

E.NCIIZAH

Department of Development Studies

Midlands State University

P Bag 9055

nciizahe@msu.ac.zw/elinahnc@yahoo.com/0771406804

Adaptation to climate change and promotion of environmental sustainability in Zimbabwe's semi-arid areas. The case of Ngundu ward in Chivi.

By

ElinahNciizah

Abstract

Promotion of environmental sustainability is a vital way in safeguarding resources across the globe. All human survival and well-being depend upon natural resources which are a source of livelihood for everyone. Yet in recent decades the resource base in many countries has diminished due to such issues as deforestation, desertification and climate change. The loss of resources is a global challenge, especially for the world's poor, who largely depend on resources for food, clean water and shelter. While this paper acknowledges that promotion of environmental sustainability is a prerequisite if development is to be realized, it argues that, climate change can be a major hindrance to the achievement of such development. In this regard, this paper examined ways of promoting environmental sustainability given the challenges posed by climate change in Ngundu ward of Chivi District within Masvingo Province. The study discovered that adaptation can play a significant role in promoting environmental sustainability. The study in many respects promotes adaptation measures at community level so as to achieve environmental sustainability. Adaptation involves adjustments to enhance the viability of social and economic activities by reducing vulnerability to climate change. It involves changing agricultural practices to suit current climate and weather patterns. Questionnaires, key informant interviews and focus group discussions were the data sources implemented in this study. The

study discovered that people in Ngundu ward have implemented adaptation measures like the practice of conservation agriculture, crop selection among others. These adaptation measures can ensure environmental sustainability and reduction of poverty and hunger.

Key Words: environmental sustainability, weather variability, adaptation, semi-arid areas

Introduction

This paper focuses on the significance of environmental sustainability in the presence of climate change using Ngundu ward found in Chivi District within Masvingo Province as the case study. Climate change has threatened environment and the livelihoods of Ngundu farmers as it has resulted in land degradation, siltation, soil erosion among other issues. The farmers in the area are largely depended on their environment and rain fed agriculture as the main source of livelihood. However climate change has affected agricultural production and grossly undermined efforts in sustainable management of land and water. The impact of climate change on agricultural land management includes an increase in pests and diseases, recurrent droughts-floods cycle, changes in the distribution of rainfall, and an increase in violent wind and rainfall intensity (Chifamba et al, 2011). Gukurume(2012)points out that climate change has of late presented insurmountable challenges to the agricultural sector as well as agricultural sustainability in many developing countries like Zimbabwe . Researches on climate change and food security has taken centre stage in Zimbabwe. However issues to do with climate change and environmental sustainability have remained a grey area which this paper sought to address.

The biophysical environment within which economic men operate often dictates the potentials as well as limits to the activities they may do(Chikodzi et al, 2013). It is quite essential that environmental parameters like climate, soil types, natural vegetation, wildlife, water resources and other natural resources are closely studied and known(Ibid). If we fail to consider the environment in this era of climate change, the repercussions of this irreversible process are likely to be drastic. Knowledge of environmental parameters indeed enables informed and sustainable long term planning particularly in the agricultural sector (Mudzengi et al, 2013). The environment requires good protection and management. Natural resource mismanagement contributes to the vulnerability of human systems to droughts and floods. This makes enhanced management to provide a tool for vulnerability reduction. Conservation of the natural

environment has inherent benefits which include biodiversity conservation, poverty alleviation, reduced demand for international humanitarian assistance and enhanced sink capacity(Ibid).

Climate change on a global scale has drastically increased as evidenced by global warming. There is increase in extreme weather events, rising sea level, disappearing glaciers and polar ice, damaged coral, changes in wildlife distributions and health, and increased activity and abundance of disease vectors. According to IPCC (2007) global mean surface temperature has increased by about 0.07°C per decade in the past 100 years. However, the increase has been more rapid about 0.18°C per decade in last 25 years, with the last decade (2001–2010) being the warmest decade on record. The average temperatures over the decade is 0.46°C above the 1961–1990 mean, and 0.21°C warmer than the previous decade (1991–2000). In turn, 1991–2000 was warmer than previous decades, consistent with a long-term warming trend (WMO, 2011). The Intergovernmental Panel on Climate Change (IPCC) has projected that global mean temperatures may increase by between 1.4 and 5.8°C by the end of the 21st century (IPCC, 2007).

Climate records demonstrate that Zimbabwe is already beginning to experience the effects of climate change, notably rainfall variability and extreme events (IIED, 2012). These conditions combined with warming trends, are expected to render land increasingly marginal for agriculture, which poses a major threat to the economy and the livelihoods of the poor due to Zimbabwe's heavy dependence on rain-fed agriculture and climate sensitive resources. Climate change poses a major threat to sustainable development at the micro and macro levels(Ibid).

Adaptation to weather variability and climate change becomes a prerequisite which is recognised as a vital component of any response in reducing vulnerability to climate change. However, people can respond to climate change in different ways, of which such ways may hinder the environment and thus worsen the effects of climate change. Farmers need to be watchful of their responses as these responses determine the sustainability of the environment. It is a major concern how farmers respond and adapt and recover from climatic hazards. Adaptation to such huge risks requires new concepts and tools that do not degrade the environment we depend on.

Before farmers adapt to climate change, however, they need to perceive the climatic changes. Failure to perceive changes in rainfall patterns and temperatures will mean that farmers will not comprehend the need to respond to the risks posed by climate change. Farmers in Ngundu ward have managed to perceive this and are implementing ways that can assist them in living under a changing climate. The IPCC (2001) defines adaptation to climate change as the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects to moderate harm or exploit beneficial opportunities. Although Smith et al (2000) defines adaptation to include all adjustments in behaviour or economic structure that reduce the vulnerability of society to changes in climate system, adaptability refers to the degree to which these adjustments are possible in practices, processes or structures of systems to projected or actual changes in climate. Adaptation to climate change can play a significant role in promoting environmental sustainability. There is need to promote adaptation measures at community level so as to achieve environmental sustainability. Adaptation involves adjustments to enhance the viability of social and economic activities by reducing vulnerability to weather variability. It involves changing agricultural practices to suit current climate and weather patterns. Such adaptation measures include implementing conservation agriculture and crop selection. These adaptation measures can ensure environmental sustainability and reduction of poverty and hunger. Noteworthy, however is that successful adaptation depends on technological advances, institutional arrangements, availability of financing and information exchange (Watson et al (1996) in de-Graft Acquah (2011)). The effects of climate change on farmers and the environment can largely be addressed by adaptation and depends on how farmers have adapted. The close relationship between weather variability and environmental degradation cannot be undermined. In this regard ways of promoting environmental sustainability given the challenge posed by weather variability become a panacea to sustainable development.

Climate change has largely been recognized in Ngundu ward. There are a lot of variations in rainfall patterns in this areamaking it difficult for farmers to know when it is planting season. Climate change can be understood as a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Environmental Sustainability

can be understood as a state in which the demands placed on the environment can be met without reducing its capacity to allow all people to live well, now and in the future (Sutton 2004). It is imperative to endorse ways that conserve the environment so that the future generations are not compromised. Environmental sustainability seeks to promote sustainable uses of resources. It discourages activities like deforestation, poaching, veld fires, land degradation among others. Natural resource management refers to the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations.

Problem Statement

Climate change occurring in Zimbabwe and Ngundu ward of Masvingo Province has a negative impact on the environment and on the livelihoods of smallholder farmers. Adaptation to climate change is a crucial step that requires acknowledgement of the fact that climate change is irreversible and requires sustainable ways of responding to it so that our environment is saved and human kind can survive. Most researches have concentrated on climate change and its effects on food security and the need to adapt but have not done much on the need to promote environmental sustainability through adaptation. Currently little is known on the nexus among, climate change, adaptation and environmental sustainability. Natural resource management can make a substantial contribution to reducing the vulnerability of human systems to climate related natural hazards and thereby saving the natural environment. This research addressed this grey area and aimed at filling this knowledge void that will be invaluable in the formulation of policies and the implementation of adaptation options.

Objectives

- The overall objective of this paper was to assess the responses or ways that have been implemented by farmers in Ngundu ward in an endeavour to respond to climate change thus promoting environmental sustainability.
- Specifically the research sought to ascertain Ngundu farmers' adaptation to climate change, natural resource management and its direct impact on the environment.

- The paper examined the adaptation measures and the barriers associated to adaptation to climate change in Ngundu.

Study Area

Masvingo is one of the ten provinces in Zimbabwe found in the drier south-eastern lowveld of the country. The province has an area of 56,566 km² and a population of approximately 1.3 million (CSO, 2002). There are seven administrative districts, namely Bikita, Chiredzi, Chivi, Gutu, Masvingo, Mwenezi and Zaka. The province is predominantly semi-arid, rainfall is minimal, highly variable/erratic and uncertain making the province prone to droughts. The dominant agricultural activities include subsistence cultivation of drought resistant cereal crops (sorghum, rapoko, millet, and some varieties of maize) and cattle rearing (and commercial cattle ranching) (Simba et al, 2012). The research used a specific case study within Masvingo province which Ngundu ward found in Chivi District. Three villages were then chosen within Ngundu ward which are Nduna 1, Pedzisai 1 and Gutu. Convenience sampling was used to come up with these villages as the all villages in the ward have been affected by climate change in a seemingly similar fashion.

Methodology

The paper approached this topical problem from a holistic point of view seeking to understand people problems from a qualitative perspective. Farmers' views were of most significance to this research as the adaptation strategies that have been implemented in this area came from their views. The study focused on Ngundu ward which is one of the administrative units (wards) within Chivi district. Ngundu ward is approximately 46km² in size with a total population of 9 031 people and a population density of 61.8 people/km² (which is one of the highest population densities in the district. From the Ngundu ward's six villages, three villages (Nduna 1, Pedzisai 1 and Gutu) were selected.

Data sources used in this study included the following:

1. Data on types of crops grown in the area came from selected Agricultural Research Extension (AREX) officers. AREX is a department within the Ministry of Agriculture. Purposive sampling was used to select AREX officers.

2. Data on assistance that is being offered to Ngundu people came from two NGO officers purposively selected, from Care International.
3. Data was also collected from the Chivi district administrator, chief and 3 headmen from the 3 villages.
4. From the selected villages, questionnaires were administered to 20 randomly selected households per village. Most importantly, the adaptation strategies being implemented in the area were also identified using the questionnaire survey.
5. One focus group discussion (FGD) was also conducted in each of the selected villages. These materials were used to obtain information related to adaptation strategies, challenges faced in adopting strategies and farmers' perceptions on adaptation strategy to environmental sustainability

Discussion and Analysis

Climate change has indeed become a major threat to sustainable growth and development in Africa making urgent action a prerequisite. The people of Ngundu ward's heavy dependence on rain-fed agriculture accompanied with high variability of production, poor and small producers, recurrent food shortages and net importers, lack of insurance and safety nets and fragile environments puts the lives of the people at risk. Ngundu ward is now covered with very spaced and scattered trees making vegetation cover like grass a thing of the past. Results found showed that rainfall in Ngundu has dismally decreased and temperatures have drastically increased. The study revealed that a significant number of farmers believed that the climate was changing for the worse. There are changes in rainfall patterns whereby rainfall seemingly start very late and end within a short period. Rainfall variability proved to be the major problem that has affected farmers in this area. Maize production which most of the residents rely on is no longer conducive in the new climatic conditions. The scorching sun also dry baked these small grains which are said to be drought resistant and can grow under dry conditions.

If this low-lying area of southern Zimbabwe becomes non-maize producing area, then surely there will be deterioration in the livelihoods of the population because of climate change. Agricultural production, including access to food in this area has become severely compromised by climate change. As was noticed, the areas suitable for agriculture, the length of growing seasons and yield potential, have decreased. Nowadays however, the Ngundu community receives rainfall that is if they receive at all, around December. This has thus impacted negatively on food security. Agricultural yields have been

grossly reduced making hunger a common theme in the area. Worse still the environment that the people largely depend on for agricultural practices is seriously impaired.

In such a situation the Ngundu residents are now relying more on Food for Work where they can be given some money transfers amounting to \$20 a month (which is way too little) after participating in community developmental projects. They now also rely on food aid which has become their means to survival with NGOs like Care International taking the lead. Climate change has only brought with it a new set of weather patterns and extremes that are well beyond what local communities can deal with. In this regard external help is necessary to rebuild the social and ecological resilience among rural communities. Gold panning in Shurugwi, a nearby area, is also one of the alternatives that people in the district have resorted to as a source of livelihood. Given the negative impacts associated with gold panning to the environment like soil erosion, land degradation and siltation of rivers it becomes crucial that adaptation responses are looked into so that they always aim at promoting environmental sustainability.

However, the study also discovered that the farmers in Ngundu are making tremendous efforts aimed at promoting environmental protection. The ways used to adapt need to be taken into consideration so that the environment is not seriously impaired but its sustainability promoted. The study in many respects promotes adaptation measures at community level so as to achieve environmental sustainability. As already highlighted, adaptation involves adjustments to enhance the viability of social and economic activities by reducing vulnerability to climate change. The study discovered that people in Ngundu have implemented adaptation measures like the practice of conservation agriculture and crop selection and diversification.

Farmers in Nduna 1, Pedzisai 1 and Guti have appreciated the need to promote conservation farming as one of the ways of encouraging environmental sustainability and reduce their vulnerability to climate change risks. Interviews showed that conservation farming has highly been promoted by Care International so as to cater for climate change and promote environmental sustainability. Conservation farming can be understood as any system or practice which aims to conserve soil and water by using surface cover (mulch) to minimize runoff and erosion and improve the conditions for plant establishment and growth. It involves planting crops and pastures directly into land which is protected by mulch using minimum or no-tillage

techniques. Conservation farming systems are mainly designed to use mulch cover to reduce soil erosion and land degradation, reduce soil temperature and conserve moisture for plant growth, increase organic matter levels and improve soil structure and fertility, reduce reliance on cultivation, achieve viable and sustainable productivity. Conservation farming practices include no-tillage or zero tillage, minimum and reduced tillage, trap cropping, cover and green manure cropping, contour farming & strip cropping, organic and biodynamic farming, crop and pasture rotation.

The questionnaire survey used showed the following conservation farming methods used in Nduna 1, Pedzisai 1 and Guti:

1. **Infiltration pits (chibatamvura)/Dhigaudye /zai(egg) pits** are some of the response mechanisms that have been used to promote conservation farming and environmental sustainability. Dhigaudye has the advantage of restoring soil fertility and keeps moisture for some period. This largely saves the crops and avoids frequent tillage of the soil.

From the questionnaire survey the following percentages for those who practiced dhigaudye were as follows:

Pedzisai 1	– 30%
Nduna 1	– 40%
Guti	– 30%

2. **Zero tillage:** This has the advantage of keeping the soil intact and restoring its fertility and increase maize yields.

Pedzisai 1	- 60%
Nduna 1	- 70%
Guti	- 55%

3. **Manure use:** This was the most strategy used. Manure contributes to soil fertility by restoring nutrients.

Pedzisai 1	-75%
Nduna 1	- 70%

Guti -68%

- 4. Early planting/dry planting:** Farmers had mixed feelings on this as this largely had several repercussions on harvesting. One of the advantages is that crop emerges faster once it rains but it is, however it is not always guaranteed that it rains.

Pedzisai 1 - 58%

Nduna 1 -38%

Guti - 30%

- 5. Use of drought tolerant crops:** Though these crops are drought tolerant the study discovered that only a small percentage had switched to these drought crops. This is highly attributed to the fact that most farmers do not like the taste of these small grains, the labor associated with producing small grains and also the challenges posed by birds. Though a very low percentage, these adaptation measures can ensure environmental sustainability and reduction of poverty and hunger in the long run.

Pedzisai 1 -20%

Nduna 1 -25%

Guti -20%

The study discovered, however, some barriers to adaptation. These include the labour associated with dhigaudye whereby the farmers have to make some pits in the whole farm before they sow their maize. This is time consuming and requires a lot of energy from these poor farmers. Most NGOs which were giving assistance in the area like Christian Care are moving out of the area. This has worsened the problems faced by farmers. There is also lack of access to credit and lack of financial support. All this undermines adaptation responses in the area. It is thus recommended that the government should increase its support in the area. There is need to promote drip irrigation in the area and establish some irrigation schemes and early warning systems. Irrigation schemes will promote gardening all year around for the farmers so that food security issues are addressed.

Conclusion

Adaptation to climate change is a crucial step that reduces people's vulnerability to climate change. However ways implemented in response to climate change should be highly taken into consideration so that they do not negatively affect the environment on which most subsistence farmers in Masvingo Province in general and Ngundu ward in particular depend on. The need to promote environmental sustainability should not be undermined as it is the starting point to addressing the impacts of climate change. Sustainable uses of resources that promote environmental sustainability involve dhigaudye, extensive application of manure, crop selection and diversification, zero tillage among others. This conserves the soil so that its fertility is restored. However there is dire need for increased government support so that irrigation schemes can be implemented and the farmers can venture into gardening all year round thereby promoting food security.

Mixed cropping that has been promoted by NGOs working in the area like Care International have been highly implemented. This also has an advantage of restoring soil fertility which is highly damaged by single cropping for several years. There is dire need to achieve sustainable environmental protection through the sound management of natural assets that include, land i.e. soils, water and forests which in turn provide multiple benefits to food production, environmental health and nutrition. Protection of the environment in such a way decreases the extent of vulnerability to climate risks.

Information gathered from respondents during questionnaires and focus group discussions also showed that farmers in the area now practice zero tillage, change in planting dates and extensive use of manure or mulching. Mulch cover is maintained at a maximum level. Soil fertility is highly increased also by combining zero tillage with the use of manure or mulching. Mulch cover will conserve more rainfall and turn it into productive plant growth. Farmers in Nduna 1 have appreciated the need to promote conservation farming as one of the unquestionable ways of encouraging environmental sustainability and reduce their vulnerability to climate change risks.

References

Acquah H. (2011), An Assessment of Farmers Perception and Adaptation Strategies to Climate Change in Beposo, Ghana

Chifamba E. and Mashavira N. (2011) Adaptation and Mitigation Strategies in Sustainable Land Resource Management to Combat the Effects of Climate Change in Chipinge, Zimbabwe, Journal of Sustainable Development in Africa, Clarion University of Pennsylvania, Clarion, Pennsylvania

CSO (2002) National Census Profile. Government of Zimbabwe Printers, Harare, Zimbabwe.

Gukurume S (2012). Climate Change, Variability and Sustainable Agriculture in Zimbabwe's Rural Communities, Russian Journal of Agricultural and Socio-Economic Sciences, 2(14)

IPCC, 2001, Climate Change 2001: Impacts, Adaptation and Vulnerability, McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J., and White, K.S., (eds.), Cambridge: Cambridge University Press.

IPCC, 2007: impacts, adaptation, and vulnerability; Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, 2007.

International Institute for Environment and Development (IIED), 2012, Climate Change Impacts, Vulnerability and Adaptation in Zimbabwe,

Mudzengi, B.K, Simba F.M, Murwendo, T, Mdlongwa T. (2013) Perspectives in climate change and gender issues: a case study of Masvingo Province in Zimbabwe. Sacha Journal of Environmental Studies, Vol 3,

Murwendo, T and Munthali, A. (2008). The value of backyard trees to peoples lives in Masvingo City, Zimbabwe Journal of Geographical Research, Vol 2, No. 1, pp. 24-37.

Ogalleh, S.A., Vogl, C.R., Eitzinger, J. and Hauser, M. (2012) Local Perceptions and Responses to Climate Change and Variability: The Casa of Laikipia District, Kenya Sustainability 2012, 4, 3302-3325; doi:10.3390/su4123302 ISSN2071-1050wwmdpi.com/journal/sustainability

Simba F.M , Murwendo T, Chikodzi, Mapurisa B, Munthali A, Seyitini L (2012a) Environmental changes and farm productivity: a case study of masvingo province in Zimbabwe. Sacha Journal of Environmental Studies,UK. Vol.2 No.1 pp114-129.

Sutton P., (2004) A Perspective on Enviromental Sustainability? A paper for the Victorian Commissioner for Environmental Sustainability, accessed from www.green-innovations.asn.au/A-Perspective on Environmental Sustainability pdf on 31/07/2015