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CLIMATE RISK MANAGEMENT: ACTORS, STRATEGIES, AND CONSTRAINTS FOR SMALLHOLDER FARMERS IN ZIMBABWE: A CASE STUDY OF CHIVI DISTRICT

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ABSTRACT

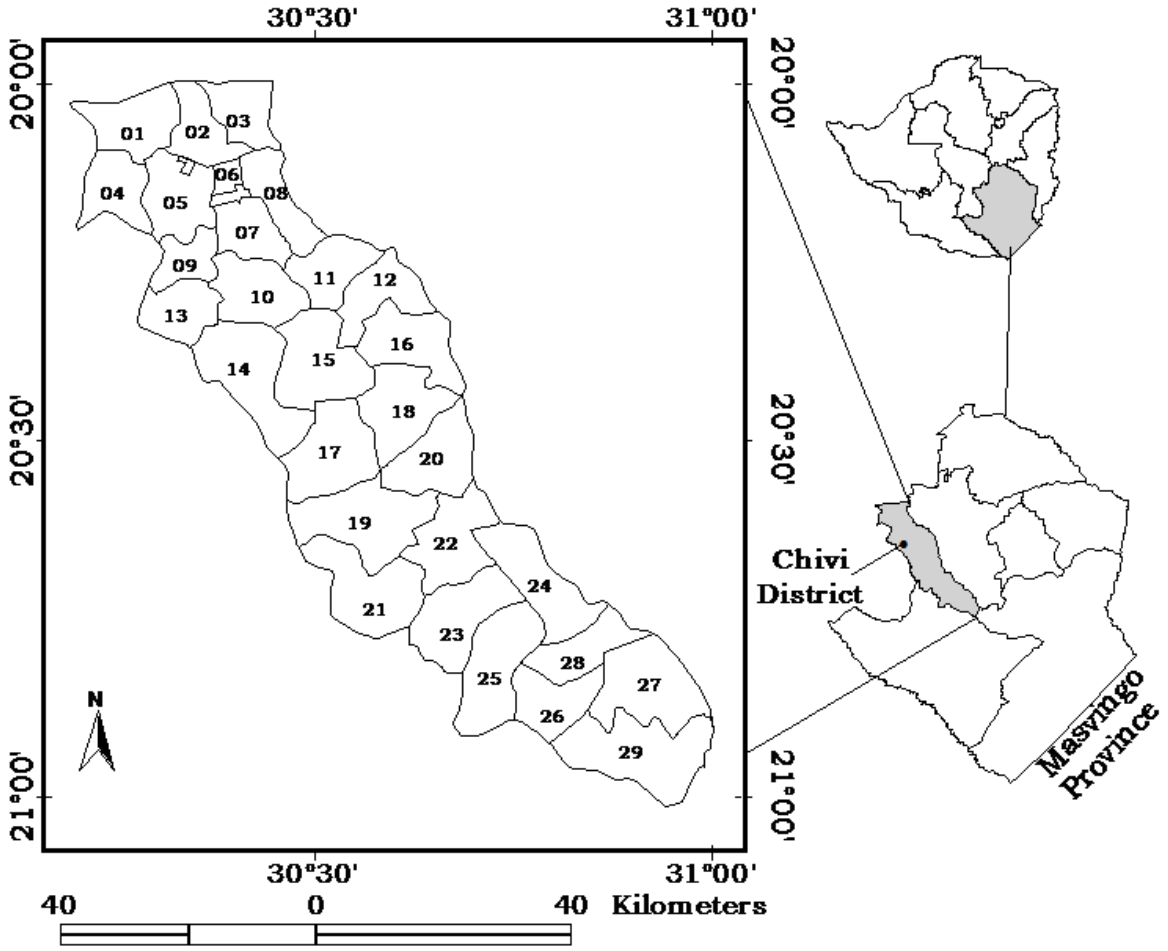
Smallholder farmers face climate variability and incidences of drought have been characteristic of smallholder farmer production in Chivi. Drought was the key climate risk in the investigation of the impact of climate variability on the sustainability of agricultural production and development of the community. With regards to climate risk management and the immediate impact of climate variability, smallholder famers in Chivi received food aid from Non Governmental Organisations (NGO)s, sought off-farm employment, sold livestock, and participated in food for work programmes among many other responses. In the long run the production of small grains such as millet and sorghum, Conservation Agriculture, crop diversification and, soil and water conservation were revealed to be more sustainable adaptation options. Agriculture, Technical and Extensions Services (AGRITEX) and NGOs were noted to be the key actors in climate risk management. The constraints to adaptation sustainability centred on lack of information, inputs, labour as well as the absence of reliable water sources.

Key Words: Climate risk,Management,Small holder farmers,Climate Variability,Drought

BACKGROUND

Zimbabwe's economy is agro-based and climate change may negatively affect agricultural production systems (Gumbo, 2006). Yields from rain fed agriculture may be reduced as a direct consequence of such scenarios as low rainfall. Most households are forced to resort to other means of raising income and coping with the climatic conditions such as the selling of livestock. A downward spiral in terms of sustainable human development thus characterizes the present state of small holder farmers in Zimbabwe. Poverty levels are high as shown by high unemployment rates and food scarcity with a high dependence on handouts from donors. They may have no alternative but to reduce consumption, cut nutrition, take children out of school, or sell the productive assets on which their recovery depends (UNDP, 2008). Agriculture is a source of livelihood for small holder farmers and extreme events such as flooding, drought may increase their vulnerability. Small holder farmers lack the capacity to adapt to climate change and they are left at a greater magnitude of risk. In a study by the International Food Policy Research Institute (IFPRI), farmers cited poverty, insecure property rights and lack of access to credit as significant barriers to sustainable adaptation (IFPRI, 2008).

Map of the study area



LITERATURE REVIEW-CLIMATE RISK MANAGEMENT

Climate Coping Strategies

As an immediate response, smallholder farmers usually sell their livestock to enable the realisation of income to buy food and pay school fees in the event of a bad harvest that erodes their ability to market their produce. A survey conducted in Mberengwa in 2010, revealed that some households engaged in destocking either through slaughtering or sales of livestock. This was in order to keep pace with approaching drought conditions that saw a decrease in livestock water and pasture thus reducing some form of loss that would be incurred if the livestock were left to die of starvation (Jerie & Matanga, 2011). Furthermore, the same study observed that, households also engaged in slaughtering and selling livestock as a way of acquiring food during drought induced famines. This decreases the wealth of the smallholder farmers and draught power to till the fields the following season. The very poor do not have such alternatives like selling of livestock and thus low crop yields have got a more devastating impact on these households.

Climate Adaptation Strategies

Small holder farmers have engaged a significant number of strategies to help them cope with climate change and variability. Some have adopted conservation agriculture, introduced irrigation, planting different crops and varieties that are also drought resistant. Conservation Agriculture has been adopted as a potential solution to production sustainability problems being faced by smallholder farmers. Its principles are to ensure minimum disturbance of the soil, timely implementation of operations, particularly planting and weeding; keeping the soil covered with organic materials such as crop residues or cover crops as much as possible; and crop mixing and rotation. (Twomlow et al, 2008). Conservation Agriculture helps in soil fertility and water management through the conservation of soil water, nutrients, and farm power (Mazvimavi et al, 2010). This implies that the strategy is of importance to smallholder farmers in Chivi given the fact that they are located in regions IV and V which are predominantly low rainfall areas. Soil and water management practices may help farmers achieve higher sustainable crop yields because they will be able to utilize the limited and unreliable rainfall they receive each season (Mazvimavi et al, 2010).

The establishment of irrigation schemes is another strategy that has been adopted by farmers in Zimbabwe. This has been prompted by the increasing climate variability taking place in the country that has since resulted in unpredictable rainfall hence the need for irrigation. It has been observed to be a means of improving food security and improving the standard of living of the rural people. Farmers in areas under irrigation in Zimbabwe realize greater income than those practicing dry land farming as shown by a study conducted by FAO of 10 irrigation schemes in regions 2, 3 and 4 (FAO, 1997). AGRITEX revealed that 11000 hectares were under smallholder irrigation farming, 9% of irrigation in Zimbabwe; with Masvingo having 2796ha with 37 irrigation schemes (FAO, 1997).This may justify the need for irrigation in Chivi given that the area is located in region IV and V of the country. The study highlights that the irrigation schemes in Zimbabwe have not been extensive.

Crop diversification and mixed crop-livestock systems have been noted as strategies being used by smallholder farmers to cope and adapt to climate variability. Some farmers are involved in the production of drought resistant varieties such as sorghum and millet that are able to thrive with less water. Maize is Zimbabwe's staple crop and with the current climate variability characterised by high frequency of mid-season dry spells and shortening of the rain season, people in Chivi are now growing resistant varieties such as sorghum, finger millet and rapoko (Dhliwayo, 2007; Mutekwa, 2009).

These highlight the efforts that have been made by smallholder farmers to minimise the negative effects of climate variability on their agricultural operation. They provision themselves for a guaranteed food security since different crops are affected differently by climatic conditions.

Livestock rearing has been noted by Mano and Nhemachena (2007) as an important livelihood source in a dry climate especially cattle to substitute crop production or in combination with crop production. Smallholder farmers especially in Region IV and V have income sources that have already been eroded as a result of a number of factors such as the unstable economic conditions in the country; hence they cannot afford to purchase cattle to help engage in crop livestock systems. The issue of resource endowments will take a central place because those households with better access to income will be able to buy cattle.

Constraints to Smallholder Farmers Adaptive Capacity

A number of factors have to be considered to ensure the adoption of these strategies. Smallholder farmers do not have the financial ability to introduce irrigation and have to depend on NGOs to provide them with these facilities. Different crops and varieties have been introduced but the challenge has arisen from how these will sustain their livelihoods. Some of the varieties adopted such as cow peas, sorghum and millet are not preferred by the smallholder farmers partly because of lack of market. Resource limitations and poor infrastructure limit the ability of most rural farmers to take up adaptation measures in response to changes in climatic conditions (Nhemachena & Hassan, 2007). Smallholder farmers are located in areas where the transport systems are poorly developed and may not attract investors in strategies such as irrigation. Their income sources, as earlier noted, are limited and restricted to agricultural production and hence strategies that require capital

Lack of credit, rationing of inputs and lack of seed limit the ability of farmers to get the necessary resources and technologies they might want in order to adapt to changing climatic conditions (Nhemachena & Hassan, 2007).These are factors that have been observed to be undermining the efforts that are made by smallholder farmers in southern Africa. This study will be in a position to investigate if the same factors will be found in areas of unreliable rainfall and poor soils of region four and five in Zimbabwe.

The HIV/AIDS that has devastated the whole of Sub Saharan Africa has also not spared smallholder farmers in Zimbabwe. Households have lost family members to the disease. This has resulted in a reduction in the labour available to work in the fields hence the output in the form of food yields will be reduced and thus an overall impact on household food security (ZIMVAC, 2005). The disease takes its toll on the productive groups of the population group that is between 20 and 60. Smallholder farmers are thus at greater risk given their dependability on agriculture for livelihood. Smallholder farmers end up selling their livestock especially cattle to sustain their household income in the event of low maize crop yields.

DATA AND METHODOLOGY

The primary data used in this study is drawn from a household survey carried out in Chivi district by the researchers. Stratified random sampling was used. All the wards in these districts were classified into three clusters according to proximity to Chivi Centre (nearer, middle and far remote ward). One ward was randomly selected from each cluster to give us 3 wards in the district. In each ward, 2 villages were randomly selected from village lists that were obtained from

the village leadership. From selected villages, lists of smallholder farmers were obtained from village heads and these were stratified by gender of the household head as well as wealth status of the household. Households were put into three wealth categories of poor, medium and rich. The three categories were created in consultation with the local heads and the extension staff (AGRITEX). The wealth status of smallholder farmers highlighted the aspect of different resource endowments which highlighted the economic aspect of the study. Using a questionnaire, the survey gathered information on the household demographics, risks and shocks affecting households, climate risk and management, household decision making and maize-Crop harvest details.

Analytical Approach

The study followed the risk chain analysis framework outlined by Heitzmann et al (2002) to enable the analysis of climate risks, impact and management amongst smallholder farmer households of Chivi. This follows the notion that all households are vulnerable to risks (Holzmann & Jørgensen, 2000) and vulnerability has been defined as the forward-looking state of expected outcomes, which are in themselves determined by the assets of a household, the correlation, frequency and timing and severity of shocks and by the risk management instruments applied (Heitzmann et al ,2002). Climate risks will potentially affect the welfare of households if they are realized, and in this study, interest was on those risks that are likely to cause negative impacts to the household such as drought which results in food insecurity and difficulty in securing livelihoods. Risk management follows thereafter with focus on:

- Risk management strategies (risk reduction, mitigation and coping);
- Risk management arrangements by level of formality (informal, market-based, and publicly provided or mandated), and
- Actors in risk management (from individuals, households, communities, NGOs, market institutions, government, to international organizations and the world community at large (Holzmann & Jørgensen, 2000).

DATA PRESENTATION AND ANALYSIS

Household Characteristics

In the study, the researchers purposively sampled both male and female headed households to capture the gender differentiated implications of climate variability (Table 1). This entailed a gender analysis of the socio-economic impact of climate change and variability on smallholder farmers. The results show that on average the female headed households have more experience in farming with 34 years against the experience of male headed households who have 25 years (table 1). The male heads on the other hand have generally spent more years in school with an average of 8 years whilst the female have 5 years. In terms of age the female headed households average 58 years against their male counterparts who average 52 years.

Table 1: Household characterization: mean difference by gender

	Gender of Head	n	Mean	Min	Max
Farming Experience	Male	54	24.81	4	60
	Female	54	34.59	2	71
Age	Male	54	51.69	25	95
	Female	54	58.65	25	93
Education	Male	54	8.02	0	11
	Female	54	5.17	0	11

Source: Household Survey data; n= number of households

The study was composed of 36 households within differentiated wealth classes, the poor, middle and rich classes (Table 2). The average age of the household heads is 55.17 years, with the mean amongst the poor being 49.97 years, middle 55.36 years and rich 60.17 years. This may be attributed to resource endowments that determine access to healthy standard of living characterized by unrestricted access to health facilities and food and nutrition balanced diet, hence a higher average within the rich and lower years within the poor who may not have attained assets. The Middle class have generally spent more years in school with an average of 7 years with the poor and rich having lesser averages of 6.3 years. The poor had the least years of farming experience with 23.56 years, the middle and rich class had higher years of 31.42 and 34.14 years respectively. The middle and rich classes as a result of better access to income and resources such as agricultural inputs are always involved in production every season. On the other hand the poor have less farmer experience as factors such as lack of inputs, limited land and poor rains, and farmers may go for some seasons without meaningful production.

Table 2: Household characterization: mean difference by wealth class.

	Wealth Class	N	Mean	Min	Max
Farming Experience	Poor	36	23.56	2	60
	Middle	36	31.42	5	71
	Rich	36	34.14	5	59
Age	Poor	36	49.97	25	87
	Middle	36	55.36	25	93
	Rich	36	60.17	26	95
Education	Poor	36	6.33	0	11
	Middle	36	7.14	0	11
	Rich	36	6.31	0	11

Source: Household survey data

CLIMATE RISK MANAGEMENT

Coping strategies

Coping strategies adapted by Male and Female headed households.

Households in Chivi have adopted various strategies to cope with drought. Table 3 denotes that the majority of the households' receive food aid, with 51.9% amongst the women and 40% within the male headed. Women are considered to be more vulnerable than men and as such NGOs target more women when distributing food aid in disaster times associated with drought. Men on the other hand have a marginally lower frequency as they are usually in a better position to make greater efforts through migration to urban areas to seek employment and earn money which they will use to boost the household food store. More male headed households are involved in off farm employment efforts with 12.5% against 6.3% by female headed households. Closely linked to this observation is the participation in food for work by the households in the district. 25% of the female households resorted to selling livestock during drought whilst 16% cited this strategy amongst men. Borrowing from fellow households and relatives is common due to the absence of the formal financial sector at communal levels. 6% cited this strategy amongst the male headed households and ZIMVAC, (2009) in their survey of rural households' livelihoods noted that borrowing was a non-sustainable strategy employed to increase food supply. The replanting of seed was noted amongst the female households with 1.3%.

Table 3: Climate coping strategies (% by gender and wealth class)

Coping Strategy	**% of sample**	**Gender of Head**		**Wealth Class**		
		Male%	Female %	Poor %	Middle %	Rich %
Did nothing	11.1	10	5.1	5.6	8.8	8.3
Sold livestock	30.6	16.3	25.3	13	19.3	31.3
Borrowed	4.6	6.3	-	1.9	5.3	2.1
Received food aid	67.6	40	51.9	44.4	47.4	45.8
Participated in Food for work	10.2	10	3.8	14.8	5.3	-
Migrated to other areas	2.8	2.6	1.3	3.8	1.8	2.1
Off farm employment	13.9	12.5	6.3	13	8.8	6.3
Ate less	4.6	1.3	5.1	3.7	3.5	2.1
Replanted seed	0.9	-	1.3	-	-	2

n=108, Source: Household Survey Data

Coping strategies adopted by households of different wealth classes.

Table 3 also highlights the coping strategies adopted by households of different wealth classes. Receiving food aid was common amongst all the classes with 44.4% amongst the poor, 47.4% the middle class and 45.85 within the rich having cited it as a coping strategy. NGOs engaged in extensive food aid distribution during this period and this targeted all households despite their wealth status. Selling livestock during drought was engaged by 31.3% within the rich, 19.3%

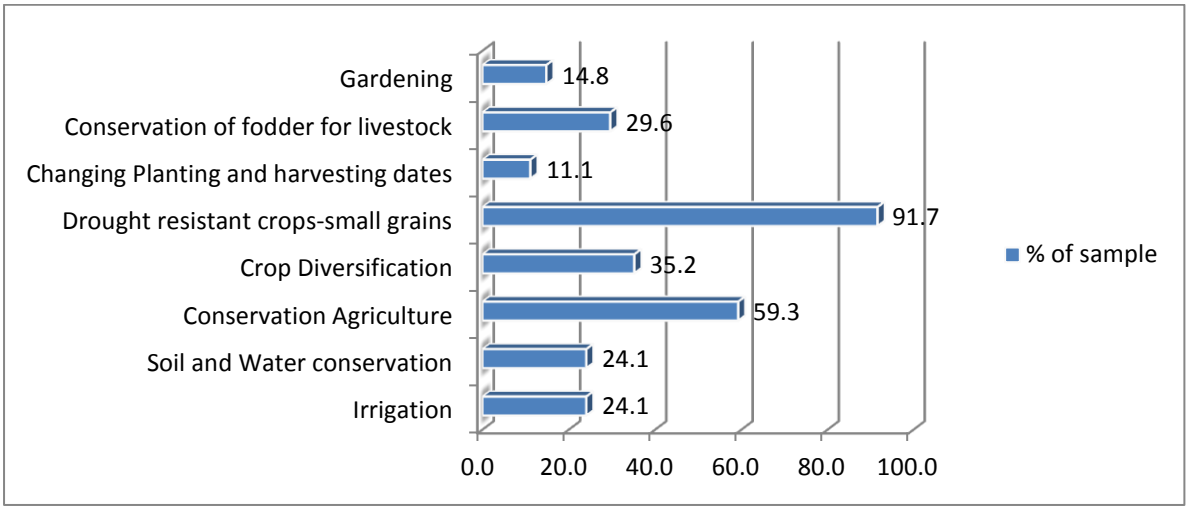
within the middle class and 13% within the poor. This may be due to the fact that the rich usually own more livestock than other classes and during drought may be able to dispose them to safeguard the family income and food security. Food for work was mainly adopted by the poor with14.8% citing the strategy, 5.3% for the middle class and none of the rich households cited it. Across the wealth categories, household members sought off-farm employment to generate income during drought periods.

Adaptation strategies

The smallholder farmer households in Chivi have made long-term adjustments in crop and livestock production systems in response to the past drought experience characterized by rainfall variations. The use of small grains such as millet and sorghum (91.7%) and Conservation agriculture (59.3%) appear to be the major adaptation strategies in the area (Figure 1). These results are similar to those found by Mutekwa (2009) and Altieri & Koohafcan (2008) who reported that farmers given the high frequency of mid-season dry spells and shortening of the rain season grow short season and drought-resistant crop varieties, such as sorghum, pearl, and finger millet. Conservation Agriculture is another strategy that has been adapted by smallholder farmers in Chivi. Conservation agriculture is being promoted throughout sub-Saharan Africa as a solution to low productivity levels, reducing smallholder farmers' vulnerability to drought, addressing low draft power ownership levels, and combating increasing levels of soil degradation and loss of fertility (Twomlow et al, 2008).

Crop diversification was cited by 35.2% of the households and has played a key role in climate risk management. This strategy reduces the risk of complete crop failure in the event of mid-season dry spells and due to different responses to climatic conditions, some crops tend to survive. Similar trends were reported in Southern Africa by Nhemachena and Hassan (2007). 30% of the households are conserving fodder to feed their livestock in times of drought. To deal with the water shortages that are characteristic of drought, irrigation was resorted to by 24% of the households' resident in ward 7 (Utsinda) where an irrigation scheme was introduced by Zvishavane Water Project along the course of Tugwi River. Soil and water conservation techniques are also common in Chivi with 24% of the responses. The main techniques include the use of infiltration pits and tied ridges that retain run-off water. Other adaptation strategies for the households of Chivi are gardening and changing planting and harvesting dates. Gardening helps supplement household food security and changing dates for planting and harvesting is in light of climate variability whereby rainfall is now received later than the expected period. Farmers may thus be in a position to realize better yield.

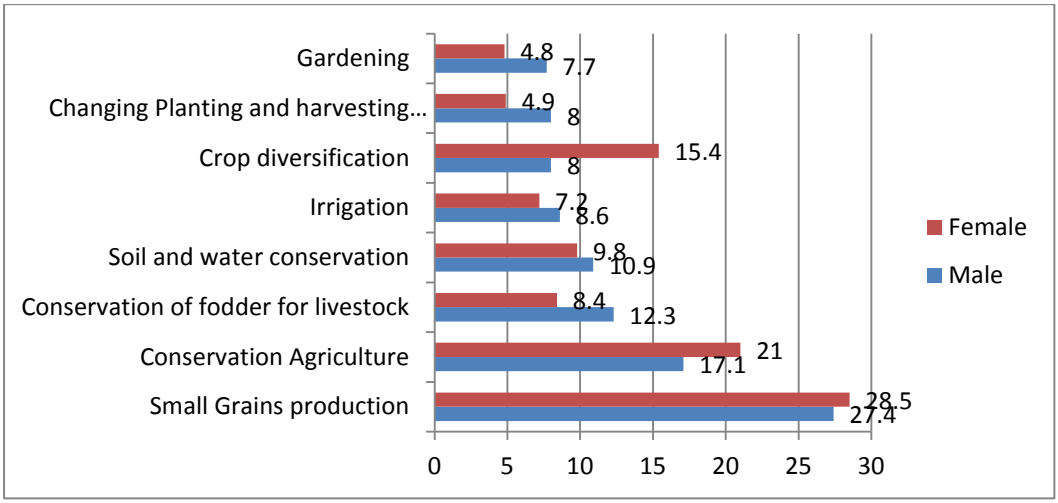
Figure 1: Adaptation strategies utilized by households (multiple responses possible; n=108)



Climate adaptation strategies: differentiated by Gender.

Figure 2 shows the adaptation strategies adopted by male and female headed households in Chivi district. The use of small-grains remains the widely adopted strategy with 27.4% amongst the male and 28.5% amongst the female. Conservation agriculture was reported by more female headed households who had 21.0% with the men having 17.1%. This may be attributed to the high labour demands that are associated with the strategy and thus fewer men partake in the strategy as compared to the female headed households. Closely related to this is crop diversification that was reported by 15.4% of the female headed households and by 8% of the male households. The conservation of fodder for livestock is common amongst the male headed households with 12.3% as they usually own more livestock when compared to the female headed households who have 8.4%. Soil and water conservation, irrigation, gardening and the change of planting and harvesting dates were noted to be common amongst the male headed households with marginally higher frequencies when compared to the female headed households.

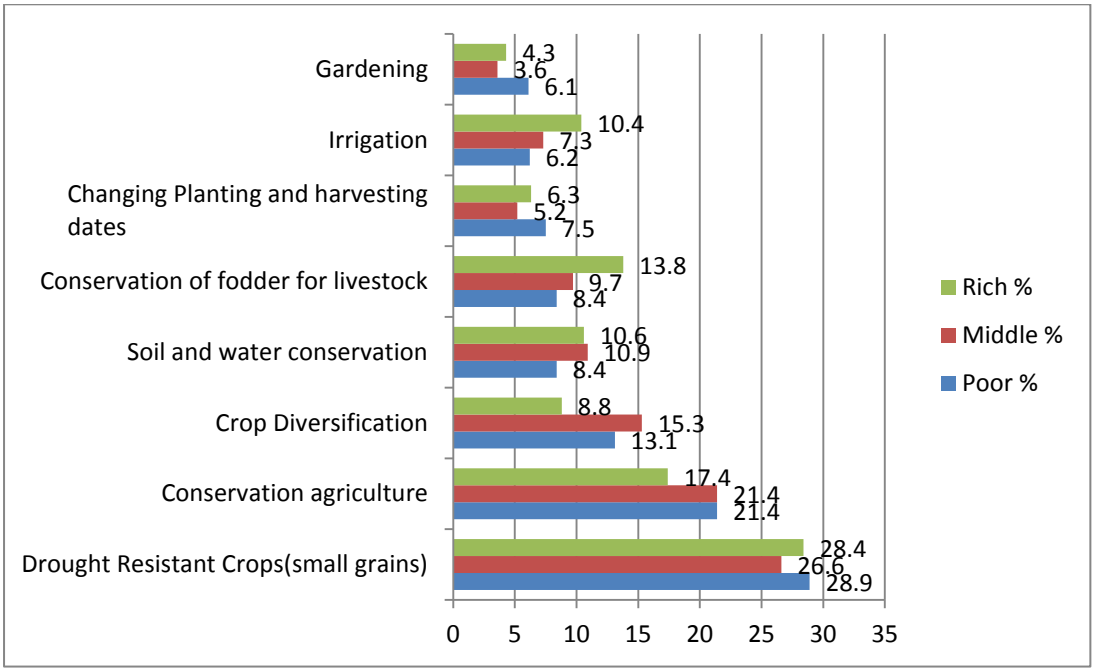
Figure 2: Adaptation strategies utilized by male and female households (multiple responses possible)



Climate adaptation strategies: differentiated by Wealth class.

Households of different wealth classes in Chivi as alluded to earlier on are affected by drought and as such the production of drought tolerant varieties dominates all the three classes (Figure 3). Conservation Agriculture was noted by 21.4% respectively within the poor and the middle class whilst the rich had 17.4%. This is largely to do with cattle ownership. The rich usually have higher numbers of cattle to enable tillage using draught power when compared to Conservation Agriculture (CA) that requires manual labour in its various operations such as weeding and basin digging. This can be closely linked with the conservation of fodder for livestock where the rich had 13.8% against the middle class who had 9.7% and 8.4% amongst the poor. Crop diversification efforts are more pronounced amongst the middle class (15.3%), poor (13.1%). The rich have a lower frequency of 8.8%. The rich because of better access to disposable income manage the persistent drought conditions using irrigation thus, 10.4% reported the strategy. This guarantees them higher returns in the form of yield and the household may realize more income through diversifying to horticultural activities. The middle class had 7.3% and the poor 6.2% to show the decline in levels of disposable income between the three wealth classes. Soil and water conservation is common amongst the three classes though more pronounced amongst the middle class with 10.9%. The poor dominate in the change of planting and harvesting dates and gardening as adaptation strategies.

Figure 3: Adaptation strategies utilized by households of different wealth classes (Multiple responses possible)



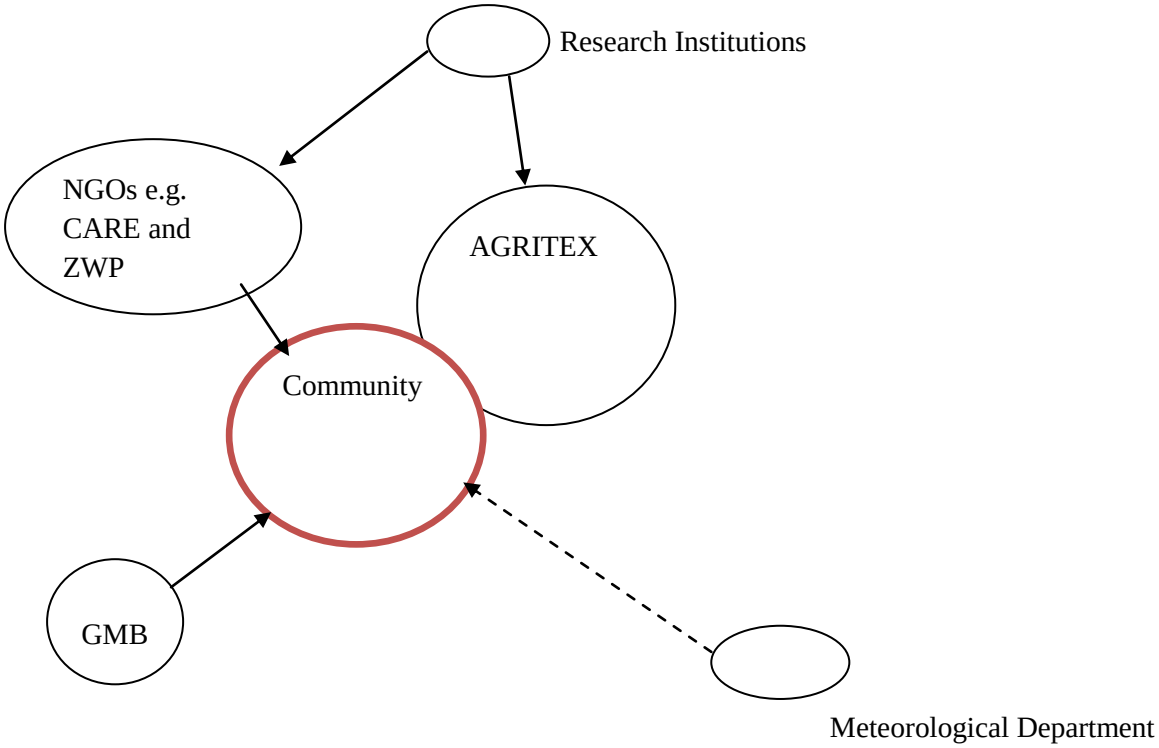
Formal Institutions and Climate Risk management

Figure 4 shows the Venn diagram that was utilized during a Focus Group Discussion held in Chivi to identify formal institutions working with farmers on climate risk management and their level of involvement. Focus was on organisations supporting conservation agriculture and use of drought tolerant crops, as climate adaptation strategies. Based on the principle of circles representing organisations, institutions, projects and actors, the connections or distance

between will illustrate different types of relationships. The connections were represented through connecting lines. In this mapping exercise, the size of the circle illustrates the relative importance of the interest group (Figure 6).

The most influential support comes from NGOs who provide inputs and training to the community. In this instance NGOs can best be described as the key institution. Their support is represented by the biggest circle in the above figure and the distance existing between the NGOs and the community is small hence showing their involvement in and relationship with the community. NGOs are thus important in the provision of information and decision making by the small holder farmers with regards to the management options to take up. AGRITEX has lesser influence when compared to NGOs but the Venn diagram illustrates that AGRITEX is directly involved in the projects as they provide extension support and ensure the sustainability of projects when NGOs cease their support. The government through its agencies like ARDA and GMB has less influence in climate risk management in the community; their involvement though notable is distant from the community. The meteorological department is further away from the community and this highlights that the people do not rely on the weather information they get from the institution. Furthermore, this shows that the information received in relation to weather is restricted to a few households in the community and as such does not have much influence and involvement.

Figure 1: Formal institutions supporting climate risk management



Source: Focus Group Discussion Ward 15 Chivi

Data from the household survey confirms the FGD findings. The major institutions involved in climate risk management are NGOs and AGRITEX (Table 4). For irrigation, support by NGOs is mainly through input provision. AGRITEX is mainly involved in demonstrations on techniques used in the strategy with 81.82% whilst NGOs have 18.18%. Training is provided by both NGOs and AGRITEX as shown by their dominance in the adaptation strategies utilized in Chivi. These extension services are usually on new technology that may need to be taken up and advice related to crop varieties

that are best yielding under climate vagaries and it is within the mandate of NGOs and AGRITEX to provide these services to smallholder farmers. NGOs are instrumental in Conservation Agriculture where they provide agricultural inputs, conduct training, demonstrations and field days on basin digging, depth and size, micro-dosing which is the spot application of fertilizer on crops using a bottle top. AGRITEX should be more active in this strategy as they enable the continuity and sustainability of projects as a public extension arm.

NGOs are highly involved in the provision of inputs of drought tolerant crops to farmers while AGRITEX is highly involved in extension training that include crop management and demonstrations on bird scaring techniques. AGRITEX is active in the conservation of fodder for livestock where they provide training and conduct demonstrations and shows. This is on the management of crop residues. However, it should be noted that extension is biased towards crop production than livestock production and management which is why few households engage in fodder conservation.

Table 4: Formal Institutions Supporting Climate adaptation strategies

Climate Adaptation Strategy	**Nature of Support**	**No of Households**	**% of households receiving support**	
			NGO	**AGRITEX**
Irrigation	Training	17	41.18	58.8
	Demonstrations	11	18.18	81.82
	Inputs	18	94.74	5.26
Conservation Agriculture	Training	44	65.91	34.09
	Demonstrations	6	83.33	16.67
	Shows/ Field Days	2	100	-
	Inputs	24	83.33	16.67
Drought Resistant Crops (small grains) Production	Training	15	20	80
	Demonstrations	13	7.69	92.31
	Shows or Field days	2	-	100
	Inputs	19	84.21	15.79
Crop Diversification	Training	6	16.67	83.33
	Demonstration	2	100	-
Fodder Conservation	Training	4	-	100
	Demonstrations	6	-	100
	Shows/Field days	2	-	100

Source: Household Survey Data

Constraints to Climate Risk Management

Having noted the strategies that are adopted in climate risk management by the households in Chivi, follow up questions were made with regards to the constraints they face in adaptation. The predominant constraints that affected the efforts by smallholder farmer to adapt to climate change are the lack of seed and fertilizer as well as the lack of information (table 5). This could be a consequence of the economic and political crisis that the country faced during the period 2006-2010 and hence the flourishing of the parallel markets much to the demise of the formal agricultural market and

extension services. Labour shortage affected conservation agriculture operations such as digging basins and multiple weeding sessions hence 10.9% of the households cited the constraint. Labour constraints are also common amongst households undertaking crop diversification, irrigation, fodder conservation and drought resistant crop production. About four percent of the households practicing conservation agriculture cited the challenge they face with cattle which feed on mulch as their plots are not fenced.

Table 5 also shows that the production of drought resistant crops was challenged by birds which feed on millet hence a decrease in yield. This constraint was noted by about 22% of the households engaged in this strategy. Poor quality seeds, pests and diseases and lack of credit also undermine the production of drought resistant crops. Efforts to extensively practice irrigation farming have been inhibited by the lack of a reliable water source, as reported by 45.3% of the households using this strategy. The same constraint was also noted by households practicing fodder conservation and crop diversification. This can be attributed to the location of Chivi district in regions IV and V of Zimbabwe, which are predominantly dry areas and receive less than 650mm of rainfall/year (Vincent & Thomas, 1960). This is compounded by the lack of funding of projects, theft of equipment; lack of a market for the produce as most irrigation projects are horticultural and the lack of unity amongst the community people with regards to irrigation of crops. The same constraint was also noted by households practicing fodder conservation and crop diversification. By-laws affect the conservation of fodder for livestock as 11.7% of the households partaking in this strategy highlighted the constraint. This is largely to do with community grazing that is widely promoted in the area hence a contrast with regards to individual fodder conservation.

Table 5: Constraints to Climate change Adaptation (% within strategy)

	Drought Resistant crops(n=95)	**Conservation agriculture (n=73)**	**Crop Diversification (n=60)**	**Fodder Conservation (n=34)**	**Irrigation (n=64)**
Lack of seed and fertiliser	64.2	69.9	35	8.8	11
Lack of information	3.2	15.1	50	70.6	6.3
Labour shortage	1.1	10.9	3.3	2.9	4.7
No fence- mulch destroyed by cattle	-	4.1	-	-	10.9
Poor quality seeds/equipment	7.4	-	5	-	6.3
Pests and diseases	1.1	-	-	-	-
Birds destroy some crops	22.1	-	-	-	-
Unreliable water source	-	-	6.7	5.9	45.3
Lack of credit	1.1	-	-	-	1.6
Theft of produce/material	-	-	-	-	1.6
Lack of market for produce	-	-	-	-	1.6
Lack of unity amongst people	-	-	-	-	1.6
Lack of funding	-	-	-	-	9.4
By-laws restrictions	-	-	-	11.7	-
Total %	**100**	**100**	**100**	**100**	**100**

Source: Household Survey Data

CONCLUSION AND RECOMMENDATIONS

Climate variability's impact is being felt and climate change effects will be felt in the long run. Since farmers largely reported drought as a key climate risk, they all indicated that this risk had an effect on the sustainability their crop and livestock production as well as development in general given that the reduction in yields subsequently led to a reduction in household consumption and thus food insecurity. Faced with this scenario, smallholder farmers in Chivi received food aid, engaged in food for work, sought off farm employment and sold their assets and livestock to cope with the extremes of the prevailing drought conditions. The production of small grains such as millet and sorghum, conservation agriculture, crop diversification, soil and water conservation were the leading sustainable climate adaptation strategies taken up in Chivi. The success of these strategies was as a result of interventions by other actors such as AGRITEX who provided technical back up for the smallholder farmers and NGOs who provided advice and inputs such as seed and fertilisers. Despite this, famers highlighted constraints to climate adaptation sustainability. These were the lack of inputs, information, lack of labour, birds which destroy their small grain plots and the lack of reliable water sources. To assist in climate adaptation, there is need for the provision of key inputs such as seed and fertilisers suitable for the soils in the district. Due to low and erratic rainfall, the area may require high yielding, short season variety seeds of maize. Small grains should be encouraged based on the results which show that farmers in Chivi have adopted the production of small grains such as sorghum and millets as a leading adaptation strategy. These should be offered at subsidized cost to enable affordability by small holder farmers and reduced dependency on donor sponsored inputs.

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