

Climate Change Adaptation Challenges in Semi Arid Region of Dande Valley in Zimbabwe

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Abstract: *Purpose-*This paper aims to cultivate a culture of understanding, Climate change adaptation challenges that impedes small scale farmers in semi arid regions like Dande Valley from full and sustainable implementing adaptation strategies. **Methodology/Design/Approach-**This study used two randomly selected wards in Dande Valley 1 and 3 of Mt Darwin District. Data used was collected in two sessions, the first was rapid rural appraisal and finally a survey using well structured questionnaires administered to 400 randomly selected small scale farmers in the two wards. 200 from each ward. Focus group discussions and semi structured interview questions were also used and were complimented by secondary data from literature reviewed. SPSS software was also used to analyse data. **Findings-** The analysis of solicited data revealed that small scale farmers in Dande Valley are faced with a number of challenges when implementing adaptive strategies. These challenges impede effective and sustainable ways of livelihood in the semi arid regions. Identified challenges included lack of adequate knowledge, institutional frame works, information, and financial. The study established that although small scale had their own climate change adaptation strategies they need financial, institutional, and information support to ensure sustainable climate change adaptive strategies. **Originality/value-**Most of the literature available on climate change in arid regions has put more emphasis on adaptation strategies. Little research has focused on challenges of climate change adaptation strategies .The study will provide insight to policy makers that will guide the small scale farmers , enhancement of climate change adaptation strategies, through addressing challenges small scale farmers face.

Keywords: adaptation challenges, Climate change, Dande Valley, small scale farmers

1. Introduction

Climate change has become a serious issue that has received global attention. Semi arid regions are the most vulnerable parts of Africa to Climate Change ,[15].The poor subsistence farmers who include persons with disabilities who live in these fragile environment ,which are prone to devastating droughts and floods have the least capacity to deal with the negative impacts of climate change , [9], [3] ,[4]. Scientific studies done in most semis arid regions tend to concur that climate variability and change is indeed a reality taking its toll on the poor people's livelihoods, [3], [24]. Multiple environmental stressors in semi arid regions has seen many small scale farmers struggling to adapt climate change , [10].Agriculture in the semi arid regions of Africa are rain fed hence the main form of livelihood, is at risk hence people have no option but to adapt to climate change. Scientific climatic projections point to increase in mean temperatures, prolonged and more intense droughts which are likely to cause semi arid regions to become drier, [15].

Climate change is likely to destroy the social and economic fabrics of many societies. Environmental migration are going to increase and are regarded as one of the coping strategies to climate change [25].

Adaptation refers to the mitigation of the impacts of climate change, and in the case of small scale farmers, this may involve adjustments in the socio economic structure in order to combat vulnerability of a system to climate change and variability. Adaption has been recognized in international forums as an important policy option especially in semi arid environments Article 10 of the Kyoto Protocol and Article 4.1b of the United Nations Framework Convention on Climate Change (UNFCCC).

Many researchers have indeed carried out research on different places, adaptation strategies. Results in most cases have shown that the small scale farmers have some coping strategies which includes diversification and growing of drought tolerant crops, [16]. It must be noted that in their quest to adapt, small scale farmers face some challenges. These challenges have been dealt with in many developed countries at the expense of the most vulnerable groups in Semi Arid regions of Africa. Few researches have been done on challenges faced by small scale farmers, when adapting to climate change .These studies are hazy, sketchy and at times disoriented. It is imperative for studies to also focus on challenges faced by small scale farmers when adapting to climate change, this will help achieve a respectable better understanding of challenges of implementation of climate change adaptation strategies. Challenges are constraints that jeopardize or affect negatively the sustainable adaptation strategies of climate change impacts). The report of the Intergovernmental Panel on Climate Change [1], challenges are explained as "conditions or factors that render adaptation ineffective as a response to climate change and are largely insurmountable" .Many researchers have written about challenges to climate change adaptation [1]. It must be noted that all these studies have failed to research in-depth the challenges to climate change adaptation strategies in semi arid regions. This study will add value in the body of knowledge on challenges of adaptation strategies to climate change in semi arid regions through a comprehensive study of the Dande valley community and secondary data sources.

2. Aim of the Study

The main thrust of this study is to analyses the challenges to climate change adaptation strategies of small scale farmers

in semi arid region of Dande Valley, Zimbabwe. The Study's main objectives:

- Identify the main adaptation strategies of small scale farmers in Dande Valley.
- Identify and assess challenges that influence the implementation of climate change adaptation in semi arid regions.
- Suggest ways and policy changes that will enhance climate change adaptation by small scale farmers in semi arid regions.

3. Design/Methodology/approach:

This study used both qualitative and quantitative data obtained from the participants through during April 2013 and April 2014. The study made use of primary data solicited from randomly selected wards 1 and 3 in Dande valley of Zimbabwe. To help support the primary data secondary data was also compared with available adaptation challenges to climate change literature. Primary data used was collected in two sessions, the first was rapid rural appraisal and finally a survey using well structured questionnaires administered to 400 randomly selected small scale farmers in the two wards. 200 from each ward. Focus group discussions, and semi structured interview questions were also used and it was complimented by secondary data from literature reviewed. SPSS software was also used to analyse data.

4. Ward 1 and 3 of Dande Valley Case Study

The study area is found in Northern part of Mt Darwin District in Dande Valley. The 2 wards were randomly selected and past studies by [1], [7] referred Dande as a semi arid region prone to alternating extreme weather conditions floods and drought. The soils in the study area are very rich self tilting soils, and some indigenous small scale farmers do not use fertilizers because the soils are very fertile. The growing season spans between October and April. The area receives very low unreliable erratic rainfall with an average annual rainfall of 500mm, maximum temperature of 36°C [32]. Small scale farmers in the study largely depend on rain fed agriculture as their source of livelihood, [20]. *Zeziphus Mauritania* is the dominant indigenous tree species, that also plays an important economic activity to the people of the study area since it's a source of nutrition and income. The main crops grown by the small scale farmers in the study area are drought tolerant crops like Millet, sorghum, rappocco, maize and of late they have switched from cotton to tobacco as a cash crop. The area experiences chronic food shortages during drought years.

5. Literature Review on Challenges to Climate change Adaptation Strategies

Adaptation to climate is an important aspect to people leaving in semi arid regions. Adaptation measures if implemented well are a panacea to food shortages and protection of livelihoods [15], [8]. There are few but

growing number of studies focusing on climate change adaptation. It has been noted by the studies that adaptation measures vary from place to place and from time .It is imperative to have region or area specific study on adaptation to climate change .It is in this context that studies in Dande Valley of Zimbabwe are very few.

Adaptation strategies according to [20], include diversified farming, crop replacement, growing drought tolerant crops, tobacco farming, back yard gardening, water harvesting and environmental migration. [2] has also re emphasized the need to recognize the indigenous knowledge system when devising adaptation measures through understanding plant phenology and astronomy when predicting climate conditions?

Most studies focused on adaptive strategies, very few that includes, [22], [14], focused on challenges to climate change adaptation strategies. The few studies reviewed where descriptive in nature, and did not focus on Dande Valley to specific, and some worse still lacked quantitative methodology. Focus on challenges on climate change adaptation was not an issue more emphasis was give on climate change adaptation strategies. Serious policy formulation on adaptation to climate change cannot make sense without addressing challenges to adaptation option in Climate change discourse. This study made use of a systematic peer-reviewed literature to identify and understand challenges on climate change adaptation strategies, which has been addressed elsewhere. Electronic data search was also used to review current studies on challenges to climate change adaptation.

6. Data Analysis and Presentation

The statistical Package for Social Scientist (SPSS) version 19 and Microsoft excel was to code and analyses data from household questionnaire survey. The respondents were given numbers for identification purposes .A template for entering data in the computer was created and was eventually entered in the SPSS version 19 computer program. Pearson's correlation was used to show the relationship between small scale farmers in ward 1 and 3 and sustainability of climate change adaptation strategies. The two wards were coded so that the situation in each ward could be analyzed. Focus group discussions and key informant interviews were used to triangulate any deviations from the observed.

7. Results

7.1 Demographic characteristic of the respondents (small scale farmers in ward in Mt Darwin District)

a) Sex

67% of the respondents were women and 33% were men. This was mainly because of the effects of environmental migration which is rampant in this area. According to the village heads in the area the women carry the entire burden imposed to the community by climate change.

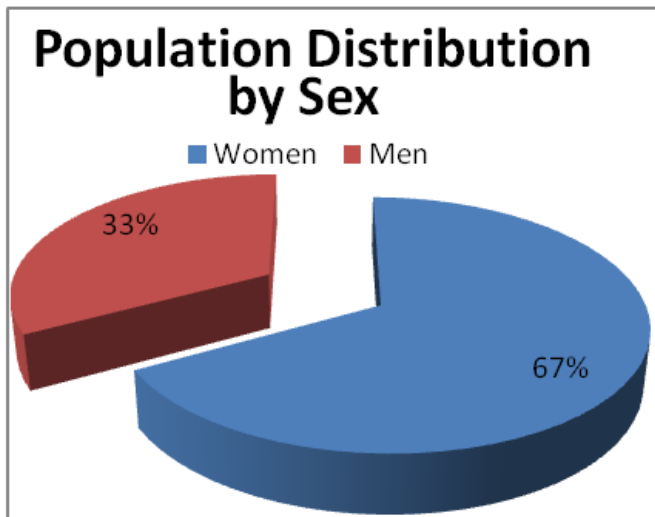


Figure 1

larger the size of household the more climate change adaptation strategies the family is likely to use. The climate change adaptation strategies included, environmental migration, crop diversification, planting drought tolerant crops and livelihood diversification.

c) Education level of participants

Only 5% of the participants who included mostly teachers and extension officers from the two wards had tertiary education. 18 % of the subjects had no formal education, the highest % of those without formal education were married women 75% and 25% were not married ,52% of the participants had reached primary level education.82% of the participants who had primary education were married 9% were single or 9% widowed.76 females had primary education. 25% participants had attained secondary education, and 67 % of those who had attained secondary education were married and 25% were divorcees.

b) Household Distribution

The number of people in a household from the two wards averaged 4.8 persons which is lower than the national average family size 5.3 (Zimbabwe National Central Statistics Report 2012). The size of the household it was established by this research that the smaller the household size the fewer the climate change adaptation strategies, the

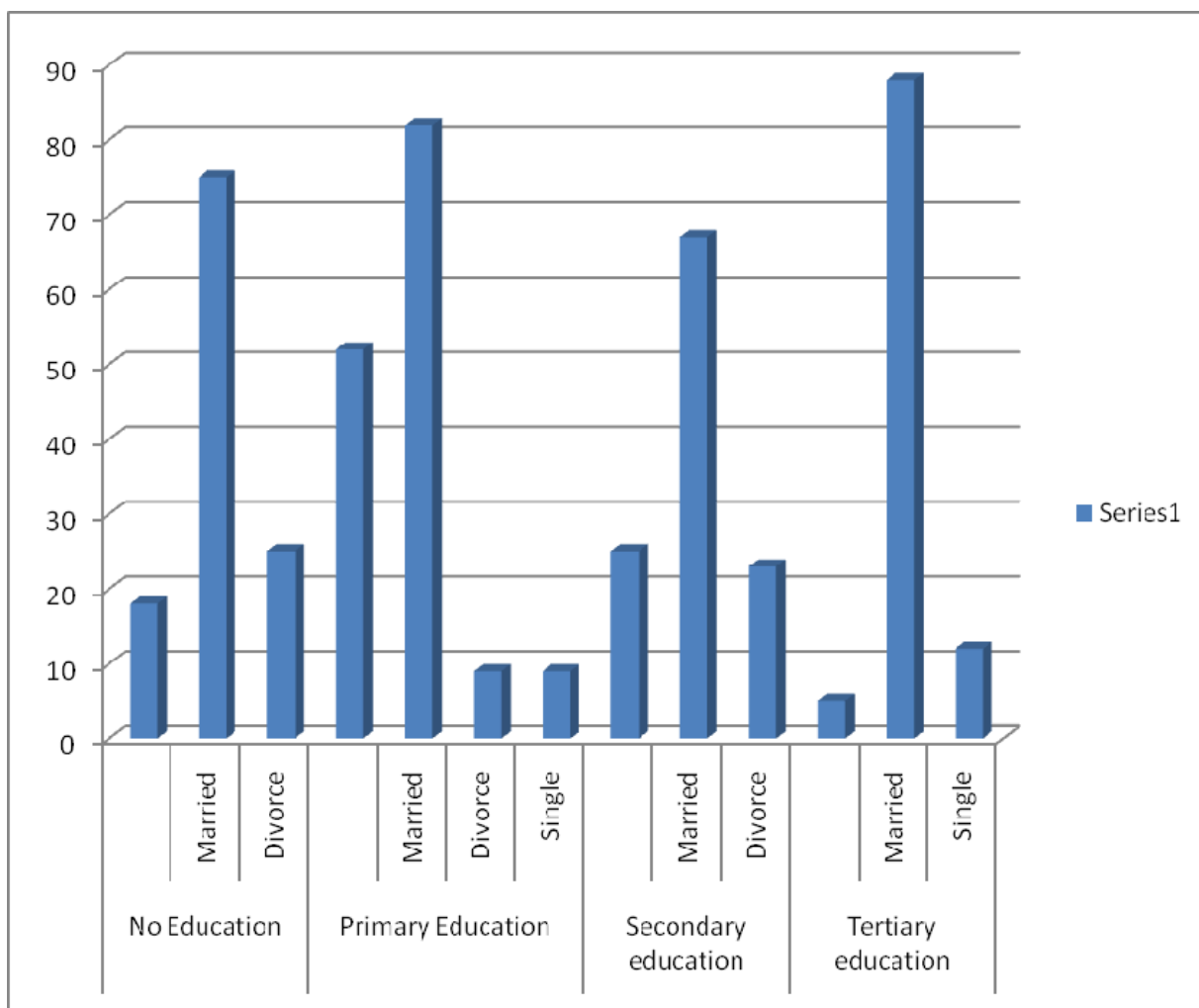


Figure 2: Level of education (Source: primary data)

Respondents were asked to give their main coping strategies and the following were the result which were gender biased ones

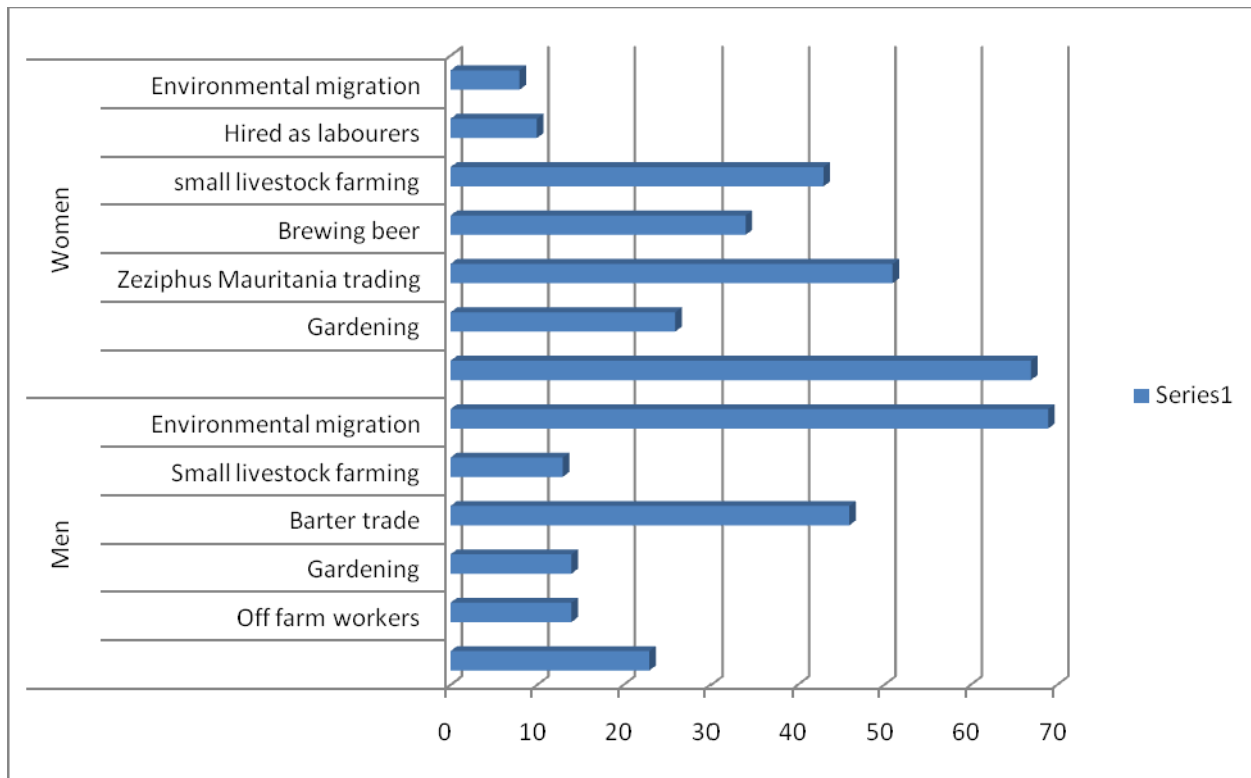


Figure 2: .Main coping /adaptation to Climate change strategies in Ward 1 and 3 of Mt Darwin District.

d) Adaptation strategies employed by households in case study

Figure (2) reveals that the respondents from ward 1 and 3 in Dande valley of Mt Darwin employ a number of climate change adaptation strategies and these include but not limited to, environmental migration, diversified crop farming [3], [6], [13], barter trade, off farm working, gardening, small livestock farming, [4], Zeziphus Mauritania trading and brewing of beer, using indigenous knowledge system. Some even reduce their daily consumptions.

Environmental migration was mentioned by most men as the main adaptation strategy to climate change, [26], and [31]. Environmental migration has been taking place for a long time in the Dande valley, with men dominating this climate change adaptive strategy. For the past 20 years persistent, devastating droughts and floods have resulted in environmental migration as an important climate change strategy in the semi arid region. It was interesting to note that (94% ;n=376) which is the majority of the respondents from the two wards reported that at least a male member of their family had taken migration as a climate change adaptation strategy over the past 5 years (2009 to 2013)

However besides environmental migration being the main climate change adaptation strategy [1],the small scale farmers in this study area face many challenges ,which include indicates that migration may contribute to resilience and innovation in climate adaptation in Northwest Africa. This is because migrant workers can enhance livelihoods and build the resilience of the original home communities through remittances.

e) Challenges to climate adaptation in semi arid region of Dande valley

Challenges that were faced by respondents in implementing climate change adaptation strategies and lack of finance was the most identified challenge. 96 % of the respondents said finance was the main stumbling block in implementing the strategies. 68% suggested lack of information on climate variability .Lack of institutional framework and capacity was identified as the stumbling block to various agricultural related adaptation measures, [26] ,[29] . In an attempt to understand what restricts households from implementing adaptation strategies, households were asked to identify key challenges to climate change adaptations. Social and religious challenges were also supported by 37% of the respondents, 30% also mentioned lack of resources and infrastructural development as a major challenge to climate change development. Absence of micro finance loans to enable them to buy inputs like seeds, herbicides, pesticides, fertilizers. In semi arid regions these affore mentioned challenges, hampers efforts to implement climate change adaptation strategies [15]

f) Challenges faced in the sustainability of Climate change adaptation strategy

Table 1

Challenge	N=400	Percentage
Lack of financial resources		
Lack of climate adaptation information	N=272	68%
Gender restrictive measures	N=400	
Social and religious	N=400	37
Institutional	N=400	100

g) **Analysis of the main challenge to the implementation of climate adaptation strategies Table 1 Pearson Correlation (Source :primary data)**

Table 2

	Satisfaction sustainability option With the challenge of the adaptation	
Pearson Correlation		-0.067
Satisfaction with current Sig.(2-tailed)		0.697
Climate change adaptation challenges		400
N	400	
Pearson Correlation	-.067	
of sustainability of climate Sig.(2 tailed)	0.697	
change adaptation strategies N	400	400

The data on climate change adaptation options and satisfaction with sustainability of the climate change adaptation option was tested using the Pearson's correlation at 0.05 significance level and 95 significance testing. The result shows that there is direct relationship since the result is positive sustainability. The results show that there is a positive relationship between the climate change adaptation option and satisfaction of sustainability of adaptation strategies. Since overcoming challenges to climate change adaptation yields and sustainability of climate change adaptation options. Therefore we fail to reject the null hypothesis that there is a positive relationship between overcoming challenges to climate change adaptation yields and sustainability of climate change adaptation options.

8. Discussions

8.1 Environmental Migration

According to [30], people move from one region to another mainly because of environmental stressors, like unreliable low erratic rainfall in some parts of Africa. Similarly in the Dande valley many people especially men migrate to other rural areas KuNyombwe (Upper part of Mt Darwin), or the newly resettled farms or nearby and far towns to seek for employment to sustain their families back home. Though a lot can be said and done on the Dande Valley communities to rescue them from food insecurity, the Zimbabwe national policy on Climate change is still in its infancy stage in terms of development, hence very little or meaningful intervention has been put in place. Dande is considered to be very remote area, and is worsened by its harsh climatic condition hence there has been lack of development hence their livelihoods had been affected seriously leaving, small scale farmers with no option but to migrate to safer zones.

8.2 Financial barriers

Implementation of adaptation strategies is mainly hampered by financial challenges .The harsh economic conditions that have prevailed in Zimbabwe since 2008, has not done any good to the small scale farmer who live in semi arid regions. Effective implementation of a strategy entails some form of cost. For example the use of new breeds of livestock or crops which are drought tolerant, means a cost to many small scale farmers which is beyond their reach. Worst still the geographical location of the source of these improved

inputs makes it difficult for farmers to easily access them in Dande Valley. Lack of financial institutions within their reach makes life even more difficulty when they want to implement climate change adaptation strategies .Many small scale farmers in the study area are generally poor [8], [11] ,and rely heavily on donations from institutions like Red Cross, World Vision and the Government, this means they have limited disposable income .

8.3 Religious, social-cultural Cultural Challenges

Religious, social or cultural affiliation presents one of the greatest challenges to the implementation of climate adaptation strategies by small scale farmers .According to [2] , [7] ,culture is pivotal to the decision to adapt and implement relevant climate change adaptation strategies .Norms and beliefs may vary within the same location ,this might be because of religious affiliation .For example some religious sect they do not promote the keeping of certain domestic animals, so even if they are recommended as important climate change adaptation options ,challenges will be faced .Environmental migration being one of the most favored option is also affected culturally as man are culturally accepted to implement this climate change adaptation strategy, [19], [17].This cultural trait on environmental migration is a great challenge as it leaves women with limited climate change adaptation options available .

8.4 Lack of information on climate change characteristics

Information is power, many small scale farmers it was revealed by this research that they do not have information [12].The Zimbabwe Meteorological Service department through various forms of media present daily weather forecast which should help farmers ,however for one reason or another it does not reach the intended beneficiaries to enhance their climate change adaptation strategies. Information on Climate change issues even from international conferences (World Summit on Sustainable Development as well as the Johannesburg Plan of Implementation of Agenda 21), that discuss adaptation issues do not involve these small scale farmers who should be the active representatives of their areas in the so called conferences. [23] in their study in Zimbabwe also highlighted that even if there is information other challenges like ,lack of finance, rights ,resource and institutional and procedural challenges normally makes implementation of the adaptation strategies weaker [5], [14], [27] .Zimbabwe like any developing country are not well equipped ,and skilled manpower shortages have worsened the situation, this has meant that information has never been easily accessible to small scale farmers. Lack of Climate change policy has meant that the indigenous knowledge though a recognized source of climate information, is slowly suffering a natural death at the expense of small scale farmers in arid regions.

8.5 Institutional Challenges

Lack of Climate change policy has meant that the existing Institutions are weakened in their operations talk of the

government and nongovernmental organization. Institutions play a pivotal role in capacity building of farmers to enhance their climate change adaptive strategies [5], [13]. Institutional roles can also help solve some challenges that are faced by small scale farmers for example finance facilities [10], [27]. Government can provide an enabling environment that can help small scale farmers' access loans or capital. The major challenge highlighted by respondents is the top-down approach used by the government to help the small scale farmers implement their adaptation strategy. The Agritex office facilitate the flow of information that help the farmers adapt to climate change, however they are also faced with a number of challenges which include lack of transport, larger sphere of influence and finance to run different projects. These government officials who are supposed to help the farmers also lack climate change adaptation information; absence of a climate change policy has not helped them either.

8.6 Technological Challenges

Having a wide range of climate change adaptation options is critical in semi arid regions where there is rampant food insecurity. Technological developments as one of the most important climate change adaptation strategies small scale farmers need to be adopted [24], [22]. Development of irrigation equipment, new varieties of crops, climate modeling are some key issues that are linked to lack of technological advancement in Zimbabwe that has challenged implementation of adaptation strategies.

8.7 Lack of infrastructure development including ready markets

As presented on the list of adaptation strategies in Figure (2). Small scale farmers in the study area collect Zeziphus Mauritania which is readily available to sell and practice barter trade, however lack of ready markets and have meant people dispose their fruits to unscrupulous business people at their yards. These were mentioned as a major challenge by many small scale farmers. Though related to agricultural development more widely, the lack of readily available markets was identified by households to constitute a major obstacle to the successful implementation of climate adaptation strategies, including the planting of drought-tolerant crops and diversification of crops. The small scale farmers fail to store their agricultural products, even the dependable Zeziphus Mauritania though they depend on their traditional storage facilities. These are built from pole and dagga and are prone to pest and insects which in turn affects the quality of stored stuff, which in turn influences the price at the market. Introduction and acceptance of new drought tolerant varieties is another major challenge as the farmers prefer maize or of late tobacco even if they fully know that they are not drought resistant.

8.8 Climate change policy implications

The paper in this part presents areas that need to be incorporated in the Zimbabwe Climate Change Policy which is being developed by the Ministry of Environment and Climate Change with special emphasis on adaptation options in semi arid regions like Dande Valley.

8.9 National Environmental fund for arid regions

Government should initiate a fund specifically meant to help farmer to access loans meant to help them buy the necessary inputs well in advance. It is recommended the funds facilities if created they should be timely, easily accessible, and manageable in terms of repayment to small scale farmers.

8.10 Capacity building to facilitate climate adaptation

Climate Change experts are very few in Zimbabwe, the few experts that are there are oversubscribed they are always busy. So this status quo require aggressive manpower development in this important field. Even the unevenly distributed Agritex extension officer's needs should by policy be given chance to improve their training which will encompass climate change issues. In house and staff development should be promoted.

8.11 Institutional Capacity

The study recommends the immediate formulation of well structured and clear climate change policy in Zimbabwe, which addresses key climate change adaptation measures. All relevant stake holders need to be part of the Climate change policy and this include locals, provincial, national and international stakeholders. From the professional point of view more scientific research needs to be conducted to help those on the ground enhance climate change adaptive strategies.

Socio Religious Practices

Each religious or social sect has its own unique way of implementing climate change adaptive strategies. Hence there is every reason to consider social and religious differences that exist within societies. Climate change adaptive strategies should not be imposed to communities, baseline surveys should be conducted before the enhancement or introduction of new climate change adaptation strategies. This study also recommends policy makers to also make use of the indigenous knowledge system in the understanding of climate change adaptive strategies Holloway, (2003), [24]. This means the Zimbabwean government should promote research on Indigenous knowledge as this helps small scale farmers in terms of climate change adaptation information, [21].

9. Conclusions

The study show that small scale farmers in ward 1 of Dande Valley, Mt Darwin of Zimbabwe have a number of adaptive strategies to Climate change. Women and children play an important role in implementing these strategies. As a result the most vulnerable carry the burden of challenges on implementation of climate change adaptation strategies in semi arid regions. The main challenges identified by this research include economic, social and cultural challenges, information and dissemination on climate change discourse, institutional and technological challenges. Knowledge on up to date scientific information that can help farmers use advanced varieties or

animal species. The prevalence of these challenges in numbers in a given scenario complicates the small scale farmers, s ability to implement adaptation strategies, and this study has enhanced the understanding of climate change through an in-depth study of ward 1 and 3 and a literature review on challenges on implementation of climate change adaptation.

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