.4	12.5	21.0
Crop pests	58.4	70.6	70.6	65.9
pests/diseases	46.3	62.6	49.9	53.2
Rainfall events	75.9	72.3	63.8	71.6
Dry spells/drought information	74.1	63.7	66.6	68.4
Total	100.0%	100.0%	100.0%	100.0%
	790	746	503	2039

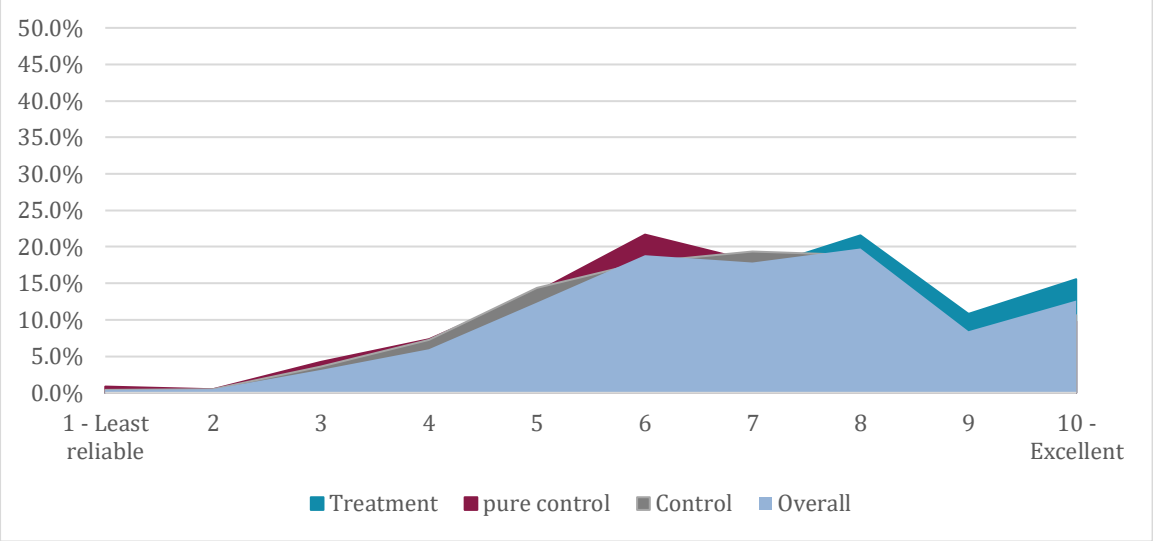
Farmers in Masvingo and Manicaland were likely to receive market and rainfall information as compared to those in Mat. South. Information on crop pests was common among farmers in Masvingo and Mat. South as compared to Manicaland. Farmers in Masvingo had a high likelihood of receiving information on pests and diseases as compared to those in Manicaland and Mat. South.

Generally, content packaging was not affected by gender, age, and size of the farmer household.

8.2.3. Reliability of the advisory information

8.2.3.1. Reliability of the advisory information by household type

Figure 34: Reliability of shared advisory information by household type

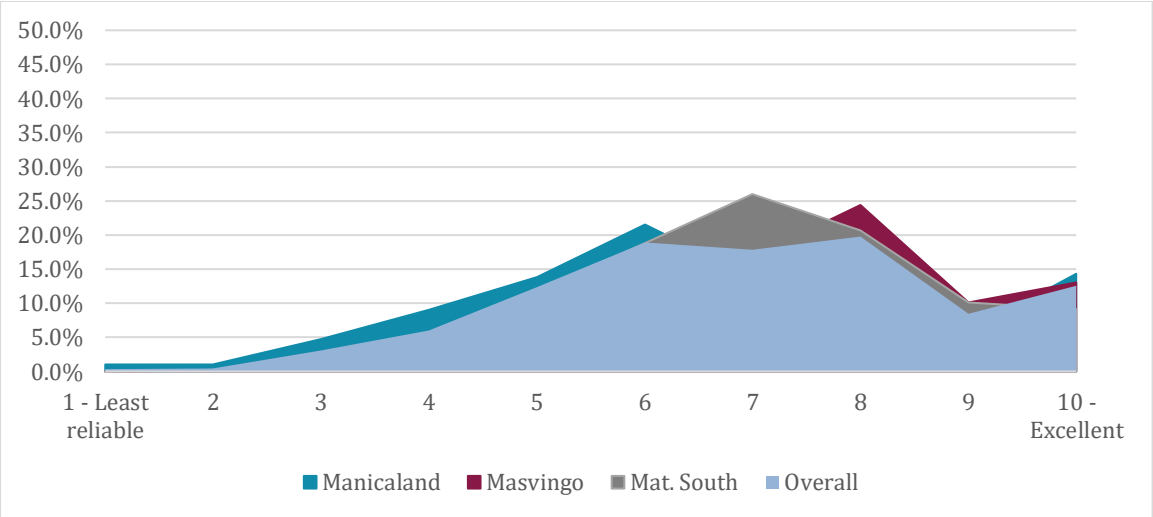


Pearson chi2 = 53.8289 P-value = 0.000

Generally, the farmers found the advisory and warnings information useful while farmer households in the treatment areas the information more useful as compared to those in the pre control and control areas.

8.2.3.2. Reliability of the advisory information by province

Figure 35: Reliability of shared advisory information by province



Pearson chi^2 = 129.6299 P-value = 0.000

Farmer households in Mat. South and Masvingo found the information more reliable as compared to those in Manicaland. The shared information reliability was b=not any different by farmer age and gender.

8.2.4. Farmer sharing of advisory information

Upon receiving the advisory information, 95 percent of the 2048 farmers who received advisory information indicated that they would share with friends and neighbours.

Table 145: Share ability of advisory information by household type

	Yes (% N)		No (% N)		Total (% N)	
treatment	97.9	894	2.1	19	100.0	913
pure control	87.9	503	12.1	69	100.0	572
control	95.9	540	4.1	23	100.0	563
Total	94.6	1937	5.4	111	100.0	2048

Pearson chi^2 = *70.9961* *P-value = 0.000*

Household in pure control areas were less likely to share advisory information received which is a good indicator for controlling spill over effect.

Table 146: Share ability of advisory information by province

	Yes (% N)		No (% N)		Total (% N)	
Manicaland	90.7	720	9.3	74	100.0	794
Masvingo	97.5	731	2.5	19	100.0	750
Mat. South	96.4	486	3.6	18	100.0	504
Total	94.6	1937	5.4	111	100.0	2048

Pearson chi^2 = *39.0464 P-value = 0.000*

Farmer in Manicaland were less likely to share advisory information received as compared to those in in Masvingo and Mat South. Gender of the farmer, household size, religion and age had nothing to do with information sharing.

8.3. HOUSEHOLD DIGITAL INCLUSION

One of the key objectives of the project is to improve access to weather, climate and hydrological information for climate resilience agriculture. To access information, the necessary framework or channel of communication must be addressed hence the baseline deemed it important o understand if farmers were digitally enabled. This is measured by examining the number of households that have access to technology as a precursor to accessing the climate resilience agriculture information including climate forecasts, market and trade information, and disaster early warning information, for supporting household decision making. The baseline assessed the extent to which households were digitally included and had access to electricity which is a key driver to digital inclusion. The focus of the baseline was whether at least one member in the household had access to, and was using, digital technology.

3.4.1. Household access to a mobile phone

Most households interviewed (92.8 percent) had access to a phone. Households in the treatment group had significantly higher access to a phone (94.4 percent) compared to those in the pure control (91.2 percent) and control groups (92.1 percent). Gwanda (88.5 percent) had a lower access to phone as compared to the rest of the districts. Since majority of the farmers have access to phone, there is an opportunity to send agricultural information via SMS as opposed to social media and internet.

Table 147: Proportion that had access to phone

6a. Do you have access to a phone																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
Response	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
No	7	5.1	9	7.9	6.5	8	9	6	6.4	7	7.9	6.5	5.3	2.1	11.5	7.6
Yes	93	94.9	91	92.1	93.5	92	91	94	93.6	93	92.1	93.5	94.7	97.9	88.5	92.4
		Chi2 85.32 P-value=.000*			Chi2 10.63 P-value=.005*			Chi2 83.64 P-value 0.000								

3.4.2. Household access to computer

Only 3 percent of households in the project intervention areas have access to a computer. Male and mid aged respondents were more likely to have access to computer. Households in Masvingo had a higher likelihood of access to computer as compared to the rest. Specifically, there was less than 1 percent access in Chipinge and Bikita districts. The proportion of households with computer access was not any different across household types sampled, and the survey did not find any significant difference in computer access based on household size.

Table 148: Household access to computer

D4a. Do you have access to a computer					
	Household type	Gender	Age	HH Size	Province

Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
D4a. Do you have access to a computer															
No	97	97.2	96.7	97.1	96.6	97.2	96.7	95.7	97.7	97	96.9	97.4	97	96.6	97.6
Yes	3	2.8	3.3	2.9	3.4	2.8	3.3	4.3	2.3	3	3.1	2.6	3	3.4	2.4
		Chi2 4.72 P-value=0.094			Chi2 1 P-value=.012*		Chi2 50 P-value=.000*			Chi2 3.04 P-value=0.219			Chi2 10.89 P-value=.004*		

Further, for the household where at least one member had access to a computer, the survey found that this computer was either accessed from a place of work, used as a small business for typing documents and printing, or a solar powered laptop at home for watching movies and playing music. The internet was hardly accessed through these computers.

3.4.3. *Frequency of use of computer*

For respondents that had reported having access to a computer, the survey asked on the frequency of use of computer. Most respondents had used the computer less than once month (27.7 percent) or a few times a month (23.7 percent). About 16.8 percent of respondents with access to computer were using the computer daily, with an additional 16.4 percent using computer a few times a week. The survey found that 15.4 percent of all households reporting having access to the computer actually never use a computer majority being female (Table 149).

Table 149: Frequency of use of computer

D4: How often do you use a computer?															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Never use.	15.4	26.2	7.3	13.5	4	22.8	13.6	17.6	14.9	10.2	21.4	10.4	15.3	12.4	22.5
Use less than once a month.	27.7	32.1	25.7	25.6	30	26.2	27.2	22.6	32.4	21.8	25.5	52.1	37.1	25.8	9.2
Use a few times a month.	23.7	18.1	29	23.3	23.8	23.6	25.2	23.5	22.5	35.3	17.9	9.4	27.9	25.8	8.3
Use a few times a week	16.4	5.4	24.9	17.9	22.3	12.5	18.9	10.9	19.1	11.6	22.6	9.4	12.2	23.6	10
Use everyday	16.8	18.1	13.1	19.7	19.8	14.9	15	25.3	11.1	21.1	12.6	18.8	7.5	12.4	50
		Chi2 66.6 P-value=.000*			Chi2 4 P-value=.000*		Chi2 26.92 P-value=.001*			Chi2 87.62 P-value=.000*			Chi2 156.61 P-value=.000*		

3.4.4. Household access to the internet

Table 150: Internet accessibility

Do you have access to the internet																
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
No	76	72.6	79	76.6	75.9	76	74.5	73.1	78	77.3	74.7	76.2	79.2	79.9	63.2
Yes	24	27.4	21	23.4	24.1	24	25.5	26.9	22	22.7	25.3	23.8	20.8	20.1	36.8
		Chi2 88.93 P-value=.000*			Chi2 1 P-value=0.852		Chi2 57.65 P-value=.000*			Chi2 17.38 P-value=.000*			Chi2 572.61 P-value=.000*		

Nearly a quarter (24 percent) of all respondents had access to the internet. A higher proportion of treatment households (27.4 percent) had access to the internet, as compared to the other household types in the project intervention areas, with control households following at 23.4 percent and pure control at 21 percent (Table 150). Majority of household in Chipinge (87.6 percent), Bikita (85.8 percent), Zaka (91.1 percent) did not have access to internet.

3.4.5. Frequency of internet access

Table 151: Frequesncy of use of internet

D5: How often do you use the Internet															
		Household type			Gender		Age			HH Size			Province		
Response	Total	Treatment	Pure control	Control	Male	Female	Youth	Midde age	Elderly	1-5 Members	6-8 Members	>8 Members	ManicaLand	Masvingo	Mat. South
Never use internet.	5	3.2	6.5	5.8	4.5	5.2	4.2	4.1	6	4.9	5	5	2.6	8.4	4.6
Use internet less than once a month.	10	12.6	10.3	6.5	8.3	10.9	10.5	9.3	10	8	8.2	19.6	12.6	8.9	8.1
Use internet a few times a month.	21.4	16.9	24	24.7	25.1	19.4	21.2	20.5	22.1	22.3	23.3	14.1	21	24.4	19.2
Use internet a few times a week.	31.4	34.4	29.1	29.7	32.7	30.7	30.3	33	31.2	30.9	31.4	32.7	31.9	29.3	32.7
Use internet every day	32.2	32.9	30.1	33.3	29.4	33.8	33.7	33	30.8	34	32.1	28.5	31.9	29.1	35.3
		Chi2 108.19 P-value=.000*			Chi2 4 P-value=.000*		Chi2 16.23 P-value=.039*			Chi2 132.3 P-value=.000*			Chi2 109.57 P-value=.000*		

At baseline 32.2 percent of households are using internet at least every day. Internet refers to accessing any of or various websites and social media platforms such as WhatsApp and Facebook, as well as news channels. A further 31.9 percent used internet at least a few times a week. There were significant differences in internet usage by household type, with treatment households being more likely to have higher frequency of use compared to the control and pure control households. Treatment households were the least likely to have never used internet (3.2 percent) compared to the pure control (6.5 percent) or control (5.6 percent). Access to internet in Masvingo especially in Masvingo and Zaka districts is less

frequent calling for consideration of different methods of sharing Agri-information to increase sustainability.

3.4.6. Frequency of use of mobile phone

Most respondents are moderate to high frequency users of mobile phones, with use referring to making calls, messages, chat platforms, buying or selling, mobile money transfers, and internet use. Most respondents use their phones at least once or twice per day (34.4 percent) and a further 28.1 percent of all respondents who have access to a mobile phone use it between three to four times daily. More than a quarter of all respondents used their mobile phones at least five or more times per day. In the highest frequency usage category, the treatment group were dominant at 32.3 percent, followed by the control (24.9 percent) and lastly, the pure control, at 24.1 percent.

Table 152: How often do you use a mobile phone

D6: How often do you use a mobile phone?																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
Response	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Never	0.2	0.2	0.1	0.2	0.3	0.2	0.3	0.2	0.0	0.1	0.1	0.4	0.0	0.0	0.4	0.0
Less than once per day	9.9	8.1	10.2	11.7	10.0	10.4	9.7	9.7	11.1	9.2	9.7	11.8	9.3	4.8	11.8	7.5
One or two times per day	34.4	31.1	37.3	35.2	32.7	35.0	33.4	35.3	34.3	35.7	35.5	30.2	33.7	33.2	39.4	34.1
Three or four times per day	28.1	28.2	28.2	28.0	28.9	27.8	28.8	29.4	23.2	26.3	34.8	21.1	28.9	26.8	23.1	38.2
Five or more times per day	27.3	32.3	24.1	24.9	28.2	26.7	27.8	25.4	31.3	28.7	19.9	36.5	28.1	35.2	25.4	20.2
		Chi2 203.3 P-value=.000*			Chi2 579.31 P-value=.000*			Chi2 83.64 P-value 0.000								

3.4.7. Connection to the electric grid

Digital gadgets are well served by electricity hence the baseline checked on proportion of farmers connected to electricity grid.

Table 153: Household connection to the grid

D10: Are you connected to the electricity grid?																
		Household type			Province			District								
								Manicaland			Masvingo				Mat. south	
	Total	Treatment	Pure control	Control	ManicaLand	Masvingo	Mat. South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Masvingo	Zaka	Gwanda	Mangwe
Yes	3.3	3.3	3.5	3.0	3.8	3.0	3.0	3.3	4.0	5.1	2.6	0.8	2.5	11.3	4.4	0.4
No	96.7	96.7	96.5	97.0	96.2	97.0	97.0	96.7	96.0	94.9	97.4	99.2	97.5	88.7	95.6	99.6
		Chi2 3.26 P-value=0.197			Chi2 210.38 P-value=.000*			Chi2 83.64 P-value 0.000								

At baseline only 3.3 percent of all respondents are connected to the electric grid. Masvingo and Mat. South Provinces had the lowest electricity connectivity especially in Chivi and Mangwe districts. There are no statistically significant differences among the three household categories considered. Households in areas with low electricity grid outreach can be considered for written Agri-information dissemination and training forums.

CONCLUSION

The evidence from the baseline confirms the barriers identified in the project document. The baseline found that receipt of climate information was different from use, as many farmers lacked resources to operationalise the climate information provided or the trust or interest to do so. Climate information appears to be inclined towards crop production sytems and less so on livestock production. Household digital inclusion would need to be taken advantage of, although districts that are underserved should be noted, in building information driven climate change adaptation and, in the long term, resilience to climate change and variability.

9. DISCUSSION

9.1. Further analysis

Multinominal logistic modelling is performed to gather more evidence on the differences between the households in the treatment group versus those in the pure control and control group in the treatment villages. Control households in the treatment villages and pure control households were compared to the treated households. Results show that households in the pure control are 59% less likely to be trained in financial management, marketing and business development compared to households participating in the GCF programme and there is statistically significant difference ($p<0.05$) between these households. The same result is observed between control and treated households where control households are 19% less likely to be trained. This result show that there could be some spill over effect of what have been already implement as part of GCF programme.

The largest difference between treated households and both pure control and control groups is observed on use of climate information on making farming decisions. Although this report presents baseline results, the effect on the initial rollout of the programme seems to have started to have an impact. Results show that 87% and 59% of the households in the pure control and control group respectively are less likely to use climate information to make farming decisions. Shock experience and livelihood coping strategies are almost similar between the treated households and the two control groups since these individuals live in the same locality. See Table 154 for more information.

Table 154: Multinomial logistic regression output

	Coefficient		Standard error		P-value	
	Pure control	Control in treated village	Pure control	Control in treated village	Pure control	Control in treated village
Financial, business and marketing training	-0.59	-0.19	0.07	0.05	0.00	0.00
Access to information	-0.06	-0.15	0.02	0.02	0.01	0.00
Value chains	0.34	0.01	0.22	0.20	0.12	0.98
Shock experience index	-0.01	0.02	0.02	0.02	0.75	0.38
Livelihood coping strategy index	0.04	0.05	0.02	0.02	0.02	0.00
Climate smart agriculture	-0.54	-1.00	0.90	0.83	0.55	0.23
Area under climate resilient agriculture measures	0.01	-0.21	0.20	0.18	0.98	0.24
Area under climate proof agriculture	-0.02	0.10	0.20	0.17	0.90	0.55
Human resource score	-0.05	0.32	0.22	0.23	0.82	0.15
Livelihood diversity score	-0.07	0.04	0.06	0.05	0.24	0.52
Asset and livestock score	-0.12	-0.08	0.02	0.02	0.00	0.00
Climate information use on farming decisions	-0.87	-0.59	0.16	0.16	0.00	0.00
Access to reliable clean water	0.20	0.15	0.12	0.12	0.10	0.20
Household income	0.00	0.00	0.00	0.00	0.19	0.03
Household dietary diversity	0.23	0.14	0.08	0.08	0.00	0.07
Household hunger	-0.21	-0.03	0.07	0.07	0.00	0.62
Constant	1.79	1.55	0.96	0.89	0.06	0.08

Results show that there is a week association between sex of the head of the household and livelihood coping strategy (0.02), livelihood diversity score (0.008) and household dietary

diversity score (0.03) and household hunger scale (0.04). Further analysis indicate that there is

an association between the livelihood coping strategy index of a household and household hunger scale (0.5) and is statistically significant ($p<0.05$).

10. RECOMMENDATION

We placed key recommendations in the executive summary, below find additional recommendations in order of priority: -

10.1. Medium priority recommendations

Build capacity for climate change adaptation for the livestock sector. The extension system's bias in favour of cropping systems results in limited support being provided to livestock farmers in as far as climate change coping and adaptation is concerned. In light of non-representation of the veterinary officer and livestock specialist at ward level, the project could adopt livestock farmer field schools and pilot and strengthen livestock lead farmers especially where value chains for these are to be strengthen. A fee-based approach could be piloted, where the livestock producer group pays a nominal fee, e.g., US$5 to the livestock lead farmer as an incentive and to help them meet their travel and lunch costs.

Support innovative private-sector led design and roll-out of crop and livestock insurance products for smallholder farmers. The recent experience in the 2021/2022 season where most surveyed farmers did not harvest any grain shows that without a viable system for resource recovery, farmers' resilience may be undermined. Some crop insurance products have been piloted previously by WFP in Masvingo, and valuable lessons could be learned from such projects, and where viable, tried in project districts. Weather indexed crop insurance, ground-trothed by farmer and extension officer managed weather station, and paying in stable currency, is suggested for consideration. Innovations like group policy cover could be explored by the project.

Facilitate the incorporation of interactions in farmer-focused mobile application to enhance trade. The project could consider investing in enhancing efficiency in crop and livestock produce trade through providing once-off funding to modify a popular mobile application to incorporate interactions required to facilitate trade. Farmers can be encouraged to take advantage of social media platforms such as WhatsApp to interact with and market their produce to local and external markets,

Build and strengthen community level intra-village production, exchanges and sales of seeds, fertilizers and feed to reduce exposure to external shocks. This would involve supporting locally based seed producers to expand their capacity and quality, thereby enabling those communities to look within for inputs rather than outside, thereby reducing the level and likelihood of contagion of external shocks. These producers could be supported through income generating projects. By reducing exposure to external shocks, this intervention would strengthen resilience.

Rethink model for supporting most vulnerable community members through community-based social protection. The elderly, disabled and young are some of the most vulnerable community members in the face of shocks. They are also least likely to belong to community based social protection organisations, and therefore also least likely to have a system to catch them in the face of a shock. One approach would be to support community groups to build their VSLs in exchange of community support to their vulnerable. For example, if a woman's poultry group is supported with seed capital, then in exchange they could use part of their profits to help orphaned children to stay in school.

Prioritise gender and youth mainstreaming across value chains: Baseline findings show a skew in favour of males with regards to participation in crop and livestock value chains. The project should consider mainstreaming gender across all value chain activities and monitoring effectively for this to inform project re-design and implementation in ways that can deliver impact for vulnerable groups, especially youth and women. Interventions should be designed such that males and females have an equal opportunity to access project resources, make decisions at household and community level, and benefit in terms of income earned and food security.

Build capacity in livestock and poultry management. One of the major constraints to livestock production appears to be lack of capacity at different levels, particularly exacerbated by the absence of a veterinary expert at ward level. Current practices by farmers suggest that there is low readiness for transition to commercially oriented production. A key missing link is the lack of awareness and knowledge. To achieve this, the project needs to strengthen existing structures, including dip tank attendants, extension officers at ward and district level, lead farmers, and district level staff in government and partner organizations. Where possible, veterinary products should be made accessible to farmers from local dealers rather than require travel to a far market. General areas for capacity strengthening range from disease prevention, feeding and feed formulation; general animal husbandry practices; breeding; pen fattening; marketing; negotiation and price determination; group dynamics, among others. This applies to the beef, goat and indigenous poultry value chains.

Promote and scale up solar driven water pumps. The project could support the establishment of solar driven water pumps and then bring water close to under-served communities through provision of piping and establishment of interspersed water points. This would significantly cut down distance and time and empower women through freeing time for other economic

10.2. Low priority recommendations

Support the development of community based and community driven early warning and early action systems: This could be done through teams comprising of beneficiaries and non-beneficiaries to play the role of disease and threat identification, awareness raising and containing contagion while promoting best practices. At community level such a system could be coordinated through the disaster management plan. Disaster management teams exist in most communities but most need reactivation and capacitation as well as clarification of role. Farmers need to be encouraged to share information on threats not only to crops, but livestock too.

Encourage farmers to take advantage of local and 'indigenous' knowledge. Presently indigenous knowledge offers an alternative and cheaper approach to addressing livestock and crop diseases for poor farmers. However, local and indigenous knowledge systems are characterized by information inconsistencies, lack of clear measures, and other challenges. The project should consider incorporating local knowledge systems and build up on some of the positive practices to enhance effectiveness.

Understand and strengthen off-farm activities and incomes, and support these to reduce household exposure to climate risks. Where households are predominantly dependent on rainfed farming systems there is a high risk of failure to meet food, nutrition and income requirements with increased climate change associated risks. If communities, through project

capacitated ISALs and VSLs, can support non-farm and off-farm activities then there is hope for communities to recover better from shocks and stresses.

Identify community-based trendsetters and support them: A shift in how support is delivered at community level may be a necessary to push and drive transformation towards a climate resilient system, as opposed to investing resources in raising awareness. Within local communities, the project could consider identifying and supporting promising farmers, through the extension system and learning briefs, and using them to benchmark what is possible, and then scale up the best practices or most promising approaches. For examples, helping a model farmer to access viable livestock markets and exchange some cattle stock for goat breeds of superior quality, may change attitudes towards selling livestock faster than 'pleading' in community meetings.

Learn from the experiences of other resilience projects. The project can learn on what works and why from previous projects, including the Zimbabwe Resilience Building Fund (ZRBF). The UNDP could consider commissioning specific research on learning accumulated so far from resilience projects and use this to inform the refinement of measures and activities planned for the current project.

Encourage farmer record keeping and use for decision making and supporting extension services with information. Maintaining records will support growing understanding of the smallholder farming systems, support mapping of diseases, build understanding of costs and help extension and project to evaluate capacity building impact. Where new breeds are being introduced to improve the local herd, there will be need to ensure that farmers are given adequate information in advance, and that monitoring ad learning are prioritised to facilitate adaptation to local conditions. Farmers should be encouraged to share information including market prices to help hedge against unfair practices by traders.

Establish and or strengthen Hygiene Clubs and link these to local government structures for support. Health clubs could be established where none exist or reactivated or members retrained where they were previously functional. These health clubs could be linked to some income generating activity through which members get money to build toilets.

11. CONCLUSION

The “Building the climate resilience for vulnerable agricultural livelihoods in Southern Zimbabwe” Project impact evaluation seeks to measure the impact of the climate resilience enhancing interventions on livelihoods of vulnerable households. This baseline survey established baseline values for critical indicators. The finding that treatment and comparison groups are balanced along observable characteristics at baseline adds credibility to the randomization process so any differences emerging after the program can be attributed to the treatment.

Agricultural value chains are generally weakly developed due to insufficient offtake capacity, and very few farmers involved in processing and value addition. While farmers can access climate information to inform farm decisions, lack of resources appears to constrain their capacity to respond to climate variability and extremes. Market information, however, remains very limited and farmers face challenges in accessing markets for inputs and produce. While various community groups offer social protection in the face of shocks, these mostly involve women and circulate low volumes of capital. Groups for collecting marketing of produce appear generally limited.

12. APPENDICES

Appendix I

The summary table of baseline indicator values and notes about how they have been computed is provided for a quick view.

Results Framework Indicators																						
			Group			Sex		Age			Province			Manicaland				Masvingo			Matabeleland	
Indicator	Population	Baseline Value	control	pure control	treatment	Female	Male	elderly	middle age	youth	Manicaland	Masvingo	Matabeleland South	Buhera	Chimanimani	Chipinge	Bikita	Chivi	Zaka	Mangwe	Masvingo	Gwanda
Indicator 4 - Number of males and females with year-round access to reliable and safe water supply despite climate shocks and stresses		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indicator 3: Number of males and females benefiting from the adoption of diversified climate resilient livelihood options (incl. fisheries, agriculture, tourism etc.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indicator 6- % of direct beneficiaries consistently using climate information/ product and services in farming decisions		33	26	26	49	32	36	32	36	33	29	38	35	26	17	39	14	47	48	37	39	33
Indicator 7- Use by vulnerable households, communities, business and public-sector services of Fund supported tools, instruments, strategies and activities to respond to climate (%)		0.8	0.5	0.1	1.8	0.6	1.0	0.8	0.7	0.9	0.2	1.3	1.0	0.1	0.3	0.3	0.0	2.9	0.0	0.0	0.2	1.8
0-25%		26.5	43.2	48.6	8.2	67.9	32.1	50.2	18.0	31.8	55.2	23.3	21.4	18.4	13.9	23.0	6.3	6.1	2.1	12.6	8.9	8.9
26-50%		51.9	33.7	32.6	33.8	65.0	35.0	47.4	26.2	26.4	42.0	37.7	20.3	20.2	8.7	13.2	7.6	16.4	2.4	10.5	11.3	9.7
51-74%		20.9	19.4	22.6	58.0	63.8	36.2	48.1	25.9	26.0	31.0	42.2	26.8	14.6	4.7	11.7	5.9	21.6	2.0	4.2	12.8	22.6

75-100%		0.8	21.9	3.1	75.0	53.1	46.9	28.1	40.6	31.3	12.5	59.4	28.1	3.1	3.1	6.3	0.0	56.3	0.0	0.0	3.1	28.1
Indicator 8 - No. of hectares under climate-proofed irrigation	11066	3872	1548	1169	1156	1523	2350	1008	916	1948	1607	1738	528	99	513	205	995	906	119	87	408	539
Indicator 9 - Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures (sample total land in ha)		3664	1468	1109	1086	1435	2229	952	853	1859	1520	1659	486	77	486	198	957	869	114	83	372	509
Indicator 9 - Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures (proportion (%) to total sample land)		39	36	39	42	38	41	39	**40**	39	41	44	28	48	16	47	31	54	37	24	42	31
Indicator 9 - Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures (ha using population)	75900	29601																				
Indicator 10- Average level of production increases (%) per hectare in newly irrigated hectares (tons/ha)	See crops production																					
Maize		300.7	177.7	493.4	221.3	254.1	397.9	311.1	264.2	319.0	439.9	217.4	179.2	155.6	349.1	717.8	115.4	208.6	289.7	91.4	254.8	206.7
Sorghum		154.2	130.6	144.5	172.4	153.8	155.4	173.7	127.5	149.8	155.5	144.1	160.6	119.3	127.4	212.7	124.8	127.4	212.9	146.0	179.1	169.5

Pearl Millet		125.2	125.1	93.6	134.9	115.0	148.6	131.3	102.0	147.7	147.6	111.1	104.7	123.4	173.0	205.0	64.7	125.4	216.7	83.9	180.4	214.3
Finger Millet		170.7	145.8	58.3	203.3	150.7	204.0	204.5	133.2	117.1	127.5	224.7	152.7	106.7	40.0	173.9	158.3	331.9	20.0	5.0	148.6	165.0
Cow Pea		149.2	128.4	197.6	141.8	139.7	169.1	121.3	160.0	197.4	102.1	197.9	149.4	105.1	105.0	88.3	173.7	115.3	573.0	66.7	226.0	174.2
Groundnut		189.3	144.3	234.0	185.9	169.1	228.6	204.0	194.7	150.5	158.0	197.7	211.9	154.9	106.4	286.9	119.3	202.9	314.1	159.5	194.3	234.3
Indicator 11 - Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems (expressed as proportion)		0.8	0.5	0.1	1.8	0.6	1.0	0.8	0.7	0.9	0.2	1.3	1.0	0.1	0.3	0.3	0.0	2.9	0.0	0.0	0.2	1.8
0-25%		26.5	43.2	48.6	8.2	67.9	32.1	50.2	18.0	31.8	55.2	23.3	21.4	18.4	13.9	23.0	6.3	6.1	2.1	12.6	8.9	8.9
26-50%		51.9	33.7	32.6	33.8	65.0	35.0	47.4	26.2	26.4	42.0	37.7	20.3	20.2	8.7	13.2	7.6	16.4	2.4	10.5	11.3	9.7
51-74%		20.9	19.4	22.6	58.0	63.8	36.2	48.1	25.9	26.0	31.0	42.2	26.8	14.6	4.7	11.7	5.9	21.6	2.0	4.2	12.8	22.6
75-100%		0.8	21.9	3.1	75.0	53.1	46.9	28.1	40.6	31.3	12.5	59.4	28.1	3.1	3.1	6.3	0.0	56.3	0.0	0.0	3.1	28.1
Indicator 13 - Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio (sample)		2047	562	572	913	1331	716	973	534	540	794	749	504	336	154	304	108	370	46	136	225	368
Indicator 13 - Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio(proportion(%))		49.0	40.6	39.6	67.6	48.7	49.6	48.7	53.4	45.5	44.2	51.3	54.8	43.7	40.0	47.2	37.6	59.1	50.0	33.6	49.3	71.5
Indicator 13 - Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio(number- population)	543620	266374																				
Indicator 14 - Increased % of women's membership in irrigation management committees		26	25	21	31			24	27	28	19	38	24	13	30	18	40	48	9	16	30	30

Indicator 16- proportion of women and men trained in financial management, and marketing and business development, with a specific focus on women targeting existing women producers' groups and savings and loans groups.		8	5	4	14	8	8	8	9	7	7	7	10	9	5	5	2	11	1	2	6	15
Other Indicators																						
Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale		severe- (23.5%) moderate+ severe(58%)																				
Livelihood diversification score		2	3	2	2	2	2	2	2	3	2	3	3	2	2	2	2	3	2	3	3	3
Asset ownership score		6	7	6	6	7	6	6	6	7	6	7	7	5	5	6	7	7	7	7	7	7
Proportion of households using atleast 10 climate smart agricultural production technologies (%)		69	64	59	84	67	72	68	74	65	62	79	66	69	64	52	72	82	78	60	80	70
Average Livelihoods based Coping Strategy Index score for households in targeted communities		2	2	2	3	2	2	2	3	2	3	2	2	2	4	4	2	2	1	1	2	2
Average number of shocks exposed per HH		5	6	5	5	5	5	5	5	5	6	6	4	5	6	7	5	6	3	7	4	5
Percentage of farmers practising value chain activities (on-farm & off-farm) in the past 12 months (%)		36	24	24	56	32	43	33	42	37	19	70	26	35	8	23	32	89	10	5	56	29
Proportion of beneficiary households with acceptable Household Dietary Diversity Score (HDDS)		15.3	14.2	14.4	17.6	14.3	17.3	15.0	17.3	14.1	7.6	23.9	16.9	9.6	6.8	5.6	11.9	32.0	18.5	17.3	21.5	16.5
Average monthly household income of households receiving GCF support (US$)		215.0	178.0	236.0	229.0	241.0	201.0	266.0	172.0	207.0	151.0	366.0	100.0	276.0	148.0	163.0	91.0	380.0	71.0	119.0	122.0	524.0
% of HHD with access to financial Services		80.0	77.0	76.7	86.5	79.0	81.7	79.0	82.6	79.3	84.9	89.0	56.0	89.3	94.6	73.8	88.2	85.7	92.4	47.2	93.4	62.9
Exposure to information score		3	4	2	2	3	3	3	3	3	3	3	3	2	3	3	2	4	2	3	4	3
Bridging social capital score		3	4	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	4	3
Access to finance score		1.4	1.3	1.3	1.6	1.4	1.4	1.3	1.5	1.4	1.5	1.5	0.9	1.7	1.6	1.2	1.5	1.6	1.3	0.7	1.5	1.1
Proportion Reporting Financial Inclusion score (%)																						
0		19	22	23	13	20	19	20	18	20	14	10	43	9	5	26	11	14	7	52	7	37
1		41	43	41	39	42	41	43	40	40	43	46	31	40	47	44	48	39	62	29	50	32

2		25	23	25	27	24	26	24	26	27	26	28	18	29	34	19	26	26	27	13	31	22
3		11	10	9	15	11	12	10	13	11	12	13	6	15	11	8	13	17	3	5	10	7
4		3	2	2	5	3	3	3	4	3	4	3	2	6	3	2	2	4	1	1	2	3

Appendix II

The table below pairs the findings and recommendations found in the executive summary with the relevant indicator.

Indicator	Indicator Definition	Relevant Finding/s	Recommendation/s
Indicator 1: Total number of direct and indirect beneficiaries	Beneficiaries who are directly benefiting from project interventions and other beneficiaries who are not directly connected to the project but will still benefit from it. This could be other members of the community or people from the area or in the value chain.		
Indicator 2: Number of beneficiaries relative to total population	Proportion of beneficiaries who are benefiting from project interventions relative to the total population in the given provinces.		
Indicator 3: Number of males and females benefiting from the adoption of diversified climate resilient livelihood options (incl. fisheries, agriculture, tourism etc.)	Beneficiaries/rainfed and in irrigation who have adopted and are benefiting from a range of livelihood options as a result of the project The population enumeration will be seprated by sex.		

Indicator 4 – Number of males and females with year-round access to reliable and safe water supply despite climate shocks and stresses	**Indicator 4** – Number of males and females with year-round access to reliable and safe water supply despite climate shocks and stresses: This indicator counts the number of beneficiaries who have unlimited access to safe water throughout the year.	**Males and females with access to reliable and safe water:** A total of 3078 households (1058 males and 2020 females) of 4080 households surveyed (73.6 percent) had access to a reliable water source throughout the year. Chimanimani and Bikita districts had the highest proportion of households with secure water throughout the year at 86.8 percent and 82.9 percent, respectively, while water security was least in Gwanda (65.2 percent) and Buhera (68.3 percent). Despite differences between districts, the field data from the baseline shows that gender of farmer, there was no significant difference in water access by household treatment type or their household type (treatment, pure control, or control) and age of farmer. For households experiencing water insecurity the main constraints were seasonal fluctuations of the water table causing source to dry up (71.7 percent) and breaking down of equipment (24.3 percent).	**Strengthen capacity of water point committees:** Water point committees are in existence in most of the targeted communities for this project. However, capacity to maintain water sources in a functional state is often a challenge, linked to factors such as insufficient training and costs. This training could piggyback on irrigation water management training, and could improve water security, including for supporting economic activities that are central to resilient livelihoods, which in turn will contribute towards resilience to climate shocks and stresses.

Indicator 5: Capacity for generation of climate information products/ services in decision-making in climate-sensitive sectors	Will measure the capacity of AGRITEX in generating climate advisories for use by farmers Scorecard is based on four factors with each rated from one to 100 to assess AGRITEX staff capacity in generation of inclusive climate advisories Results for all 155 AGRITEX staff involved will have to be at least 75% in two criteria at mid-term and 75% in all 4 criteria at the end of the project	At baseline, AGRITEX understands its mandate/role as the dissemination of advisories rather than the generation of climate information products and services to support decision making in climate-sensitive sectors. Indeed, AGRITEX being district based had the ability to facilitate that rain gauges managed by farmers were read and data submitted to the responsible institution, MSD. In fact, any training on rain gauges would have to be done by MSD with AGRITEX providing the site-specific context. Further, AGRITEX did not independently generate advice based on MSD analysis of data, but relied on advisories disseminated at district level, and cascaded those down to the ward level. Thus, the baseline concludes that capacity to generate climate information products by AGRITEX is low (20 percent or below)	**Training in climate advisories should focus on institutional mandates and community-level roles:** Agritex has presence at ward level and is most trusted source of advice by farmers. The Agritex officer has not been trained to generate climate advisories but can share any tailored information to help farmers make decisions, based on analysis by subject specialists at MSD, and passed on to Agritex through its provincial and district structures. If Agritex is seen to be generating the climate advice, then should the advisories be inaccurate, particularly due to climate change influence on predictability of seasonal weather, this would have implications for extension including farmer despondency to any other advisories. Training of Agritex should equip them with the toolkits for use for facilitating community interpretation of climate information

Indicator 6- % of direct beneficiaries consistently using climate information/ product and services in farming decisions	***Indicator 6*** **-** % of direct beneficiaries consistently using climate information/ product and services in farming decisions: This indicator measures the extent to which farmers use climate information products for decision making in activities that are sensitive to climate change. All households who said they use the information to make farming decisions were considered as the numerators and the denominator is the total sample.	**Consistent use of climate information, products, and services**: At baseline 65.6 percent of all households sampled (N=4080) had received climate information in the 2021/22 season. Treatment households (88 percent) had relatively higher access to climate information compared to pure control (55.5 percent) and control (55.2 percent) households. Of the households receiving climate information, **85 percent of them used the climate information provided to make farming decisions**. Climate information influenced decisions such as changing planting dates (81.6 percent); change in crop choice (62.7 percent) and change in the variety of crop planted (60.9 percent). Hardly any of the sampled farmers use crop insurance (1.2 percent) or livestock insurance (0.9 percent) due to lack of familiarity and information, perceived cost of such service, and general attitude towards risk.	**Strengthen capacity for collection of village-level climate data to inform tailored advice:** To enhance the relevance and uptake of climate information by smallholders, the GCF should invest in scaling up automated weather stations complemented by village level weather data collection using standard rain gauges. For automated stations, the project will need to identify a viable sustainability plan for internet data- which may include negotiating to have this paid for through devolution funds at RDC level. Farmers collecting rainfall data would need to be trained by MSD on accurate measurement, with data collected sent to the Agritex Officer for onward transmission to MSD. Having at least one rain gauge per village would increase data points for informing farmer decision making. **Use the farmer field school approach for disseminating climate information and other water, climate, and market advisories:** The GCF project should build up on existing farmer field schools (FFS) for information dissemination to farmers. Locally generated rainfall data could then be interpreted by the Agritex officer and shared in these platforms. **Capacitate the MSD on areas where gaps exist with respect to the focus of the GCF project**: MSD requires training around supporting institutions in mainstreaming climate change adaptation into various economic sectors, as well as on supporting stakeholders with appropriate decision support tools. Agritex and ZINWA both need training by MSD on data interpretation, processing and disseminating tailored climate messages to farmers and other users.

Indicator 7- Use by vulnerable households, communities, business, and public-sector services of Fund supported tools, instruments, strategies and activities to respond to climate (% using at least 3 CSA)	The indicator will measure use and behaviour change and implementation of CRA practices. A scorecard administered based on four factors will be administered to assess the uptake of CRA practices amongst smallholder farmers trained through the FFS. The score should be at least 75% for 32,617 farmers at mid-term and double the number of farmers at end of the project	**Fund supported tools, instruments, and strategies**: At baseline the proportion of households using tools, instruments, strategies, and activities to respond to climate were assessed. Using three CSAs as a measure, the baseline found that overall, the proportion of households using CSA was 94 percent. The proportion did not vary by gender or age of farmer. At district level, proportions of households using at least 3 CSA practices for responding to climate ranged from 91 percent in Chimanimani to 99 percent in Chivi.	Covered in other recommendations

Indicator 8 - No. of hectares under climate-proofed irrigation	The indicator measures the area under climate proofed irrigation systems being additional area in hectares from baseline. Individual area under climate-proofed irrigation were added to get the total number of hectares from the sample.	**Climate proofed irrigation**: Individual area under climate-proofed irrigation were added to get the total number of hectares from the sample. At baseline there is a total of 3872 ha under irrigation across sampled households in the 9 surveyed districts, with Bikita (995ha) and Chipinge (906ha) having the largest share, and Mangwe (87ha) and Buhera (99ha), the least. Measures for climate proofing irrigation used by surveyed farmers included mulching (71 percent); water harvesting (41 percent) and water scheduling (16 percent). Use of climate proofing practice for irrigation varied by location, with 85.7 percent of households in Mat South using at least one climate proofing practice, compared to 72.1 percent for Masvingo and 41.4 percent in Manicaland.	**Strengthen capacity of irrigation management committees in water management:** The Department of Irrigation in collaboration with Agritex should be capacitated to train and support irrigation management committees to set up and operationalize governance structures, including around management of water within irrigation schemes. A key element of this support would include helping to address past and ongoing conflicts in targeted irrigation schemes and supporting water users to develop and implement by-laws on water management, including use of climate proofing relevant to local area. (Short term) **Rehabilitate wetlands for sustainable access to irrigation water:** The GCF project should consider building capacity for sustained irrigation through engaging the Environmental Management Agency (EMA) and local environmental committees in intervention areas to rehabilitate wetlands as a medium-term strategy for ensuring sufficient recharge for local water resources. This will ensure that in the medium to long term the irrigation activities are supported by reliable and sustainable for irrigation. **Strengthen farmer capacity in climate-proofing irrigation:** The project should train farmers on climate proofing practices, including on how to harness data from rain gauges to inform irrigation scheduling. Learning from other irrigation schemes within and across districts on what works for climate-proofing irrigation could be facilitated through lead farmer exchange visits and or farmer led research through the farmer field school (FFS).

Indicator 9 - Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures	**Indicator 9** - Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures: A sum of individual farmer area under rain-fed were added together to calculate this indicator.	**Hectarage under water harvesting and climate-resilient water management measures:** At baseline a total of 3364 hectares drawn from across the survey sample was under water harvesting and climate resilient water management measure, with Masvingo province contributing the most (1659 ha) followed by Manicaland (1520 ha) and Mat South (486ha). There were statistically significant differences in hectarage across districts, with Buhera (77ha) and Mangwe (83ha) having the least area, and Chivi (869ha), Gwanda (509ha) and Chimanimani (486ha) contributing the most to the project total. Overall, treatment households had the least landholding under water-harvesting and climate resilient water management at 1086ha, compared to control (1468ha) and pure control (1109ha) households. Further, the baseline found some gender inequalities with respect to land with climate resilient water management practices, with male farmers controlling 2229ha and females 1435ha. At least 95.5 percent of households surveyed reported using at least 3 climate resilient water management measures, with treatment households having the highest proportion (98.7 percent), pure control at 94.5percent and control at 93.4 percent.	**Sustainably intensify crop production under climate resilient water management through learning for transformation:** The majority of farmers are already using climate resilient water management practices yet crop productivity under dry spells and drought stress appears to be low. The project should consider conducting a systematic review of these practices to facilitate learning on what works for increasing production using climate resilient water management practices. Farmer field schools facilitated by Agritex are recommended as platforms for farmer learning around such intensification, and this should be buttressed on learning from other farmers within and across districts, through lead farmer exchange visits, research from national agricultural research stations in different agricultural zones and harnessing this learning to transform practices locally.
Indicator 10- Average level of production increases (%) per hectare in newly irrigated hectares (tons/ha)	Indicator will measure the increase in production from baseline yields for specific crops in irrigation and dryland farmers supported by the project; Baseline yields for newly irrigated schemes vary by crop, to be confirmed at inception: 1. Maize: 0.1 tons/ha 2. Beans: 1 t/ha 3. Groundnuts: 0.5 t/ha	Not required	

Indicator 11 - Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems	The indicator measures the number of dryland and irrigation farmers practicing CRA. Sum of individuals who practice at least 3 CSA result in this indicator. A score of 1 was given to each CSA used and individual total was calculated. A farmer who practices at least 3 CSA was considered for the purpose of calculation of this indicator.	**Smallholders implementing climate resilient agricultural practices and cropping systems**: Using a minimum of any three practices, the baseline counted the number of households that were implementing climate smart agriculture (CSA). At least 3993 households of the 4180 surveyed (95.5 percent) were using at least 3 CSA practices. The proportion by district ranged from 91 percent in Chimanimani to 99 percent in Zaka. Age and gender of farmer were not predictors of CSA use among the survey sample.	**Incentivize production of climate-resilient crops through promoting or strengthening offtake capacity for those crops:** To encourage a shift in cropping systems in favour of climate-resilient crops, such as the traditional grains, the project should consider facilitating the capacitation of off-takers to get into contract with, and or increase their capacity, to purchase the local-climate smart crops. In a value chain approach, this would mean enhancing processor and aggregator capacity, through linking them more effectively with finance and technical assistance. Through strengthening livestock value chains, such as leather value chain on the back of government support, the project could support some low hanging fruits in ways that will increase household income and enable investment in climate resilient assets, including purchase of appropriate climate resilient inputs.

	Proportion of households adopting climate smart agricultural production technologies: This is the number of households in the target areas that are adopting climate smart agricultural production technologies expressed as a percentage of the total beneficiaries targeted. Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. These include conservation agriculture, soil and water conservation techniques, water harvesting technologies for irrigation. A score of 1 was given to each CSA used and individual total was calculated. A farmer who practice at least 3 CSA were considered for the purpose of calculation of this indicator and the numerator is the total number of households practicing at least 3 CSA and denominator is the total number of households surveyed.		
Indicator 12: Numbers of operational monitoring stations in key catchments and VIS systems.	The indicator measures the number of operational AWS and low-cost weather stations and hydrological monitoring stations	Not a requirement from the baseline survey	

Indicator 13 - Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio	***Indicator 13*** **-** Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio: This indicator counts the number of smallholder farmers receiving new advisories and warnings through various media developed for both agriculture and water management. The numerator is the sum of all individuals receiving warnings and denominator is the total number of households surveyed.	**Number of smallholders receiving new advisories and warnings:** A total of 2047 of the 4080 surveyed households (49 percent) at baseline were receiving advisory or warning information related to agriculture and water management. Proportions varied by province, being highest in Mat South (54.8 percent) and Masvingo (51.2 percent) and least in Manicaland (44.2 percent). Analysed by district, farmers in Mangwe (33.6 percent) and Bikita (37.6 percent) were the least likely to receive advisory information, while those in Gwanda (71.5percent) and Chivi (59 percent) were most likely to receive advisory and warning information for agriculture and water management. Further, field data shows that more treatment households (67.5 percent) were, at baseline, receiving advisory information compared to their pure control (39.6 percent) and control (40.6 percent) peers. Advisory information covered rainfall events (71.6 percent); dry spell or drought information (68.4 percent); crop pests (65.9 percent) and less so on agricultural markets (21 percent). Most respondents received advisory information from extension officers (85.7 percent); and radio (20.2 percent); lead farmer (18.6 percent) and SMS (17.4 percent) were also important. About 95 percent of those receiving advisory information shared it.	**Use social media and field school platforms to increase capacity to collect data to inform locally relevant advisories:** The GCF project should explore opportunities for engaging farmers in making observations and sharing data for informing advisories, for example, through the use of platforms such as WhatsApp and SMS. In addition, these platforms could be used for farmer sharing of market information, including early warning information, to protect farmers from exposure to market shocks.

Indicator 14 - Increased % of women's membership in irrigation management committees	***Indicator 14*** **-** Increased % of women's membership in irrigation management committees: This indicator was calculated as, numerator is the total females who responded that they are member of water user's group and denominator total number of female.	**Women's membership in irrigation management committees:** At baseline, men dominate irrigation management committees (IMCs) with on average women making up **26 percent of leadership** in these IMCs. The baseline found stark differences in women's leadership participation across locations, with Masvingo being the most inclusive province at two fifths of all IMC members being women (38 percent) followed by Mat South (24 percent) and Manicaland being the least (19 percent). Analyzed by district, Chivi and Bikita topped the list for inclusion of women in IMC leadership (48 percent, 40 percent, respectively). In contract, Zaka (9 percent), Buhera (13 percent) and Mangwe (16 percent) had the least proportion of women in their irrigation committee structures.	**Mainstream gender in the design, delivery, and measurement of results of this project:** The low proportion of women in IMCs is indicative of gaps in awareness and practice of including women as active participants in the development process, especially in decision making. Supporting women without sufficient knowledge of the gender inequalities at the structural level, may inadvertently undermine their resilience and push them towards vulnerability. Helping communities appreciate the needs of gender equity should precede any transfer of assets, lest this fuels GBV. Gender should be mainstreamed in this project, along with youth. The project should prioritize awareness raising on gender issues, including with respect to control of household assets and decision making over the use of household income and farming. Approaches should ensure that gender is actively mainstreamed in all capacity building activities, and throughout all other programmatic activities. Caution should be taken to ensure that women in leadership are not only meeting the quota but are indeed making decisions. This will require supportive infrastructure, including farmer to farmer exchanges between women in leadership across irrigation schemes, and other knowledge sharing events. -

Indicator 15: Number of women in strategic leadership positions in IMCs	The indicator will measure the number of women in IMCs occupying strategic decision-making positions; At least 50% of the positions should be occupied by women	At baseline, decision making at strategic level in Irrigation Management Committees (IMCs) is male dominated. The baseline found that women take up 26 percent of leadership roles in IMCs. Of all provinces, Masvingo was the most gender inclusive with 38 percent of IMC members being women, with Mat South at 24 percent and Manicaland performing the least at 19 percent. District level variations were statistically significant, ranging from 9 percent in Zaka and 48 percent in Chivi district. In FGDs, respondents also pointed that proportional representation did not help much with ensuring that women-specific issues were addressed, because 'the few males in the IMCs would dominate decisions regardless'.	**Track the participation of women in irrigation:** Indicator 14 and 15 both focus on women in leadership in IMCs. Considering that more land under climate-proofed irrigation is under male farmers (2350ha) compared to women (1523ha), the project should monitor the change in women's access to irrigation as an indicator of women's empowerment through irrigation. An increase in the proportion of women owning land under irrigation and owning or accessing other strategic resources associated with irrigation, such as land, water, pumps, would be indicative of progress in gender and social inclusion. **Resource support institutions with appropriate tools for addressing gender issues in the project:** In addition to gender awareness and responsiveness training that should be provided, the project should also focus on providing practical tools to support the implementation of project activities in irrigation. The Gender in Irrigation Learning and Improvement Tool (GILIT) can be used to support gender equity efforts in irrigation projects, while the REACH toolkit could provide guidance on how to include women in planning and evaluating irrigation projects. In the mid-term evaluation, the Pro-WEAI tool could be used to measure women's empowerment in irrigation.

Indicator 16- proportion of women and men trained in financial management, and marketing and business development, with a specific focus on women targeting existing women producers' groups and savings and loans groups.	This indicator measures the number of women who access financial training. Whilst the target is on women targeted by the project, a third of those targeted should be from women headed households.	**Proportion of women and men trained in financial management, and marketing and business development:** The baseline established that 7.5 percent of men and women surveyed has received training in the three competency areas. While there were no statistically significant differences by province, proportions varied substantially by districts, with Mangwe (2.5 percent) and Bikita (2.4 percent) being nearly six time less than in Chivi (11 percent) and Gwanda (15.3 percent). Further, women and men in the treatment group were three times more likely to have been trained (14.1percent) than peers in the pure control (3.7 percent) and control groups (5.3 percent). Gender of respondent was not a predictor of whether the respondent had received training in the three areas.	**Support the participation of young people and men in producer groups and VSLs:** The project should consider supporting the participation of men and young people in producer groups and VSLs which appear to be female dominated. In addition, the project should consider integrating income generating activities to support household incomes in ways that will enable households to generate off-farm income that will contribute towards agriculture input costs sustainably. While targeting women's groups already in existence is cost effective and ensures effective efficient implementation, there will be need to understand existing challenges faced by these groups, including around managing for conflicts. Knowledge exchange between these groups should also be considered for enhancing their profitability and exploring possible collaborations.
Household Dietary Diversity Score (HDDS)	Household dietary diversity refers to the number of food groups consumed by a household over a given reference period and is an important indicator of food and nutrition security for many reasons. A more diversified household diet is correlated with caloric and protein adequacy, percentage of protein from animal sources, and household income (Swindale & Bilinsky, 2006). The HDDS indicator provides a glimpse of a household's ability to access food as well as its socioeconomic status based on the previous 24 hours (Kennedy et al., 2011). The computation of this score was based on what respondents reported as having ate in the last day, and on this basis, households were classified as having either one of low, medium or good dietary diversity.	At baseline only 15 percent of households in the intervention areas have good dietary diversity. Baseline data shows that 41 percent if household met medium range while a further 44 percent were classified as having low dietary diversity.	

Household Hunger Scale	The HHS module in the questionnaire covered a recall period of 30 days and consisted of two types of questions (three "occurrence" and three "frequency-of-occurrence" questions). The respondents were first asked if a given condition was experienced (yes or no) and, if it was, then with what frequency (rarely, sometimes, or often). All questions were worded to be as universally relevant as possible and focused strictly on the hunger-specific experience of insecure access to food. The resulting responses were transformed into a categorical indicator of hunger. As a categorical variable, households were categorized as "little to no hunger in the household" (0-1), "moderate hunger in the household" (2-3), or "severe hunger in the household" (4-6). Frequencies were subsequently determined	At baseline, 37.2 percent of households had experienced little or no hunger; 22.2 percent had experienced moderate hunger, while the remainder 40.6 percent had experienced severe hunger. Treatment households had the least proportion of households with severe hunger experience (37.9 percent), compared to pure control (39.3 percent) and control (44.5 percent) households.	
Asset and Livestock Ownership Score	Asset ownership score- This score was constructed from 8 productive assets and 10 livestock assets. Each of the assets was assigned a score of “1” if the household owned the asset at the time of the interview, otherwise a score of “0” was given if they did not. The sum of all the 18 individual scores comprises the asset ownership score.	The overall asset and livestock ownership score was 6. Manicaland, which had the least livelihood diversity score, also had the lowest asset score at 6, with the other provinces scoring 7. Female farmers had a higher asset score (7) compared to their male peers (6), as were younger farmers (7) relative to their middle aged and elderly counterparts at 6. Households in the control households had slightly more assets (7) compared to the other two. Only those districts in Manicaland had an asset score of less than 7 (Buhera and Chimanimani, 5; Chipinge 6).	

Livelihood Diversity Score	Livelihood diversity score: this was calculated by 23 income generating activities the household participated in and a score of 1 is given when the household utilized the one, else zero score was given. The sum of all the 18 individual score gives the livelihood diversity score.	There is very limited range of livelihoods per household. At baseline, the overall livelihood diversity score for sampled households was 2, suggesting that incomes for the majority of households was derived from two activities. Across the project provinces, Manicaland had the least at 2, while Masvingo and Mat South were more diverse at 3 livelihood sources on average.	
Livelihood Coping Strategy Index:	This indicator was calculated using the following. The respondents were asked for a set of questions for selling or making changes of assets or livelihood in the last 30 days due to the lack food of or lack of money to buy food. The answer to these questions was yes/no. These 10 coping strategies were categorized into the following four groups: Emergency strategies: affect future productivity, and are the most difficult to reverse, Crisis strategies: such as selling productive assets and reducing human capital formation and are difficult to reverse; Stress strategies: such as borrowing money, purchasing food using credit or savings, indicates a reduced ability to deal with future shocks and can lead to a current reduction in resources or increase in debt; and Neutral strategies: do not employ any of the above strategies and reflect an improved ability to cope with shocks. The livelihood coping strategy index is then constructed as a weighted index of the adoption of these various types of coping strategies: LCSI = (adopt emergency strategy*4) + (adopt crisis strategy*3) + (adopt stress strategies*2) + (adopt neutral strategy*1) and the maximum score is (3 emergency strategies X4) + (4 crisis strategies X3) + (3 stress strategies X 2) = 30. The average LCSI per HH is reported for this indicator. The sum of these values yields the Livelihoods CSI.	The Livelihood Coping Strategy Index (LCSI) overall for the sample was 2. Manicaland had a slightly higher score of 3 with other provinces at 2. The baseline did not find any difference in LCSI by sex of farmer. However, on the basis of age, middle aged respondents had a higher index at 3, compared to 2 for the other age categories. Treatment households had a higher LCSI (3) compared to the pure or control groups. Focusing on districts, the baseline found that Chimanimani and Chipinge (4) had a high LCSI, meaning that households in those districts were more likely to experience food insecurity and lack of sufficient income.	

Shock exposure index-	This indicator was constructed using 27 shocks that were asked. If a household experience the shock, a score of 1 was given else score of zero. The individual scores were added together to come up with shock exposure index. Households that experienced at least 4 shocks were reported only.	Overall, the shock exposure index for the sample population was 5, with households in Manicaland (6) and Masvingo (6) having a higher exposure relative to those in Mat South (4). Gender and age of farmer were not relevant predictors of household shock exposure. However, the household type was correlated to the household's shock exposure index. The shock exposure index for the control households was 6, while the treatment and pure control were both at 5. Districts surveyed had significantly different shock exposure indices, with Chipinge and Mangwe having the highest at 7, followed by Chimanimani and Chivi (6). Zaka and Masvingo had the least shock exposure at 3 and 4, respectively.	

Value chains:	The respondents were asked value chains they participated in and these were grouped into storage and handling, value chains and marketing and distributions. A score of 1 was given if the household used a value chain. Individual who participated in at least a single value chain were reported.	Agricultural value chains are weakly developed for the crops and livestock classes that farmers are presently engaged in. Contract farming arrangements exist only for 6 percent of the surveyed farmers. Offtake capacity is low for crops and livestock currently being produced	**Build strong and viable offtake capacity to stimulate transition towards climate-resilient value chains.** There is evidence of farmers growing traditional grains under contract, but this is very limited with only few farmers engaged. The project should seek partnerships to strengthen the offtake capacity of food processors, including through increasing their access to capital, and ensuring that the legal framework is supportive of grain purchases by millers, as this will generate sufficient demand required to stimulate production of small traditional grains. At present farmers claim that they cannot produce these crops in large quantities as they consume a small portion and have no markets to offload excess. The same applies to livestock value chains, where the markets need to be more structured to allow farmers to sell at the right price as opposed to buyers detecting prices. In the beef and goat value chains, there are prospects for linking the project with the leather value chain programme that the Government recently rolled out with support from donors. When farmers keep their livestock for hide, the quality of meat will improve and therefore, earn farmers more overall. **Strengthen product off-take capacity and broker farmer input schemes to incentivise uptake of promoted practices.** It is important for the project to focus resources on learning more about the motivations for uptake of risk mitigating practices and behaviours and use this to inform programming. If off-takers are identified and linked with farmers, and in turn these off-takers are incentivised to provide inputs and extension advice, then farmers could be more forthcoming on technology uptake, leading to a reshaping and structuring of markets.

Access to finance Index	Respondents are asked if they own a bank account, if any member of the household is a member of an ISAL, has a mobile money account and if any member of the household had access to a loan in the past 12 months. If the household had used any, a score of one “1” is assigned and zero “0” otherwise. A sum of the individual scores are added to give the total score. The maximum possible score is 4.	Results show that the average access to finance index is one. Only six households had a score of 4 and 72% of the households had a score between 1 and 2. A total of 20% of the households had a zero score.	

Appendix III

Matching of sample

Matching of respondents was conducted using several covariates. The following were considered to create matched samples in this study. There were 3 groups to be matched and group membership of the participants is exclusive such that participants belonged to only one group; either treatment, control in treatment, or pure control. The two control groups were merged into a single control group and this was then used to match households. We selected some variables, discrete and continuous, which were used for matching between the groups. Majority of these variables were overlapping between the groups, hence a potential to produce a better match.

The Mahalanobis and Propensity Score Matching (known in STATA as psmatch2, combination of Mahalanobis and PSM) was utilised to match households. This entailed using psmatch2, a STATA module that implements full Mahalanobis matching and a variety of propensity score matching methods to adjust for pre-treatment observable differences between a group of treated and a group of untreated. To match, the following steps were followed.

(a) Selection of variables to include in the Propensity Score Matching. This included identification of the treatment, outcome (no outcome was included since it's a baseline), and covariates and these are explained below.
(b) Treatment: farmer group was used as the treatment factor. Since the approach adopted using binary values, the treatment group was coded as "one", the control group in the treated villages and the pure control group were combined and both recoded as "zero".
(c) Outcome: no outcome variable since it's a baseline
(d) Covariates: this included age, gender, religion, education, household size, household income, cultivation maize, sorghum and pearl millet and finger millet.

Overall, the matching resulted in 1,253 farmers in the treatment group being matched across the control groups. The BIE Matching Report provides additional details.

Appendix IV

Household Demographic Characteristics Summary- Manicaland										
		Treatment		Pure control		Control		Total		
		%	N	%	N	%	N	%	N	P-value
Gender of farmer	Male	32%	183	35%	221	34%	201	34%	605	
	Female	68%	391	65%	410	66%	392	66%	1193	0.508
	Total	100%	574	100%	631	100%	593	100%	1798	
Age of farmer	Youth	24%	140	32%	204	33%	196	30%	540	
	Middle age	31%	180	20%	129	20%	117	24%	426	0.000
	Elderly	44%	254	47%	298	47%	280	46%	832	
	Total	100%	574	100%	631	100%	593	100%	1798	
Level education	No education	1%	7	2%	11	3%	15	2%	33	
	Primary	1%	7	2%	11	2%	12	2%	30	0.384
	Secondary	49%	264	44%	259	50%	275	48%	798	
	Tertiary	43%	234	46%	270	40%	217	43%	721	
	Informal	1%	6	2%	12	2%	9	2%	27	
	ECD	0%	1	0%	2	0%	0	0%	3	
	Don't know	4%	24	4%	23	3%	17	4%	64	
	Total	0%	0	0%	1	0%	1	0%	2	
Marital status	Married living together	100%	543	100%	589	100%	546	100%	1678	
	Married living apart	39%	171	32%	161	40%	179	37%	511	0.002
	Separated	2%	10	5%	24	4%	18	4%	52	
	Divorced	3%	12	2%	10	0%	2	2%	24	
	Widow or widower	1%	4	2%	10	1%	6	1%	20	
	Single/Never married	7%	29	13%	63	8%	38	9%	130	
	Total	49%	215	46%	228	46%	206	47%	649	
Religion	Other	100%	441	100%	496	100%	449	100%	1386	
	Apostolic	1%	4	2%	11	1%	4	1%	19	0.006
	Christian (all groups)	50%	285	40%	252	51%	301	47%	838	
	African traditional	46%	264	55%	345	45%	264	49%	873	
	Islam	3%	16	3%	17	3%	19	3%	52	
	Total	1%	5	1%	6	1%	5	1%	16	
Household size	1-5 members	100%	574	100%	631	100%	593	100%	1798	
	6-8 members	48%	277	66%	418	51%	305	56%	1000	
	>8 members	40%	228	30%	191	40%	237	36%	656	0.000
	Total	12%	69	3%	22	9%	51	8%	142	

Household Demographic Characteristics Summary- Masvingo										
		Treatment		Pure control		Control		Total		
		%	N	%	N	%	N	%	N	P-value
Gender of farmer	Male	42%	206	36%	178	41%	200	40%	584	
	Female	58%	279	64%	310	59%	289	60%	878	0.140
	Total	100%	485	100%	488	100%	489	100%	1462	
Age of farmer	Youth	26%	124	33%	160	29%	144	29%	428	
	Middle age	30%	146	24%	118	23%	111	26%	375	0.021
	Elderly	44%	215	43%	210	48%	234	45%	659	
	Total	100%	485	100%	488	100%	489	100%	1462	
Level education	No education	1%	6	1%	7	2%	8	2%	21	
	Primary	2%	7	3%	13	2%	11	2%	31	0.173
	Secondary	37%	167	43%	202	43%	193	41%	562	
	Tertiary	54%	242	48%	224	45%	202	49%	668	
	Informal	1%	5	2%	9	2%	7	2%	21	
	ECD	0%	2	0%	0	0%	1	0%	3	
	Don't know	4%	19	3%	15	6%	29	5%	63	
	Total	0%	1	0%	0	0%	0	0%	1	
Marital status	Married living together	100%	449	100%	470	100%	451	100%	1370	
	Married living apart	40%	152	37%	149	41%	152	39%	453	0.648
	Separated	3%	12	5%	22	4%	13	4%	47	
	Divorced	1%	4	1%	4	1%	4	1%	12	
	Widow or widower	1%	5	1%	5	0%	1	1%	11	
	Single/Never married	10%	40	11%	45	9%	32	10%	117	
	Total	45%	171	45%	182	45%	166	45%	519	
Religion	Other	100%	384	100%	407	100%	368	100%	1159	
	Apostolic	0%	1	1%	3	0%	0	0%	4	0.351
	Christian (all groups)	43%	210	39%	189	43%	209	42%	608	
	African traditional	55%	266	59%	288	55%	269	56%	823	
	Islam	1%	7	2%	8	2%	11	2%	26	
	Total	0%	1	0%	0	0%	0	0%	1	
Household size	1-5 members	100%	485	100%	488	100%	489	100%	1462	
	6-8 members	47%	228	60%	291	56%	274	54%	793	
	>8 members	40%	194	35%	169	37%	182	37%	545	0.000
	Total	13%	63	6%	28	7%	33	8%	124	

Household Demographic Characteristics Summary- Mat. South										
		Treatment		Pure control		Control		Total		
		%	N	%	N	%	N	%	N	P-value
Gender of farmer	Male	23%	68	31%	102	29%	87	28%	257	0.068
	Female	77%	225	69%	222	71%	216	72%	663	
	Total	100%	293	100%	324	100%	303	100%	920	
Age of farmer	Youth	24%	70	24%	79	26%	78	25%	227	0.050
	Middle age	29%	85	20%	65	20%	61	23%	211	
	Elderly	47%	138	56%	180	54%	164	52%	482	
	Total	100%	293	100%	324	100%	303	100%	920	
Level education	No education	2%	6	1%	4	2%	5	2%	15	0.511
	Primary	1%	3	2%	6	2%	6	2%	15	
	Secondary	49%	136	59%	177	54%	150	54%	463	
	Tertiary	42%	118	33%	98	37%	102	37%	318	
	Informal	1%	4	1%	2	2%	5	1%	11	
	ECD	0%	1	0%	0	0%	0	0%	1	
	Don't know	3%	9	4%	12	3%	8	3%	29	
	Total	0%	1	0%	1	0%	0	0%	2	
Marital status	Married living together	100%	278	100%	300	100%	276	100%	854	0.737
	Married living apart	30%	67	28%	68	30%	69	29%	204	
	Separated	7%	15	5%	13	6%	14	6%	42	
	Divorced	2%	5	1%	3	3%	6	2%	14	
	Widow or widower	1%	3	2%	6	2%	4	2%	13	
	Single/Never married	9%	20	13%	31	14%	33	12%	84	
	Total	51%	115	50%	123	45%	102	49%	340	
Religion	Other	100%	225	100%	244	100%	228	100%	697	0.036
	Apostolic	0%	0	1%	4	0%	1	1%	5	
	Christian (all groups)	27%	79	21%	69	26%	80	25%	228	
	African traditional	68%	200	72%	234	64%	195	68%	629	
	Islam	5%	14	5%	17	9%	27	6%	58	
	Total	0%	0	0%	0	0%	0	0%	0	
Household size	1-5 members	100%	293	100%	324	100%	303	100%	920	0.061
	6-8 members	47%	138	56%	181	59%	178	54%	497	
	>8 members	41%	119	35%	112	31%	95	35%	326	
	Total	12%	36	10%	31	10%	30	11%	97	

Appendix V: Data analysis plan

Indicator	***Indicator Definition***	***Tool***	***Question***	***Tool ID***	**Method and Analysis**	***Disaggregation***
Household classification			B5		Descriptive stats by district and ward	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* *4.* Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* *5.* Age (youth, middle aged etc)
Demographic Characteristics of respondent			B1 C1-C9		Descriptive statistics by district	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* *4.* Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* *5.* Age (youth, middle aged etc
Description of the survey sample (Household Socio-Economic Status)			Module D D1-D19 Module E E1-E11		Descriptive, by sex of HHH and district	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* *4.* Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* *5.* Age (youth, middle aged etc

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
Asset ownership score			Asset & livestock modules (please indicate)		This score was constructed from xx productive assets and xx livestock assets. Each of the xx assets was assigned a score of "1" if the household owned the asset at the time of the interview, otherwise a score of "0" was given if they did not. The sum of all xx individual scores comprises the asset ownership score, which ranges from 0 to xx	6.
Livelihood diversification score		HHS	Module D		This summary variable ranges from 1-xx depending on how many livelihood activities or cash sources the households was engaged in during the past 12 months.	7.
Human capital score		HHS	HH roster		This binary variable is equal to "1" if any HH adult (aged 18 years or older) has completed primary school or has a higher-level education.	8.
Indicator 1 - Total number of direct and indirect beneficiaries	This indicator counts Beneficiaries who are directly benefiting from project interventions and other beneficiaries who are not directly connected to the project but will still benefit from it. This could be other members of the community or people from the area or in the value chain.		KII with UNDP		Add figures from project documents	1. District 2. Sex/gender (level1), *3.* Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*,
Indicator 2 - Number of beneficiaries relative to total population	This indicator measures the proportion of beneficiaries (direct and indirect) who are benefiting from project interventions relative to the total population in the given provinces.		KII with UNDP		Add figures from project documents	1. District 2. Sex/gender (level1), *3.* Province (level 1)

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
Indicator 3 - Number of males and females benefiting from the adoption of diversified climate resilient livelihood options (incl. fisheries, agriculture, tourism etc.)	This indicator counts the number of beneficiaries/rainfed and in irrigation who have adopted and are benefiting from a range of livelihood options as a result of the project.	KII	KII with UNDP Household survey data		Add figures from project documents Analyse the following: .	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* *4.* Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* *5.* Age (youth, middle aged etc
Indicator 4 - Number of males and females with year-round access to reliable and safe water supply despite climate shocks and stresses	This indicator counts the number of beneficiaries who have unlimited access to safe water throughout the year as a result of the project. Construction of climate proof and revitalized irrigation schemes is expected to lead to availability of reliable and safe water supply.	HHS	O1-O14	HHS	Number and proportion by districts, sex of HHH, B5	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* *4.* Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* *5.* Age (youth, middle aged etc
Indicator 5 - Capacity for generation of climate information products/services in decision-making in climate-sensitive sectors	This indicator measures the capacity of AGRITEX in generating climate advisories for use by farmers. A score card will be administered based on four factors with each rated from one to 100 to assess AGRITEX staff capacity in generation of inclusive climate advisories. Results for all 155 AGRITEX staff involved will have to be at least 75% in two criteria at mid-term and 75% in all 4	KII	1. How would you rate your departments (in this district) in the following aspects? 2. What tools do you use for disseminating climate information to farmers? 5. What is the level of Involvement of farmers in shaping the format of the seasonal forecast? Are services tailored to the needs of different farmers? How is that so? 6. What platforms exist for disseminating seasonal forecasts? 7. What level of capacity exists in the following areas? Rank your station's need for this skill on a scale of 1-5, one being least and five, highest.	Key informant interview 3	Narrative analysis The following criteria will be used: 1. Localized weather, climate and hydrological model forecasts generated regularly 2. Use of water resource models and translation of forecasts into impacts 3. Develop information products incorporate indigenous knowledge and 4. Dissemination of advisories in an inclusive and gender responsive manner	1. District *2.* Sex/gender (level1), *3.* Province (level 1)

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
	criteria at the end of the project.					
Indicator 6 - % of direct beneficiaries consistently using climate information/ product and services in farming decisions	This indicator measures the extent to which farmers use climate information products for decision making in activities that are sensitive to climate change	HHS	Module F F1-F17		Percentage by district, sex of HHH, B5	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Indicator 6 - % of direct beneficiaries consistently using climate information/ product and services in farming decisions	The indicator measures yield levels from small holder farmers crop production over seasons. This will be after support by the project and subsequent adoption of practices.	HHS FGD	1. What kind of information do you, as farmers, need with respect to seasonal climate? 2. What climate information are you presently receiving? Probe: Source, Reliability of information/trust of seasonal forecast; Information sharing 3. To what extent do farmers use this information? Please explain why or why not they use this information. What are the barriers to access to, and use of, seasonal climate forecast?	FGD	Descriptives Percentage by disaggregation's Narrative analysis	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		KII	1. What proportion of farmers are accessing climate information services? 2. What are the barriers to farmer use of seasonal forecasts? How can these be addressed?	Key informant interview 3	Narrative analysis	
			1. Are there any tailored climate and weather information products your organisation is providing in your district? Mention number, wards or villages these were implemented. 2. What is the extent of your institution's capacity (e.g., technical and financial) in	Key informant interview 1	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			terms of planning for climate change mitigation and adaptation? 3. Are there any mechanisms in place to disseminate this information to smallholder farmers? 4. If yes, what are these mechanisms and for how long have they been in place? 5. To what extent do you use climate information products/services in decision-making in climate-sensitive sectors in your district? How reliable has this climate information been in the past?			
Indicator 7 - Use by vulnerable households, communities, business and public-sector services of Fund supported tools, instruments, strategies and activities to respond to climate	The indicator measures use and behavior change and implementation of CRA practices. A scorecard administered based on four factors will be administered to assess the uptake of CRA practices amongst smallholder farmers farmers trained through the FFS The following criteria will be used: 1. Subscription and Active use of climate information products for crop/water management 2. Active use of climate-resilient crop varieties, crop-livestock systems, as well as water-efficient technologies 3. Active adoption for CRA practices promoted through the FFS curriculum. 4. Participation in O&M fund, community open learning days, and	HHS		HH Survey		1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* 5. Age (youth, middle aged etc

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
	participatory planning.					
		FGD	6. Have you conducted field-based training on water management for climate resilience in rain-fed farming? 7. If yes, what training was carried out? Mention by ward and village. Please also include relevant topics covered. 8. How many farmers, disaggregated by sex, participated in the training? How about youth farmers?		Narrative analysis	
		KII	3. What is the current uptake of climate-resilient among small holder farmers in your district	Key informant interview 2	Narrative analysis	
Indicator 8 **-** No. of hectares under climate-proofed irrigation	The indicator measures the area under climate proofed irrigation systems being additional area in hectares from baseline.	HHS	Module I I1-I7		Descriptive stats; by district and sex, B5	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		FGD	1. Irrigation is one other way of addressing climate risk. Are there any irrigation schemes serving this community? 2. What practices are farmers in this irrigation scheme using to address the issue of climate change? 3. What infrastructure exists for ensuring enhanced water security for this irrigation scheme, especially considering climate change related risks? (Cyclones, floods, drought)	FGD	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			4. What practices are farmers in this irrigation scheme using to address the issue of climate change? 5. What infrastructure exists for ensuring enhanced water security for this irrigation scheme, especially considering climate change related risks? (Cyclones, floods, drought)		Narrative analysis	
		KII	1. What farming practices are used by farmers to reduce exposure to climate hazards? 2. What proportion of the irrigation scheme is under climate proof irrigation farming techniques?	Key informant interview 2		
Indicator 9 **-** Number of rain-fed hectares exhibiting water harvesting and climate-resilient water management measures	This indicator measures hectares under dryland/rainfed production where farmers are practicing water harvesting and water management measures/ technologies eg basins, terracing, mulching etc.	HHS	Module I I8-I13		Descriptive stats; by district and sex, B5	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		FGD				
		KII	1. What are the climate change adaption interventions carried in the village/district? 2. What are the climate change mitigation interventions carried in the village/district? 3. Has any member of this community been involved in field-based training of farmers on rain-fed as a climate-resilient water management? 4. If any, how much training was carried out? Mention by ward and village		Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			5. How many farmers participated in the training? Disaggregated by males and females. 6. To what extent were these interventions important to you and your community?			
Indicator 10 - Average level of production increases (%) per hectare in newly irrigated hectares (tons/ha)	The Indicator measures the increase in production from baseline yields for specific crops in irrigation armers supported by the project; Baseline yields for newly irrigated schemes vary by crop, 1. Maize: 0.1 tons/ha 2. Beans: 1 t/ha 3. Groundnuts: 0.5 t/ha	HHS	Module J J1-J19		Descriptive stats; by district and sex, B5	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		FGD	1. What do most people in this community depend on for their livelihoods/ incomes? 2. Let's now talk about agricultural production. What are the current levels of agricultural production in your community? 3. Crops (yield per hectare) 4. Probe: Proportion of farmers growing small grains (sorghum and millets) and why?	FGD	Narrative analysis	
		KII	1. What are the current levels of agricultural production in your district? 2. Crops: ask for maize, sorghum, millet, groundnuts, round nuts, beans 3. Livestock: ask for cattle, goats, sheep, chickens	Key informant interview 1	Narrative analysis	
			1. Main crops 2. Average landholding per plot holder 3. Average production in kilograms per hectare for crops: a) Maize b) Beans	Key informant interview 2	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			c) Groundnut d) Other crop 1 e) Other crop 2			
Indicator 11 - Number of smallholder farmers implementing climate-resilient agricultural practices/cropping systems ***& Proportion of households adopting climate smart agricultural production technologies***	The indicator measures the number/proportion of dryland and irrigation farmers practicing CRA. A scorecard administered based on four factors will be administered to assess the uptake of CRA practices amongst smallholder farmers The score should be at least 75% for 30% of targeted farmers at mid-term and for 60% at end of term	HHS	Module I I14-I17		Proportion by district and sex of HHH and respondent, B5	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), Treatment Status (control, pure control, treated): level 2 4. Province (level 1), Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2, 5. Age (youth, middle aged etc
	This is the number of households in the target areas that are adopting climate smart agricultural production technologies expressed as a percentage of the total beneficiaries targeted. Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. These include conservation agriculture, soil and water conservation techniques, water harvesting technologies for irrigation etc.	HHS	Module I I14-I17		Also analysis average number of practices Number of HH with atleast 3 practices	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
		FGD	1. Do farmers use fertilisers? If so, for which crops? What are the main sources of fertiliser used? 2. If farmers are not using fertilisers, what are their reasons? 3. What are farmers doing (on their own without external assistance) to cope with, and adapt to, the effects of climate change? Are these measures working? 4. What support or interventions are being promoted by government and development partners operating in this area? 5. Tell me about the cropping practices that are being promoted to improve resilience to climate effects. What practices are these, and how are farmers taking up these practices? **Probe**: Challenges with uptake 6. Tell me about the livestock practices for enhancing resilience to climate change. Are there any measures in place? If so, what are they, and to what extent are these working? **Probe**: breeding; livestock fodder	FGD	Narrative analysis	
			7. What else needs to be done to enhance resilience to climate change in this community? Probe: who should do this? 8. There have been other interventions in the past that have sought to improve farmer resilience to climate change. We are interested in learning from these. What have you as farmers in this area learned from these projects? Can you please tell us what works if one intends to make a sustainable difference to communities (with respect to climate adaptation)?	FGD	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
Indicator 12 **-** Numbers of operational monitoring stations in key catchments and VIS systems.	This is the total number of weather and hydrological monitoring stations developed through project support. Weather and hydrological monitoring stations include but not limited to Low-cost water gauging stations, automated weather stations, Tahmo rainfall stations and hydrological stations.	KII	KII with UNDP, MSD			
Indicator 13 **-** Number of smallholders receiving new advisories and warnings developed for both agriculture and water management and disseminated through media, including SMS and radio.	This indicator counts the number of smallholder farmers receiving new advisories and warnings through various media developed for both agriculture and water management by GCF interventions.	HHS	Module G G1-G5		Proportion by district, sex of HHH, B5	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		FGD	1. What kind of information do you, as farmers, need with respect to seasonal climate? 2. What climate information are you presently receiving? Probe: Source, Reliability of information/trust of seasonal forecast; Information sharing 3. To what extent do farmers use this information? Please explain why or why not they use this information. What are the barriers to access to, and use of, seasonal climate forecast? 4. Is this information tailored to suit your needs as farmers? How should this information be packaged to make it relevant to your needs? 5. Are there any mechanisms in place to disseminate this information to smallholder		Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			farmers in your community? If yes, what are these mechanisms and for how long have these mechanisms been in place?			
		KII	1. Do you feel you have capacity to develop inclusive climate advisories? 2. If yes, why do you say you have capacity? If no, why do you think you do not have the required capacity? 3. Do you have access to weather, climate and hydrological information for climate-resilient agriculture? 4. If yes, how do you access this information as an organisation?	Key Informant Interview Guide 1	Narrative analysis	
Indicator 14 - Increased % of women's membership in irrigation management committees		HHS	Module Q A &B		Percentage by district, by sex of HHH & Sex of respondent, B5	
		FGD	1. Can you please tell me about the participation of women in climate resilience initiatives. Are there any barriers to their participation and involvement in decision making? 2. To what extent are young people involved in climate resilience initiatives? Why is that?		Narrative analysis	
		KII	1. Have you ever received any training as farmers in irrigation? 2. What training did you receive? (list)	Key informant interview 2	Narrative analysis	
Indicator 15 - Number of women in strategic leadership positions in IMCs		HHS	Module Q C-J		Percentage by district, by sex of HHH & Sex of respondent, B5	
		FGD				
		KII	3. Does the irrigation scheme have a management committee? 4. If yes, how many members are in that committee? a. Of the total, how many are women? b. How many are youths? 5. What sex are the following office bearers?	Key informant interview 2	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			a. Chairperson b. Secretary c. Treasurer 6. Does this irrigation scheme have a constitution?			
Indicator 16 - Number of women and men trained in financial management, and marketing and business development, with a specific focus on women targeting existing women producers' groups and savings and loans groups.		HHS	Module P P1-P7		Percentages by district, Sex of HHH and Sex of respondent, B5	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* 5. Age (youth, middle aged etc
		FGD				
		KII				
Indicator 17 - Number of women and men smallholder farmers participating in the planned 75 innovation platforms to build the climate-resilience and productivity of horticulture value chains		HHS				
		FGD	6. Are there any innovation platforms for diversified climate resilient agriculture and markets? 7. If yes which are these platforms? Mention by village and number of farmers participating.	FGD	Narrative analysis	
		KII	KII with UNDP			
Livestock Productivity		HHS	Module K K1-K12		Descriptive stats by district and sex of HHH, B5	1. District 2. Treatment Status (control, pure control, treated)

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
						3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
	Improved livestock practices	HHS	Module I I17	HHS	Descriptives	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		FGD	1. Livestock (number per household). Let's talk about livestock that farmers in this community own. 2. Probe: Are the breeds that farmers are using suited for this area? What breeds are they keeping for cattle and goats, and why?		Narrative analysis	
		KII				
Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale	Food Insecurity Experience Scale (FIES) is experience-based measures of household or individual food security. The FIES Survey Module (FIES-SM) consists of eight questions regarding people's access to adequate	HHS	Module L L1-L8	hhs	FIES, descriptive Moderate to severe 30days Severe 30days Moderate to severe 12 months Severe 12 months	6. District 7. Treatment Status (control, pure control, treated) 8. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 9. Province (level 1),

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
	food.This is calculated for a 12-month recall period to account for the household hunger status over all seasons, including the lean season. The FIES is calculated using severity weights for all 8 questions and applies the Raschmodel developed by FAO. Responses are grouped into 2 categories i.e no to little hunger and moderate to severe hunger.					*Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* 10. Age (youth, middle aged etc
Average Livelihoods based Coping Strategy Index score for households in targeted communities	The indicator seeks understanding of longer term households coping capacities as determined by income, expenditure and assets. It gives an understanding of behaviours of households engage in to adapt to recent crises (such as selling productive assets) and also provides insights into the difficulty of their situation and how likely they will be to meet challenges in future.	HHS	Module L LIVELIHOOD AND ASSET BASED COPING STRATEGIES		Food Security Indices	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2,* 5. Age (youth, middle aged etc
		FGD	1. What are the main sources of income in this village? 2. How are local livelihoods affected by climate change? 3. Can you compare your income levels in the past 2 years? How have you responded to erosion of income from agricultural activities?	FGD		
			4.			
		KII				

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
Household experience of shocks and stresses:	Shock exposure	HHS	Module M M1-M5	HHS	Proportion of households by district, sex of HHH, B5 Shock exposure index %of HH with any shocks exposed in the past 12 months %of HH exposed to at least 5 shocks in the past 12 months Average number of shocks exposed per HH	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
	Shock impacts on income and food consumption	HHS	Module M M1-M5	HHS	Descriptives	By major 5 shocks
	Household Responses to Shocks/ Shock coping stratgies	HHS	Module M M1-M5	HHS	Descriptive analysis Top 10 Coping Strategies by the Top 5 Shocks Exposed in the Past 12 Months	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc By major 5 shocks
		FGD	1. Let's now talk about the climate. What changes are you seeing in the seasonal climate as farmers in this area? (Probe: season start, predictability of the season, length of season, end of season, etc.) 2. How has climate change affected this community? (Negatively or positively)? Let's look at it in terms of agriculture, economy and society. **Probe**: are the effects the same for men	FGD	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			and women? How about young people? Economic Social Agricultural 1. Which households are most affected and why?			
		KII				
Percentage of farmers practising value chain activities (on-farm & off-farm) in the past 12 months	This indicator counts project participants as value chain participants if his/her primary purpose of the activity is to enhance the commercial value of a commodity to sell to/in the market	HHS	Module N N1-N13a	HHS	Proportion of households by district, sex of HHH, B5	1. District 2. Treatment Status (control, pure control, treated) 3. Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
		FGD	2. Value chain practices **Probe**: how easy to provide feed; markets for beef; do farmers who sell beef do any value addition, i.e., processing to make additional income). 2. Tell me about value chain practices in this community. What markets can farmers in this community access for (a) crops and (b) livestock? 3. Do farmers add value to their produce, and if so, how? **Probe**: How accessible are input and output markets?	FGD		
		KII	3. Is there any value addition to the crops being produced in your district? If yes please	Key informant	Narrative analysis	

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
			explain. 4. Is there any value addition to livestock being produced in your district? If yes please explain.	interview 1		
Proportion of beneficiary households with acceptable Household Dietary Diversity Score (HDDS)	Household Dietary Diversity Score is a measure of household food access (food consumption) that reflects household access to a variety of foods defined by the number of unique foods consumed by household members over a given period. It provides an estimation of the quality of a diet. The HDDS is not a nutrition indicator but a proxy for household socioeconomic status.	hhs	Module L HDDS		Food Security Indices (HDDS)	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Proportion of beneficiary households with acceptable food consumption	The FCS is considered as a proxy indicator of current food security. FCS is a composite score based on dietary frequency, food frequency and relative nutrition importance of different food groups. Therefore, it is a measure of dietary diversity, food frequency and the relative food nutrition of the foods consumed. It classifies households into three groups, poor, boarder line or acceptable food consumption.	hhs	Module L HDDS		Food Security Indices (HDDS)	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Average monthly household income of households receiving GCF assistance	This refers to the amount of income (in cash or in-kind) that a household earns from various economic activities	HHS	Module D D17-D18	hhs	Descriptive Monthly HH income Monthly HH Expenditure	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1),

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
	that the household members are engaged in. Income refers to money received, especially regularly, for work or through investments. In the rural settings, this also includes payment for causal labour, money from petty trade…etc					*Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Access to financial Services		HHS	Module E	HHS	HH Member in ISAL Used Load or savings Access to financial services Utility of loan	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Exposure to information:					This is the total number of xx topics about which the respondent received information in the past 12 months	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Bridging social capital score			Household co-operation module		This is based on responses from 4 questions: 1) xxxxx, 2) xxxxx, 3)xxxxx 4xxxxx. This score is an additive index,	1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1),

Indicator	*Indicator Definition*	*Tool*	*Question*	*Tool ID*	Method and Analysis	*Disaggregation*
					ranging from 1-8 based on responses to these two questions.	*Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc
Access to markets		HHS	Module N			1. District 2. Treatment Status (control, pure control, treated) *3.* Sex/gender (level1), *Treatment Status (control, pure control, treated): level 2* 4. Province (level 1), *Treatment Status (control, pure control, treated): level 2; Sex/gender: level 2*, 5. Age (youth, middle aged etc