INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Mixed Methods Research Strategies in Climate Change Adaptation in Mt Darwin District, Zimbabwe

Vincent Itai Tanyanyiwa
Senior Lecturer, Department of Geography and Environmental Studies,
Zimbabwe Open University, Harare, Zimbabwe
Tarisai Kanyepi
Student, Department of Geography and Environmental Studies,
Zimbabwe Open University, Harare, Zimbabwe

Abstract:
The fact that the use of mixed methods studies has become "trendy" again after a period of disrepute does not mean the issues such methods raise have gone away. Definitional, paradigmatic and methodological issues continue to be raised when researchers write about mixed methods, while design issues, issues in sampling, analysis and reporting and wide-ranging demands on researcher skills, finances and time are faced daily by those involved in a mixed methods study. This paper seeks to elucidate the challenges faced in carrying out a mixed methods study on climate change adaptation in a rural community in Zimbabwe. Mixed methods researchers, in combining the benefits of both qualitative and quantitative approaches to research, often claim greater validity of results as a reason for their methodological choices, however without adequate consideration of issues involved such validity may be more imagined than real. The researchers recommend use of aides and observation guides in collecting data. Other researchers in future studies should conduct a two week pilot study and should at least visit the study area three times before conducting research to gain an intimate knowledge of the area.

Keywords: *Climate change, methodology, mixed methods, qualitative, quantitative*

1. Background to Study

Climate change is a reality. It has arisen as a critical development issue with predicted impacts on biodiversity, rural livelihoods, national and global economies (Carlson and Shumba, 2011). The IPCC Third Assessment Report (2007) identified the increasing frequency and severity of droughts and floods, the shift in onset of the rains, increasing intensity of mid-season wet and dry spells and variations in the cessation of the rains in the last 50 years as a major consequence of climate change.

Climate change, which is attributable to the natural climate cycle and human activities, has adversely affected agricultural productivity in Africa (Ziervogel et al.. 2006). There is consensus in literature that Africa is one of the most vulnerable regions in the world due to widespread poverty, limited coping capacity and its highly variable climate (Carlson et al. 2012, Madzwamise2010). Agriculture is the backbone of national economies of the Southern African Region, with at least 65% of their citizens living in rural areas and relying on rain fed agriculture and natural resources such as grazing land and fuel wood for survival (Carlson and Shumba, 2011).

Agriculture's sensitivity to climate-induced water stress is likely to intensify problems of declining agricultural productivity, economic productivity, poverty and food security (Carlson and Shumba, 2011).Smallholder farmers account for almost 62% of the rural communities in the country, inhabiting some of the most vulnerable and marginal landscapes (Carlson and Shumba, 2011). Extreme weather events, namely tropical cyclones and droughts have increased in frequency and intensity (Mutasa, 2008).

In the rural communities of Zimbabwe, where 62% of the population resides, smallholder families thrive on rain fed agriculture and livestock rearing as main source of income for their livelihood. Subsistence livelihoods have evolved a number of coping strategies to manage weather variability, including drought years and low crop yields. However, experience has shown that identified adaptation measures do not necessarily translate into changes. Therefore a better understanding of the local dimensions of climate change is essential to develop appropriate adaptation measures that will mitigate adverse consequences of climatic change impacts. This study seeks to identify impacts of climate variability and or climate change on rainfed agriculture in Matope Ward in Mt Darwin district of Zimbabwe.

1.1. Statement of the Problem

Zimbabwe is an agro-based economy that lies in a semi-arid region with an estimated 62% of its rural communities dependent on agriculture as a means of livelihood (Carlson and Shumba, 2011). Rainfall and water are central to the lifestyle of smallholder farmers in rural communities, influencing their climate-sensitive livelihoods and activities, namely livestock rearing and crop production (Madzwamise, 2010).

However,there is considerable uncertainty in the comprehension of climate change adaptation at finer spatial scales, such as at the state or national level as there is insufficient technical expertise in climate change information packaging and inadequate local specialised training facilities and programs (Chimanikire,2012).Effective adaptation of the agricultural sector to adverse effects of climate change and water stress is imperative to ensure food security and livelihoods of the poor (Bryan et al., 2008).

The vulnerability of smallholder farmers to climate change and variability is increasingly rising. As agriculture is the only source of income for most of them, agricultural adaptation with respect to climate change is vital for their sustenance and to ensure food security. In order to develop appropriate strategies and institutional responses, it is necessary to have a clear understanding of farmers' perception on climate change, the actual adaptations at farm-level and factors which are constraining their plight to adapt, thus the research seeks to investigate and assess the farm level adaptation by smallholder farmers in Matope Ward to climate change and variability.

1.2. Research Questions

- What are the impacts of climate change on rain-fed agriculture?
- What are farmers' views on temperature and precipitation trend over the over the last couple of decades.
- What measures have been taken by smallholder farmers in response to the impacts of climate change and variability?
- What are the major constraints farmers are facing in adjusting their farming practices in response to changing temperature and rainfall?
- What other possible measures can be established by farmers in strengthening their resilience to climate change?

1.3. Study area: Matope Ward

1.3.1. Location

The study area Matope Ward 24 of Mt Dawin District is located in one of the seven districts located in Mashonaland Central province of Zimbabwe. The study area's locational co-ordinates is Latitude 16 47' Longitude 31 35'. It is located approximately 155km from the capital city of Harare. Matope Ward consists of three villages namely Chiunye, Mutondwe and Chatumbama which all lie on the north- eastern side of Mt Darwin District town business centre. The study focuses on Chiunye and Mutondwe villages.

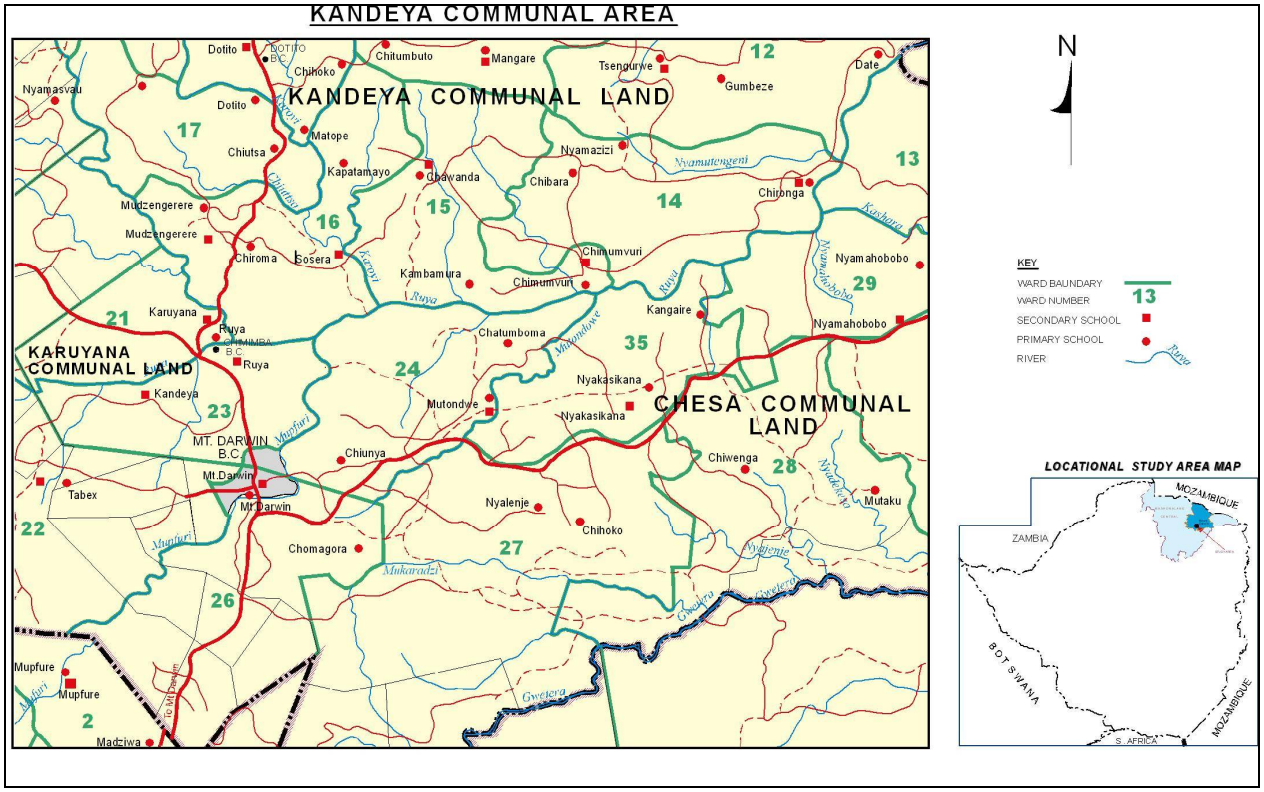

Figure 1

Matope Ward is located in agro-ecological region III, a semi-intensive farming region covering 19% of Zimbabwe. Although rainfall in this region is moderate in total amount, severe mid season dry spells make it marginal for maize, tobacco and cotton, or for enterprises based on crop production alone. The farming systems are therefore based on both livestock (assisted by the production of fodder crops) and cash crops. The region experiences high temperatures (above 25 degrees Celsius) and rainfall that ranges between 650-800mm per year.

1.3.2. Socio- Economic Background of Study Area

The average rainfall of about 650-800mm per year per year makes the ward generally suitable for livestock rearing and for major crop types. Local residents in Matope Ward 24 in Mt Darwin District keep mainly cattle and goats and grow some crops for subsistence use mainly. Non-arable land is used for grazing under communal tenure. Mt Darwin District has an approximate population of 212 190 people with an average household size of five people per household. Matope Ward has an estimated population of 7000 people, a population density of about 33 persons per km^2 with a population growth rate of 1.3% (Zimstat Census 2012).

The District has 40 primary schools and 14 secondary schools. The teacher student ratio of 1;23 for secondary schools is in line with the MDG Goal of 1;28 pupils, whilst the primary school ratio of 1;43 is way above the required ratio. The inhabitants of this communal area are predominantly smallholder farmers who depend on rain-fed cropping and livestock rearing generally for subsistence. Livelihood is dependent mainly on farming and other off-farm activities to supplement income.

The community depends on groundwater for domestic requirements with deep wells and boreholes as a main source for drinking water and livestock watered during dry season. Mutondwe dam is owned by the community for irrigation purposes and the boreholes are for livestock and domestic purposes. Mutondwe irrigation scheme, an11hectare scheme engages an average of twenty farmers and is the sole irrigation scheme in Matope Ward. The study area has an electrified business centre and lacks a police station, clinic, post office and a GMB depot. Mutondwe village is the sole village with a high school in the Ward, and it offers A level secondary school (Zimstat, 2012).There are 12 NGO's operating in the whole district of Mt Darwin District specializing in water and sanitation, OV support schemes, education and behavioural change.

1.3.3. Political Context of Zimbabwe

Zimbabwe is a polarized country. Moreover, the country has two political parties, namely Zanu PF and The Movement for Democratic Change (MDC) which have continuously bumped heads mainly in the appointment of legislators and councilors to run the administrative factions of the country. Therefore, in the study area, the political administration is headed by elected representatives from the two respective political parties. In addition the administration structure in the study area of Matope Ward reflects the fragmented conflicting interests between these political structures which are some of the factors that play an important role in the carrying out of this research study. In addition, there is a conflict of interest between three administrative posts in the District namely the Provincial Governor post, District Administrator and Village District Council Head, as these roles conflict on their interest of overseeing development initiatives in Matope Ward.

1.3.4. Research Design

The research design used in this study is the mixed method research using the triangulation approach which refers to empirical research that involves the collection and analysis of both qualitative and quantitative data (Johnson and Onwuegbzic 2004:18). Creswell and Clark (2007:62-4) argues that the triangulation approach obtains complementary quantitative and qualitative data on the same topic, bringing together the strengths of the two methods. Furthermore the triangulation design involves concurrent but separate collection and analysis of two types of data, which are then merged at the interpretation-of-results stage (Jenkins:2001).

The quantitative research method enabled the researcher to trace rainfall trends and relationships.In addition it allowed for comparisons using empirical rainfall statistics for the past hundred years for Mt Darwin District. The qualitative component of the design helped to elucidate the strengths of sensitivity to meaning and context.It also enabled in-depth study of smaller samples and great methodological flexibility in using observation and focus group discussions as research instruments. This combination of both quantitative and qualitative allowed for combination of the two sets of strengths and compensating for their weaknesses (Punch, 2009). Therefore a combination of both methods yields more validity and reliability than using either method on its own.

1.3.5. Case Study Approach

Case study approach is a form of qualitative design which involves the detailed analysis of a single case, the extensive examination of a single situation and the focus of unique features of one setting (Lee and Lings 2008;55).It is an enquiry of a particular contemporary phenomenon which uses multiple sources of evidence (Johnson1994;20).This approach was employed in this research to answer the key questions of why smallholder farmers who rely on dry-land farming are vulnerable to climate change, and how they are adapting to the adverse impact of climate change. The use of a case study qualitative design in this study enabled the documentation of real life events, recording what people said, observing the behavior and examining visual images in the study area. The case study approach also assisted in bringing out the views and opinions of the research participants concerning adaptation to climate change and water stress in the study area. It provided for more detailed information on the actual strategies and views of many age groups as this approach deals with creativity, innovation and context away from homogeneous and routine situations, providing an opportunity for obtaining more ideas in the study area in which no past climatic studies have taken place.

However the case study approach entailed that each subject had to be studied holistically as the researcher had to observe each individual case in its natural setting which is time consuming and sometimes impossible (Kitchin and Tate, 2000). In this study the quantitative approach allowed for collection of data on age groups, percentage distribution by gender and empirical analysis of rainfall trends and relationships.

1.4. Fieldwork Management and Procedures

1.4.1. Pilot Study

In attempt to tame the research environment, the researcher undertook a pilot study a week prior to the research study by visiting Mutondwe and Chiunye village. This involved the researcher creating familiarization with Matope Ward's surroundings by locating the governmental institutions and making contact with the traditional authority system of the area. This exercise was crucial in order for the researcher to identify the "gatekeepers" of Matope Ward to lessen the difficulties of getting the participants on board when conducting out the actual study.

The researcher also familiarized herself with the norms and cultural customs of the study area, thereby gaining general information on the sample characteristics by incorporating the "outsider-insider" approach mainly since the study area is the researcher's home area, however since the researcher was then raised up in an urban area it was crucial that the researcher familiarized with the norms and cultural customs of Matope Ward.

In this study two pilot studies were conducted for the questionnaire. As argued by Thomas and Nelson (1996), the first pre-testing was done to get rid of ambiguous questions, verify content and expressions followed by deleting and correcting mistakes. One of the areas of interest for correction was on issues of ambiguous terms to the pre-testing respondents such as climate change, it was difficult for the respondents to discern the meaning of climate change so researcher had to use understandable terms to depict the parameters used to discern climate change in the local language, in Shona. In addition the researcher tested the research instruments for the study by selecting two participants from the study area to test their comprehension of the interview questions and re-drafted them.

2. Management and Procedures used in Research

2.1. Sampling Framework

2.1.1. Target Population

The population in the study comprised of the two villages located in Matope Ward 24 of Mt Darwin District. The study mainly targeted smallholder farmers located in Ward 24 of Mt Darwin Rural District, which is one of the more than sixty rural administrative districts in Zimbabwe. Its choice as an area of study is deliberate in that, not only is the district strategically located in agro-ecological region III of the country, more interestingly the district is also home to a reasonably substantial number of farms which are located in the regarded communal areas in the land classification system in Zimbabwe. Although only one Ward was chosen for this study, the physical, economic and environmental profiles of the chosen ward is not only typical of what is happening in the whole of Mt Darwin Rural district, but these profiles are also a fair representation of the situation prevailing in most of the rural wards of Zimbabwe.

3. Sampling Techniques

3.1. Simple Random Sampling

Due to lack of a sequential order in the ordering of the households in the study area, the researcher used the simple random sampling method to select household respondents for the questionnaire. The researcher made use of the population registers from the Headmen of each village, which constituted the sampling frame for the study. Each entity or individual was selected one at a time and independently therefore ensuring that each entity had an equal chance of being selected from the three selected villages.

The researcher ordered the sampling frame and then assigned a number name to each community member beginning with the number 1 to the noted first participant on the sampling frame. After deciding on the required sample size of forty- two, the researcher used the sample size calculator, to generate a random numbers table. Using the generated random numbers table the researcher simply selected the individuals on the numbered list who corresponded to the generated random numbers. In reference to the simple random selection procedure the first household member name's number picked was noted to be the first participant and the subsequent household members were chosen until forty-two participants were obtained and then questionnaires were administered to each of the forty-two respondents' names selected. This technique was particularly considered an effective sampling method as the elements of the population were randomly listed, thereby saving time and resources.

3.2. Purposive Sampling

In order to save time and resources the researcher used her judgment to select population members who were good prospects for accurate information as key informants in the society who would elicit their views on climate change and the effects of water stress to the community during key informant interviews. The researcher selected fourteen key informants depending on their role in society, which she would interview. These informants entail the following;

- 2 AREX officers
- 3 Headmen
- 2 Church organizations representatives
- 2 NGO representatives
- 2 Women groups representatives
- 1 Nurse
- 1 Meteorology personnel
- 1 Headmaster

This sampling method was suitable in this study mainly as it is a non-profitability method, which cuts cost and achieves more respondents. The researcher employed this sampling method in selection of participants in the focus group discussion. The above mentioned participants entailed individuals in the society who were in place to elucidate more information on the phenomenon under study.

In selecting focus group members, the researcher required at least fifteen participants. The researcher selected three distinctive age groups as respondents namely the youths, middle aged and the elderly participants. The age selection was as follows:

- Youths [18-35] years
- Middle aged [36-50] years
- Elderly [60+] years

The youth's age range of (18-35) was chosen mainly since the age of eighteen is ethically considered according to Zimbabwean legislation to be adults. The incorporation of the (36-50) age group was that they would be the economically active, including the (18-35) age group. The last selected age group (60+) age group was that they have lived longest in the area and have community repository information which is vital in elucidating the climatic events of Matope Ward. However, this method was prone to select people who have the researcher's requisite job titles or age categories yet lacking expert knowledge in their jobs or their life experiences in relation to the study sometimes.

4. Research Instruments

The research instruments used in this study include a survey questionnaire, interview guide, focus group discussion and observation guide were chosen instruments for an in depth understanding and analysis of perceptions of smallholder farmers on climate change adaptation. The study relied on the experience and knowledge of farmers, community members and agricultural experts in Ward 24 to characterize and solicit pertinent exposure to climatic and non-climatic factors.

4.1. Challenges Faced in Study area

One of the most difficult challenges facing the researcher was that of controlling the expectations of the villagers in Chiunye and Matope respectively. Most of the locals in the area were under the false impression when the researcher first approached them seeking for their approval to participate. They assumed the researcher was from an organization that could offer them funds to enhance their livelihood after assessing their needs. However the researcher clearly explained to them that the study was for academic studies purposes only and the participants would only be able to access the results of the study at the stakeholder meeting.

The researcher further had to set up links with "the gatekeepers" of the study area namely, institutional leaders, Meteorological station and the District Administrator to gain a general synopsis of the phenomenon under study. This was very helpful in instances whereby the researcher faced issues of negative attitude towards the research, with some of the villagers feigning ignorance on the study. Some of the villagers were ignorant of the issue of climate change or simply highlighted a lack of awareness. In addition, the wrong assumption of the research participants in assuming the researcher could be linked to Non-governmental organizations despite explaining that it was for academic purposes created a few difficulties.

Firstly the wrongly assumed perception of the researcher being a donor, led to some of the participants falsifying information and even exaggerating the type of difficulties faced in adjusting to temperature patterns over the past four decades. The issue of ethics was also a fair deterrent to time management for the researcher as she had to extend the time, in instances whereby at arrival at certain households the researcher had to assist some of the farmers to weed or water their gardens before conducting an interview or conducting an observation.

The researcher also faced some difficulties in selecting the focus group discussion members as she aimed to select a maximum of twelve participants. There were also hardships in ensuring the participants from Mutondwe village attended the focus group discussion as the village is distant almost from Chiunye village approximately eight kilometres from where the group was meant to convene. Therefore, the researcher had to ensure, her and the selected members agreed on a suitable time, in this case they agreed on convening at the weekend.

The researcher faced difficulties in accessing Matope Ward as it is a marginal area. Also there was a lack of transport facilities to access parts of Mutondwe village especially the bus services. Therefore the researcher had to make the journeys on foot, which was difficult as the area is hot and has an enervating climate that the researcher had to wear a brave face in asking questions. Mutondwe village was approximately eight kilometers, so researcher took advantage of the cool morning temperatures to travel to Mutondwe and conduct questionnaires and interviews of the agricultural extension officers at Mutondwe irrigation scheme.

In addition, during the conduction of the focus group discussions the researcher faced difficulties in obtaining the views or opinions of the shy members of the group. Some highly esteemed individuals or political party representatives of the village who were part of the

selected group members dominated the discussions. This led to some members shy members in the group just nodding their heads or just remaining silent on certain issues that opened an opportunity for debater views and comments. However the researcher also obtained additional views and comments from key-informant interviews conducted.

In conducting the focus group discussions, women were sometimes overshadowed during discussions and reverted to nodding their heads in supposedly agreement or merely murmuring amongst themselves in lowered voices. The researcher noted this as a probability of sign of gender imbalance in the study area, this was further examined during the observations the researcher conducted to assess the assignment of job tasks chores handled in their daily activities.

The issue of education level especially for government institution representatives such as Agricultural extension officers, Environmental Management Agency representatives and Meteorological Officers limited the level of questions the researcher asked or in certain instances the answers she received were very bleak. The researcher managed to obtain rainfall data only for the past 100 years of Mt Darwin District from the meteorological station in the study area. There were difficulties in obtaining temperature data for the study area, since data is very expensive to obtain as the charges are very steep. In addition the meteorological officers in the Mt Darwin district were reluctant to release temperature and rainfall data for the study area as they regarded the researcher as an academic outsider however after realizing that the researcher was using the "insider-outsider" approach since the study area was her home area they assisted by giving a general synopsis of the temperature patterns of the past decade for the area as meteorological specialists and also as fellow farmers in Mt Darwin District.

4.2. Control, Reliability and Validity

Saunders et al., (2003) argues that validity is the extent to which the data collection method accurately measures what they were intended to measure. Reliability is the extent to which the data collection methods yield consistent findings if replicated by others (Saunders and Thornhill, 2003).The researcher interviewed a sample of those surveyed by questionnaire and repeating certain questions again in the focus group discussions.

These methodological triangulation approaches were set up to check validity and explain more fully the richness and complexity of human behaviour by studying from more than one standpoint. Furthermore the researcher applied triangulation within a method approach as argued by (Cohen and Manion, 1994), which allows for appreciation of the situation from more than a single viewpoint. In the use of respondents with different roles in the society such as the nurses, headmaster, headmen and AGRITEX experts so as to elicit view so as to characterize the situation in the study area..

After revision in accordance with critic obtained from colleagues obtained in first trial-run, three respondents who were part of intended population were used in the second pre-test. This was applied on a sample of respondents when the questions were too open-ended in the questionnaire. The questions were then reconstructed, recorded and defined.The researcher also made follow ups for questionnaires to be completed within the specified period.

4.3. Data Collection Procedures

These are steps taken in administering instruments and collection of data from research informants. Both primary and secondary data sources were used to collect qualitative and quantitative data for this study. Primary data was collected from sample households, focus group discussions in the district and by preparing and distributing semi-structured questionnaire through interviewing method. Secondary data sources were also an important source of information for this study. Time series rainfall and temperature data were collected from the meteorological stations.

4.3.1. Questionnaires

The researcher administered the questionnaires personally using face to face approach, whereby she introduced herself and administered the questionnaire, which the respondent answered as she waited. Using this approach, there was the advantage of getting a definite response from the participants unlike the drop and pick method.

4.3.2. Drop and Pick Method

In cases where the researcher failed to find the household head at home, the questionnaires were dropped at the specific household. These were then picked later after completion by the researcher on an agreed date with the consent of the research participants. This method allowed the participants to answer the questionnaire at their own time; however there was no control over whether respondents responded in time.

.

4.3.3. Key Informant Interviews

The researcher arranged for appointments with the potential respondents where handouts were issued. The researcher then set up appointments with the interviewees after gaining their consent to participate in the study. The researcher had to adjust her schedules to meet the respondents at times convenient for them.

4.3.4. Observation

When using observation methods, direct contact with some of the respondents were minimized instead their actions were examined and noted systematically. With regard to this, it involved the researcher watching the actions of farmers in terms of accessing water,

cropping land, state of grazing land to assess vulnerability to climate change and the adaptation strategies set up. The researcher mainly focused on both verbal and non verbal actions of the smallholder farmers.

4.3.5. Focus Group Discussions

The researcher set up schedules after selecting three distinct age groups mainly young, middle aged and the aged to discuss and collect views from concerning their livelihood experiences within the study area. The researcher had to pick a convenient venue and then select participants who consented to participating in the focus group discussion.

4.4. Data Analysis, Presentation and Discussion Methods

This section spells out the overall procedures used to organize, describe and analyze the collected data. The data was analyzed in the manner that best answers the questions and addresses the hypotheses of this study (Saunders, 2003& Mason 1997).This involved a mix of qualitative and quantitative research. The qualitative phase developed a robust view of smallholder farmer attitudes, motives, behavior and perceptions which were based on one-on-one interviews and focus group discussions. While quantitative research involved larger sample and statistical analysis of the household questionnaire responses and the empirical analysis for the rainfall pattern data obtained from the meteorological station to identify segments more reliably, (Dibb et. al 2001).

4.4.1. Content Analysis

The data collected determined the manner in which the data was interpreted and analyzed. Once raw data was collected, analysis of data and presentation was done using Microsoft Excel Spreadsheet. Pie charts and graphs were used to present data from the survey and to show major statements made and opinions held by the respondents. The findings from the key informant interviews were correlated with those from household questionnaire and data from focus group discussions was taken into account. The researcher used tables and graphical presentation for numerical data and in order to calculate the frequencies and percentages of categorized data.

4.4.2. Discussions

It involved the interpretation and suggestions on improving the operation of the system under study. Research results and their implications to the problem in the case study were made with particular references to some theorists outlined in the literature review section.

4.5. Research Ethics

Research ethics refer to a code of behaviour that is expected of the researcher (Muswazi and Kanhukamwe, 2003). Ethics are concerned with extent to which researcher is ethically and morally responsible to his or her participants. The researcher adhered to research ethical considerations in conducting the study by applying research ethics on all stages of the research namely planning, and conducting and reporting the study. The researcher did not use deception on people participating instead she made use of an introductory letter in conducting interviews, questionnaire and focused group discussions to gain the research participants' informed consent.

In conducting observation she sought the permission of the Headmen of the specific village under study to avoid cases whereby the observed information might unnecessarily harm the participants physically, emotionally or psychologically. Those rural farmers who were unable to give consent or unable to participate in open-ended interviews were not asked to participate. The researcher further preserved the privacy and confidentiality whenever possible of the participants, by respecting their anonymity during questionnaires. Participants were notified how results would be published and to avert challenges of confidentiality participants were told that other researchers may review the process and data. In addition, the researcher did not manipulate the results or data collected to suit the researcher's conclusion, any findings that did not suit expected outcome were explained.

5. Summary

The study set out to assess farmers' perceptions on climate change adaptation and water stress in Matope Ward in Mt Darwin District. A sample of forty –two households from Chiunye and Mutondwe villages were used, thirteen key informants were interviewed, a focus group discussion held and the researcher carried out participant observation in the study area. The methodologies used include the mixed method approach and a case study approach. The study was largely promoted by numerous reports that were received on the negative climate change impacts on the rural communities of Zimbabwe.

The study was not an easy study to carry out mainly because some governmental institutions and other farmers were at first defensive and unwilling to divulge information. In addition, some farmers also tended to exaggerate the challenges they face in adapting to water stress and climate change in the study area. In spite of these constraints, interesting findings and observations were made and the following conclusions were made.

6. Conclusion

The use of the mixed method design enabled the researcher to use a higher number of respondents, with use of open ended questions in questionnaires and focus group discussions. This enabled probing which yielded detailed information that illuminated nuances and highlighted diversity within the context of Matope Ward. The research design relied on varied data collection tools which were more suitable for this study since time and resources were limited. This study was also empowering and participatory as the villagers of

Matope Ward were able to reflect on their experiences. The use of meteorological data analysis was a predetermined area of enquiry. The use of the triangulation approach allowed synthesis of the two distinct types of data which were then merged at the interpretation of results stage. However in using the observation method, the researcher was prone to bias as she participated in some of the interaction scenes under observation.

7. Recommendations

The researcher recommend use of aides in collecting data during observation and recommends that other researchers in future studies should conduct a two week pilot study and should at least visit the study area three times before conducting the research to gain an intimate knowledge on their study area. In addition, the researcher recommends the use of a comprehensive rainfall and temperature data analysis and compare it with perceptions of the smallholder farmers of Matope Ward in future studies to assess fully the adaptations of the research participants.

6. References

i. Adger et al. (2003), Adaptation to Climate Change in Developing World. Progress in Development Studies, 3(3), 179-195.
ii. Adger, N. and Kelly, M. (1999), Social Vulnerability to Climate Change and the Architecture of Entitlements." Mitigation and Adaptation Strategies for Global Change 4: 253 – 266.
iii. Adejuwon et al. (2008) Climate Change and Adaptation in African Agriculture, Report, Rockfeller Foundation, Stockholm Environmental Institute.
iv. Benhin, J.K.A. (2006) Climate change and South African agriculture: Impacts and adaptation options. Centre for Environmental Economics and Policy for Africa (CEEPA) Discussion paper No. 21 CEEPA University of Pretoria South Africa.
v. Bryan E.T Deressa G. et al. (2009) Adaptation to Climate Change in Ethiopia and South Africa, Options and Constraints, Environmental Science and Policy 12, 413-426.
vi. Bryceson D. (2000) Agrarian Vista or Vortex: African Rural Livelihoods: Review of African Political Economy, World Bank, Washington D.C
vii. Chimanikire D.P (2011) Mitigation and Natural and Subnational Reports the Climate Change Institutional Architecture in Southern Africa; Case of Zimbabwe, International Symposium on IPCC,Chapter 13-16, Tokyo Japan.
viii. Davidson (2003) Understanding Climate Change Risk, Vulnerability in Northern forest based communities, West view Boulder. Colorado USA.
ix. Deressa, T, Hassen, R., Alemu, T., Yesuf M., & Ringler, C. (2008). Analyzing the determinants of farmers' choice of adaptation measures & perceptions of climate change in the Nile Basin of Ethiopia. International Food Policy Research Institute (IFPRI) Discussion paper No. 00798. Washington, D.C. IFPRI.
x. Devereux. S and Maxwell (2001a) Food Security in Sub-Saharan AfRICA,ITDG Publication, Pietermaritzburg.
xi. Dooley, D (2003) Social Research Methods, Prentice Hall Inc, New Jersey Downing et al. (1997). "Adapting to Climate Change in Africa". Mitigation and Adaptation Strategies for Global Change 2 (1): 19 – 44
xii. Downing, T.E. 1992 Climate Change and Vulnerable Places: Global Food Security and Country Studies in Zimbabwe, Kenya, Senegal and Chile. Research Report No. 1. Environmental Change Unit, University of Oxford, Oxford.
xiii. Easterling et al. (2007) Food, fibre and forest products, In Climate Change 2007:Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry ML, Canziani OF, Paluti kof JP, vander Linden PJ and Hanson CE (eds), Cambridge University Press,Cambridge, United Kingdom, 273-313.
xiv. Ericksen et al. (2011). When not every response to climate change is a good one: Identifying principles for sustainable adaptation. Climate and Development, 3, 7-20.
xv. FAO (2008) Conservation Agriculture: Conserving resources above – and below – the ground. [Online] Available:ftp://ftp.fao.org/docrep/fao/010/ai552e/ai552e00.pdf (August 09, 2013)
xvi. FAO (2009) Conservation Agriculture Scaling Up for Increased Productivity and Production. [Online]Available:http://www.norway.org.zm/Embassy/norwayzambia/Project Archives/ConservationAgriculture/(July 09, 2013)
xvii. FAO (2011a) Climatic Risk Analysis in Conservation Agriculture in Varied Biophysical and Socio-economic Settings of Southern Africa. Rome: Food and Agriculture Organisation of the United Nations.
xviii. Madzwamise.M (2010) Climate Governance in Africa,Adaptation Strategies and Institutions,Henrich Boell Co.Cape Town.
xix. Mudimu G. (2008) Zimbabwe Food Security Issues Paper for Forum for Food Security in Southern Africa, Department of Agricultural Economics, Harare UZ.
xx. O'Brien, G. O'Keefe, P. Rose, and Wisner, B. (2006) Climate change and disaster management. Disasters, 2006 Vol. 30, 64-80. Overseas Development institute, Blackwell Publishing Oxford UK.
xxi. Rosenzweig, C. and Hillel, D. (1995) Potential impacts of climate change on agriculture and food supply. Consequences Volume 1, No. 2 Summer 1995.
xxii. Rosenzweig, C. and D. Hillel. (1998), Climate Change and the Global Harvest: Potential Impacts of the Greenhouse Effect on Agriculture. Oxford University Press, New York.

xxiii. Rosenzweig, C. and D. Hillel.(2008). Climate Change and the Global Harvest: Impacts of El Nino and Other Oscillations on Agroecosystems. Oxford University Press, New York.

xxiv. Scoones, I.et al.. (1995) Hazards and opportunities: farming livelihoods in dryland Africa − lessons from Zimbabwe. Zed Books, London.

xxv. Smit B. (ed 1993) Adaptation to climate variability and Change ; Report of the Task Force on Climate Adaptation Bulleting 93-04,pp53

xxvi. Smit, Barry and Skinner (2002). Adaptation options in agriculture to climate change: a typology. Mitigation and Adaptation Strategies for Global Change 7: 85-114.

xxvii. Skinner, M.W., Smit, B., Dolan, A.H., Bradshaw, B. and Bryant, C.R. (2001), Adaptation Optionsto Climate Change in Canadian Agriculture: An Inventory and Typology, (Department of Geography Occasional paper No. 25.). Guelph: University of Guelph, 36 pp.

xxviii. Smit, B.: (1994), 'Climate, compensation and adaptation', in J. McCulloch and D. Etkin (eds.), Proceedings of a Workshop on Improving Responses to Atmospheric Extremes: The role of insurance and compensation, Toronto, Environment Canada/The Climate Institute, pp. 2.29–2.37.

xxix. Smit, B., Wandel, J., (2006). Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16, 282-292.

xxx. Smithers, J and Smit, B. (2009). Human Adaptation to Climatic Variability and Change In L. E. Schipper & I. Burton (Eds.), Adaptation to Climate Change (pp. 15-33). London: Earthscan.

xxxi. Stern, N. (2005) Stern Review on the Economics of Climate Change. (http://www.hmtreasury.gov.uk/independent_reviews/ stern_review_economics_climate_change /stern_review_Report.cfm).

xxxii. Tanner and Mitchell (2008), Entrenchment or Enhancement: Could Climate Change Adaptation Help to Reduce Chronic Poverty? Institute of Development Studies Bulletin Volume 39(4 September), 6-15.

xxxiii. Weber, E. U. (2010). What shapes perceptions of climate change? Wiley Interdisciplinary Reviews: Climate Change 1 (3), 332-342. doi:10.1002/wcc.41, http://dx.doi.org/10.1002/wcc.41

xxxiv. Tubiello, F.N., Amthor, J.S., Boote, K.J., et al.. (2007). "Crop response to elevated CO2 and world food supply: A comment on 'Food for Thought...' by Long et al.., Science 312:1918-1921, 2006." European Journal of Agronomy 26(3), 215–23.DOI:10.1016/j.eja. 6/11/2014.

xxxv. http://www.worldbank.org/eca/climate/ECA CCA_Full_Report.pdf (Accessed 31 September 2013)

xxxvi. www.Zimstat.au.zw (Accessed 24 July 2013)

xxxvii. www.adv-geo.sci.net (Accessed 30 July, 2013)