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Title

Climate change adaptation and mitigation at policy level: The role of the Government of Zimbabwe and other stakeholders

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Abstract

Agriculture has been a vital cog in contributing to the Gross Domestic Product (GDP) of Zimbabwe. Small holder farmers in Zimbabwe's communal lands of Zaka and Bikita depend entirely on rain-fed agriculture, a situation that makes agriculture and rural livelihoods susceptible to climate change effects. The purpose of this research is to analyze the role of government, civic society, non-governmental organizations (NGOs) and the Private sector in climate change adaptation and mitigation at policy level and how sustainable agriculture has been promoted using various mechanisms to mitigate the effects of climate change and enhancing the adaptive capacity of vulnerable communities. The researcher used theoretical coding method which is a qualitative research process specifying the theoretical backgrounds of the research and policy recommendations registering the variety in the body of references. A first cycle of analysis was conducted to group the relevant strands into categories then a second analysis was conducted to harmonize the initial categories. The results from the findings show how the government mobilized communities to develop multiple adaptation strategies such as crop and livelihood diversification, educating communities on climate change adaptation through Agriculture Extension Officers, crop and livestock variation (known as *pfumvudza*), climate change education, water harnessing through borehole drilling, assembling of irrigation schemes and dam construction. The study concludes and recommends that there is need to recognise the role of government and other stakeholders in climate change mitigation and adaptation through relevant ministries to address climate change effects and enhancing adaptive capacity of small holder farmers for sustainable livelihoods.

Key words

agriculture, adaptation, adaptive capacity, climate change, mitigate, policy, sustainable Zimbabwe

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Introduction

Agriculture has been a vital cog in contributing to the Gross Domestic Product (GDP) of Zimbabwe. Small holder farmers in Zimbabwe's communal lands of Zaka and Bikita depend entirely on rain-fed agriculture, a situation that makes agriculture and rural livelihoods susceptible to climate change effects. The purpose of this article was to analyze the role of government and other stakeholders in climate change adaptation and mitigation and how the adaptive capacity of vulnerable communities has been enhanced. Several policies have been promulgated by relevant ministries with regards to addressing the effects of climate change and ensuring that small holder farmers' adaptation capacity is improved to enhance sustainable agriculture. Past researches have concentrated their research on community-based strategies to climate change adaptation. This paper focused on clarifying the specific strategies and measures implemented at policy level by the government and other national and international stakeholders in mitigating the effects of climate change and supporting adaptation mechanisms to promote sustainable agriculture. The Zimbabwe government has among other policies implemented the National Climate Change Response Strategy and the National Adaptation Plan in 2013 and 2019 respectively making a significant impact in finding long lasting solutions to adapt to climate change.

Background

The problem

Climate change has continued to pose a great threat to the livelihoods of many in Zimbabwe especially to farmers in rural areas who depend on rain fed agriculture. Climate change adaptation and mitigation has become a priority of government to extricate small holder farmers against poverty and hunger due to unsustainable yields countrywide. Government is therefore critical in ameliorating the effects of climate change and ensuring the development of adaptive capacity of small holder farmers in rural areas who have been susceptible to climatic upheavals. Climate change affects agriculture, depletes water resources and impacts on food security. Hence, many households have become food insecure as agricultural production has been affected.

Theoretical framework

This study was guided by the African Socialism theory that was constructed by Kwameh Nkrumah in his quest to see Africa developed through what he termed reconstructed traditionalism (Nkrumah, 1965). This meant that communitarianism and economic solidarity constitute the essence of African traditional life and how Africa was going to develop strong institutions of development going forward. Many African statesmen have hence, embarked upon expeditions of building up systems based on this communitarianism solidarity or socialism which they regarded as a deep attitude of the mind. Despite the various forms and versions that the proposed system took in different countries all over the continent, the common denominator was the call for a return to the African traditional life structure, for instance, *ujamaa* in Tanzania. The socialist theory in the African context was a strategy to build systems in the continent and do away with the dependency mindset in relying with developed countries at the expense of Africa's independence and development. Nkrumah as an African leader and Pan-Africanist believed and saw 'African socialism' as an authentic means of achieving the economic, social and political development of the new African States of which decolonization was merely a beginning and offered a challenge to African nationalist leaders to a full responsibility for their new nation states. With regards to global challenges such as climate change, African countries must devise ways and strategies that are synonymous with African systems in order to enhance climate change adaptation and mitigation. The phenomenon communitarianism and solidarity posited by Nkrumah is therefore critical in enhancing adaptive capacity of Zimbabwe and relatively all African countries. The concept of resilience provides a useful strategy and leeway for examining the challenges faced by small holder farmers in Zimbabwe in adapting to climate change in Zimbabwe and how authorities remain critical in climate change adaptation and mitigation. Communitarianism and solidarity mean government and other stakeholders will assist and help vulnerable communities that are most affected by climate change using the available resources to steer adaption and mitigation to climate change for small holder farmers.

The terms communitarianism and solidarity entail helping small holder farmers who have experienced traumatic events but have not been able to recover well and those who belong to high-risk areas. In applying the African Socialism theory in the current study, the researcher could identify the susceptibility of small holder farmers in Zaka and Bikita areas in Masvingo and assess whether the community members were in a position to be able to recover from the effects of climate change. The Zaka communal lands as a rural community is identified as one of the communities affected by climate change-related disasters in Zimbabwe, hence the need to concentrate this research in this area and

Government and other stakeholders assist and stand in solidarity with these areas in building resilience against climate change and ultimately capacitating climate adaptation and mitigation.

This solidarity and communalist perspective include the provision of services such as transport and communication, access to credit, markets, and emergency relief and recovery systems. The study operated within the parameters of African Socialism in dealing with climate change effects, which was a navigating tool that assisted the researcher to gather in-depth information about the adaptation and mitigation strategies that is needed for small holder farmers in Zaka. These include the coping and adaptive mechanisms that the Government employs in the face of climate change. However, it was apparently clear that small holder farmers in this area needed an invisible hand, in form of Government, Non-Governmental organizations, civic society and the private sector to intervene with strategies to effectively cope and adapt to the effects of climate change. This interventionists approach requires the need to understand the shocks and stresses that affect the community and its systems and the factors that render the community vulnerable to those shocks and stresses, particularly those related to climate change thus standing in solidarity with most affected areas.

Literature

Climate change, which is attributable to the natural climate cycle and human activities, has adversely affected agricultural productivity in Africa (Mugambiwa & Tirivangasi 2017; Ziervogel et al. 2006). There is ample evidence that reveals that Africa and other developing countries face more challenges from climate change because of poor adaptation mechanisms in place. Therefore, farmers can reduce the potential damage by making tactical responses to climate change and following what Government and other stakeholders have offered in the fight against climate change and poverty (Tabbo & Amadou 2017).

Zimbabwe's rural communities have been negatively affected by the impact of climate change as they dependent more on rain fed agriculture. However, farming of less drought resistant crops has been recommended by Government through its policy of climate change adaptation for rural communities. The change in climatic conditions is apparent in Zimbabwe due to an unprecedented increase in unreliable rainfall patterns, resulting in nationwide flash floods and droughts. This has left communities that rely on farming outputs at greater risk, because climate change diminishes the prospects of having a reasonable and sufficient yield every year. Ndebele and Mubaya (2015) highlighted that climate change introduces greater variability in maize yields, thus making maize production a riskier agricultural activity. According to Ndebele and Mubaya (2015), in Masvingo Province's two districts Zaka and Bikita, dry spells are on the increase; rainfall patterns have become more erratic, therefore failing to support crop production. Through agriculture extension officers, Government has managed to distribute drought resistant crops such as sorghum and millet in areas worse affected by climate change.

Most recently, the Government has adopted the crop and livelihood diversification (*pfumvudza*) concept and also mobilizing for the growing of small-grain crops, which have proved to be a viable means to adapt to climate change and mitigate the effects (Chazovachii, Chingwenya & Mushuku 2012). This can be cited as great strategic planning on the part of the government, which keeps distributing various inputs in areas that are prone to drought and educating communities through agricultural field officers of the *pfumvudza* concept as well as encouraging people in these areas to grow small-grain crops. Gukurume (2013) adds that what should be underscored is that the perpetual decline in rainfall and skyrocketing water shortages in the region pose serious implications for rain-fed agriculture, which predominates in Zaka District. Harvest failures are perpetual in most parts of the district.

In their study in Zimbabwe, Matarira et al. (2004) established that yields of maize, the most widely grown crop in Zimbabwe, decreased dramatically under dry land conditions in some regions (sometimes up to 30%) even under full irrigation conditions because of high temperature increases that shorten the farming season. Chazovachii et al. (2012) argues that commercialisation of the maize crop in Zimbabwe has also forced farmers in marginal lands to grow maize even though their agro-ecological conditions are unsuitable for maize farming, which has resulted in severe shortages of food. Hence, there is a growing feeling that crop yield and staple food grain production in marginal areas have become highly variable because of this shift.

Ndaki (2014) observes that education should be prioritised on the climate change agenda, the knowledge level regarding climate change adaptation in some of the regions remains low. Education through agricultural extension officers should be upscaled in rural areas as has been prioritized by the Zimbabwe Government to equip farmers with knowledge of how to implement adaptation mechanisms in the farming season. In addition, conceptualisation of key issues like climate change adaptation, capacity to adapt to climate

change and vulnerability level to climate change require highly elaborate work to reflect the local contexts of an exposure unit or system in question (Below et al. 2012). As such, adaptation to climate change is crucial for sustainable food security and economic development. To reduce the economic and social impact of climate change in Zimbabwe, focus has to be on adaptation to the changes that are necessary to thrive in changing climatic conditions (Chikonzi, Murwendo & Simba 2013). Adaptation strategies by the Central Government remains critical to assist smallholder farmers to achieve their food, income and livelihood security and it allows them to maintain livelihoods in the face of climate change. In that regard, it remains apparent that Government has a significant role to play in ameliorating the effects of climate change in rural areas through various policies and mechanisms to ensure the achievement of the sustainable development goals on poverty eradication and hunger reduction mostly in rural areas which depend on rain fed agriculture. Various irrigation schemes have been initiated by government in vulnerable areas in Masvingo Province as part of its efforts to address the effects of climate change.

Research gap

Previous studies have focused on community-based strategies to climate change. However, this paper will clarify the role of Central Government, private sector, NGOs and civil society towards climate change adaptation, mitigation and enhancing the adaptive capacity of small holder farmers in Zimbabwe. The paper will also seek to clarify the effects posed by climatic upheavals on the food security status of the country and also role played by developmental partners to equip farmers with climate change adaptation strategies so as to ameliorate and mitigate the effects of climate change on rural households. This paper is critical in understanding the role of government and other stakeholders both national and international in addressing the impact of climate change and how communities can cope and adapt to global warming as an international problem.

Aim of the study

To examine the role of Government and other stakeholders in climate change adaptation and mitigation and also explore the impact of climate change on food security in Zimbabwe. The paper also examines various mechanisms and strategies by Government and developmental partners to mitigate the effects of climate change. The research also provided answers to questions arising from what policies have been put in place by Government in dealing with climate change. This study adds to a pool of research conducted at a local level that examines the impact of climate change on food security. Being a small holder farmer requires adjustment and adaptation, which implies an integrated approach to be able to cope with prevailing situations. However, the Government and other development partners need to assist and capacitate climate change adaptation.

Methodology

Research approach

The researcher used interviews to gather information from research participants. The researcher also got information from papers and journals, articles and books using theoretical coding method. The researcher used a qualitative research approach in conducting his study. The researcher shows some appreciation of the theoretical frameworks that gives direction of the research activities before making a choice of the hypothesis. The method that is used by qualitative researchers symbolizes a belief that is common that they can provide a deeper understanding of the social phenomenon under investigation.

Research design

The researcher used a case study as a research design. This case study had been used to make analysis of subjects within the limits of a specific environment and circumstances. A descriptive case study was made use of to scrutinize the sequence of interpersonal events after a certain amount of time had passed. An advantage of case study method was the aptitude to detain difficulties of real-life situations so that observable fact can be studied in better levels of intensity. This is an important type of research as it informs policy makers on the decisions to make facing a problem like this and how policies will go a long way in mitigating and ameliorating problems faced, in this case by small holder farmers in rural Zimbabwe in general in as far as climate change adaptation is concerned. The researcher noted the lack of technological advancement and poor infrastructure to deal with climate change in developing nations particularly. This has contributed immensely to the problem of food insecurity. But the gap was also filled by other stakeholders including non-governmental organisations who also helped in supporting climate change adaptation at various levels.

Target population and sampling

The study was composed of two groups, where the targeted population was the whole group of people which the researcher aimed to simplify the study findings and the accessible population which was the part of the population which the researcher had

reasonable admission, maybe a division of the target group. The researcher used purposive sampling as a sampling strategy. It is a type of sampling that relied on the judgment of the researcher when it came to selecting the units for example pieces of data that were to be studied, (Patton, 1990, 2002). The purpose of purposive sampling was to center on particular characteristics of population that was of interest which enabled to answer the researcher's questions.

Ethics

The researcher obtained local and community consent from traditional leaders through explaining to them how this research was going to help them in the long run and how it was going to be used to access adaptation materials from developmental partners. These principles are critical and need to be embraced when interrelating with other people while the study is being carried out. The researcher also took note of the need to treasure people not as lifeless sources of data that can be used anyhow by anybody but as people whose rights and welfare must be secured and valued.

Results and discussion of findings

This section presents and discusses the results of the study and policy initiatives by Government and other stakeholders, recommendations that need to be prioritised for effective climate change adaptation. The researcher wanted to find ways in which Government and other developmental partners should assist communal farmers in the form of the enhancing their adaptation capacity to enhance the food security status. Building adaptive capacity of small holder farmers will help ameliorate challenges facing rural households currently in mitigating the effects of climate change in Zimbabwe. The Madondo and Chinorumba community was hit hard by the adverse effects of climate change, like many other rural communities in Zimbabwe. The inhabitants of the community with the help of other stakeholders including government are doing what it takes to withstand the adverse effects of climate change, but in the process their efforts are being crippled by several challenges. From the information gathered through other researches and texts, and various responses from research participants, government and NGO officials and village leaders remain critical in the implementation strategies of climate change adaptation. This article contributed to the understanding of the role of government in steering a National Climate Change adaptation response mechanism that helps communal farmers in Zimbabwe to adapt to climate change.

Climate change and food security: How Government is assisting communities to be food secure

Climate change has affected food security and exacerbated malnutrition in rural households and the Government and other stakeholders have been seized with finding ways to replicate the effects of climate change. The research reports that agricultural productivity has declined immensely. The study also argued that agricultural yields have declined and this is particularly caused by unpredictable weather patterns. However, the Government must upscale their planning and response to the needs of the vulnerable areas through planning properly for farming seasons and capacitating rural households to participate in issues of climate change. Inefficiency on the part of Government is also noted as farming inputs would have distributed late and farmers cannot plan properly because of that and this was largely attributed to transportation and logistical problems. In fact, this jeopardizes the timing and planting date of most peasant farmers.

The agricultural sector is highly vulnerable to the effects of climate change yet it contributes immensely to the economy. Prevalence of crop pests and diseases was also reported to have increased and this poses further challenges to agriculture. The study findings show that a diverse set of crops have been abandoned and farmers now grow small quantities of other crops. Participants' interviews with Agric-extension workers in the area of study indicate that the decline in the growing of maize as a cash crop is associated with drought conditions especially in Zaka Masvingo. Although NGOs introduced mulching to reduce water loss and increase yields of maize, 11 of the selected respondents abounded the crop citing that the yields of the crop have declined over the years because of a decline in soil fertility and droughts. Scientific evidence supports peasant farmer's views as it argues that warmer temperatures lead to phenology and shortening the growing season which contributes to a reduction in crop yield.

The phenomena experienced in the study as noted and discussed suggest that food security and nutritional status of households is at threat due to climatic upheavals. To strengthen food security and nutrition status of households in Zaka, the government and other private stakeholders are initiating irrigation programs for sustainable food production. Introducing of drip irrigation plays an important role in strengthening food security and at the same time saving water which focuses on the principles of sustainable development. This also

strengthens household adaptive capacity when agriculture is negatively affected. Like other areas with irrigation mechanisms, the government needs to locate seriously affected areas and ensure irrigation schemes are resuscitated so as to ameliorate the effects of climate change and ensure food security and nutrition levels rise.

The concept of climate change adaptation

Humans have been adjusting to changes in the environment few decades ago. Adaptation in the context of climate change is viewed as a means of strengthening resilience of individuals and systems to climate change and climate vulnerability (Elmum, Modise & Marr 2017). Apparently, adaptation has most often been assessed in the context of vulnerability to climate change. As a result, adaptation to climate change is usually preceded by analysis of perception of climate change as this is what spurs an individual or group to want to respond to perceived climate change or not (Elmum et al. 2017). Adaptation measures in agricultural practices include crop and livestock variation (*pfumvudza*), community-based adaptation, climate change education, water harnessing through borehole drilling in rural areas, irrigation schemes done by Government agencies, rainwater harvesting through massive dam construction by government water-conserving techniques and the use of drought-resistant crop varieties (Mugambiwa 2018).

The Zimbabwe Government has managed to come up with the National Climate Change Response Strategy in 2013 and the National Adaptation Plan in 2015 and it has made significant contribution in adapting to climate change in most vulnerable rural areas. This policy also encompasses the initiative to sponsor and initiate irrigation facilities in almost all districts in the province so as to support agriculture throughout the year. It is now a policy to ensure that in each and every district there is an irrigation scheme from every water body in an effort to ameliorate the effects of climate change and adapt to global warming.

Most rural communities in Zimbabwe have been underdeveloped infrastructurally and the dependence on climatic volatile resources is very high. Their livelihood activities are reliant on the natural environment, savaged by climate change, which plunges these communities into climate change vulnerability (Dube & Phiri 2013). Climate change has aggravated poverty levels in most rural communities of Zimbabwe, where 70% of the country's population is trapped in high poverty circles and mostly located in rural areas. Accordingly, the government has responded to the plea of rural farmers together with other developmental partners in ensuring that borehole drilling is intensified in Masvingo Province as it has been hardly affected by climate change. This infrastructure is critical in assisting agricultural production at household level and ensuring that water is available to all households, and that people will not travel long distances to access clean water. This policy has also been supported by a number of developmental partners including ChinaAid, Norwegian Aid, USAid to mention a few. The government of Zimbabwe declared drought a national disaster on 05 February 2016 because of the dire effects of the El Niño weather. The declaration was meant to ensure a well-coordinated response to minimise distress and suffering caused by the climate change variability mostly in Masvingo and Matabeleland provinces, which are seriously engulfed in the catastrophic effects of climate change. These provinces are naturally situated in regions that receive low rainfall.

Enhancing adaptive capacity in Zimbabwe: Policy and practicing the National Adaptation Plan

This study also revealed that for effective adaptation to take place, Zimbabwe needs to enhance its adaptive capacity in rural areas especially through adopting to contemporary technologies. Zimbabwe created the National Adaptation Plan (NAP) to climate change, which seeks to improve the resilience of cities and rural communities to climate change impacts and ensures climate smart urban and rural investments. The Zimbabwe Government has come up with the National Adaptation Plan to ensure effective climate change adaptation strategies are implemented and reducing climate change effects. It is a flexible process that builds on the country's existing adaptation activities and helps integrate climate change into national decision-making (UNDP 2017). Zimbabwe's vulnerability is related to lack of adaptive capacity and coping with additional stress posed by climate change. Adaptive capacity is typically limited by poverty, poor public and environmental health, weak institutions, lack of infrastructure and services, marginalisation from decision-making processes and planning procedures, gender inequality, lack of education and information, natural disasters, environmental degradation, reliance on rain-fed agriculture and climate-sensitive resources, and insecure tenure (IIED 2012)

Zaka communal lands lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. Rainfall exhibits considerable spatial and temporal variability characterised by shifts in the onset of rains, increases in the frequency and intensity of heavy rainfall events, increases in the proportion of low rainfall years, decreases in low intensity rainfall events, and increases in the frequency and intensity of mid-season dry-spells (Unganai, 2009). Extreme weather

events, namely tropical cyclones and drought have also increased in frequency and intensity. These effects represent considerable effects that climate change has had in Zimbabwe. However, Zimbabwe has made considerable efforts to adapt and mitigate the effects of these climatic changes.

The International Panel on Climate Change fifth assessment report indicates that countries have the potential of reducing the impacts of climate change through effective adaptation measures (IPCC 2012). Adaptation should be a concern to African countries as climate change impacts already have and will continue to negatively impact on needs of human beings that includes food, water and shelter. The World Bank (2011) asserts that vulnerable populations and societies such as the indigenous people, elders and children in the developing world will suffer more because of climate change. Limited awareness about the nature and magnitude of climate change starts with researchers and academics. There are several climate change issues that have not yet been established with certainty that are important for agriculture, such as the time of onset summer rainfall and the prevalence of dry spells within the rain seasons in southern Africa (Mutekwa 2009).

It is against this background that adaptation involves changes to behaviour that includes planting of drought-resistant crops, borehole drilling, water harvesting mechanisms, climate change education and changes to infrastructure. All stakeholders both at national and global level can contribute to climate change adaptation and enhancing the adaptive capacity of developing countries such as Zimbabwe. Studies on adaptation point that each community has distinct levels of vulnerability and resilience and that each situation is different. The social and economic status of countries have also played a determining role in the enhancement of adaptive capacity of rural areas that have mostly been affected by climate change as they depend more on rain fed agriculture and infrastructure development has also affected adaptive capacity of climate change. In 2014, the Global Environmental Facility handed a grant of $3.9 million to scale-up climate change adaptation (UNDP 2016). In 2015, the Ministry of Environment, Water and Climate launched a project (scaling up adaptation in Zimbabwe), with a focus on rural livelihoods. The mentioned project seeks to scale-up climate change adaptation measures of rural communities and it targets to reduce the vulnerability of women. Thus, there is need for external support from the international community and national government agencies, to poor and vulnerable rural people who possesses the lowest levels of adaptive capacity especially in rural areas to ensure drilling of boreholes, developing irrigation infrastructure, climate change education, infrastructure development, planting of drought resistant crops and plant variation (*pfumvudza*) to mention a few.

Strategic importance of groundwater resources in climate adaptation in Zimbabwe

Borehole drilling or groundwater storage in Zimbabwe is believed to be quite extensive, and could act as a natural buffer against climate change and variability. However, the quantities that can be sustainably abstracted are unevenly distributed, and yields vary. Groundwater is the main source of water for more than 70% of the national population living in rural areas. Sparsely populated areas are particularly reliant on groundwater, with hand dug wells historically playing a major role in rural and peri-urban areas. Other sources are boreholes, springs, sand dams and riverbank abstractions. Groundwater is a finite resource that can be depleted if use is not properly regulated. Sustainable groundwater abstraction could play a major role in achieving the following Sustainable Development Goals (SDGs) in Zimbabwe: 1) end poverty, 2) end hunger and promote sustainable agriculture, 6) sustainable water and sanitation, 8) inclusive sustainable economic growth, and 13) combating climate change impacts.

As water supply coverage improves, new sources will be required in difficult-to-reach locations and tough hydrogeological conditions where the risks of drilling a dry borehole are high. Over the past three decades, Zimbabwe has witnessed a significant increase in water wells and boreholes. These are financed by development programmes as well as investments by water users and local businesses. Not only do boreholes supply hand-pump water, but they also play a substantial role in small as well as larger rural piped water supplies that may help agricultural production.

However, the occurrence of borehole water is dependent on deep aquifers whilst shallow and deep wells can be dug almost anywhere except rocky and Kalahari sand areas in Zimbabwe. Wells have generally been used for primary purposes such as household uses only. There are very promising prospects for sustainable groundwater use for secondary uses such as food production/processing and livestock farming which rural households of Zaka depend upon. Horticulture is also supported through borehole water as well as livestock farming.

However, the lack of good scientific knowledge on groundwater resources in Zimbabwe, and Africa in general, undermines its potential to contribute to poverty reduction and economic development, and threatens its environmental sustainability. Drilling of borehole remains equally important in climate change adaptation as it provides rural people to

access to clean water and support irrigation activities in such areas.

Pfumvudza farming policy: A farming instrument to adapting to climate change for sustainable food production

This study revealed that the Government of Zimbabwe has used the Ministry of Agriculture, Lands and Rural resettlement through Agriculture Extension Officers to educate farmers on the concepts of *pfumvudza* as a way of adapting to climate change as a new farming technique. This article will get into detail with this concept in order to fill the gap left by other researches in clarifying Government mechanisms through the relevant Ministry at policy level to help rural communities ameliorate the effects of erratic rainfall patterns in Masvingo rural areas.

Pfumvudza is a crop production intensification approach under which farmers ensure the efficient use of resources (inputs and labour) on a small area of land in order to optimize its management. "P*fumvudza* means a new season of increased productivity, it is a season of producing more on less land and with less resources; a season of climate proofing our agriculture through the adoption of Conservation Agriculture'', said the Permanent Secretary of the Ministry of Lands, Agriculture, Water and Rural Resettlement, John Bhasera. What makes *pfumvudza* unique is the size of the plot used, at just 16m x 39m the plot is small enough to easily prepare, small enough to manage with mulch, small enough to weed, and even small enough to water by hand with harvested rainwater in the event of a mid-season dry spell or drought.

The concept has been successful in helping farmers to produce grains including maize, sorghum and millet, while it also encourages the rotation of legumes such as beans, ground nuts or cowpeas. According to Matthew Mbanga, CEO of Foundation for Farming Trust, the secret to the project's success has been its scalability. Conservation Agriculture drastically reduces the workload for farmers and limiting the size of plots makes it even more manageable. All 1.8 million beneficiaries of the Presidential Inputs Scheme, now called the Climate-proofed Presidential Inputs Scheme, are each expected to establish three *pfumvudza* plots over the 2020/21 agricultural season.

A new government initiative is aimed at increasing farmers' resilience of Zimbabwe has set a target to train 1.8 million farmers in Conservation Agriculture (CA) by October 2020 in time for the 2020/21 cropping season. One million farmers have already been trained in the country. To help achieve this ambitious goal, the Food and Agriculture Organization of the United Nations (FAO) has been training government extension staff to implement the *pfumvudza* concept and to train small holder farmers in rural Zimbabwe to help bring food self-sufficiency to Zimbabwe.

It is hoped that the project will address the problems of low levels of productivity and agricultural production, making the country's farmers and households more resilient to climate shocks and ultimately ensuring food security in Zimbabwe. The scheme also offers real potential for commercialisation by encouraging smallholder farmers to produce surplus food to earn a regular income. The government's objective is to climate proof the agricultural production of smallholder farmers (who make up 80% of farmers in Zimbabwe) and ensure food self-sufficiency for the nation.

Drought resistant crops as adaptation strategy (crop diversification)

This study ascertained that households in Zaka District have resorted to crop diversification or the ploughing of drought resistant crops as a way of minimising the risk of crop failure in the district. Government through Agriculture Extension Officers have distributed seed in various districts that are prone to climate change as a way of cushioning farmers who cannot afford seeds for the farming of less drought resistant crops. Farmers are not only resorting to crop diversification but also resort to diversification of livelihood activities in a bid to minimising impacts of food insecurity and vulnerability.

It also emerged that small-scale farmers in Zaka and Bikita Districts are responding to climate change by diversifying their range of crops and adapting to short-season varieties and small grains. The researcher noted that drought-resistant crops that include sorghum, *rapoko* and finger millet are most favoured by many peasant farmers. This study noted that growing of small grains is one of the local adaptation strategies to the impact of climate change as rural farming is now affected by unreliable rains. The participants considered cultivation of drought-resistant crops as an important tool for addressing crop failures. This trend clearly portrays that households understand the importance of cultivating small grains and drought-tolerant crops.

Dam construction in Zimbabwe as adaptation strategy

The building of dams in Zimbabwe has been instrumental in climate change adaptation and an integral part of integrated rural development which attempts to develop natural resources such as land and water for the benefit of the local people. The Zimbabwe Government has been constructing dams

around the country including the Tokwe Mukosi dam in Chivi which is the biggest inland dam in Zinbabwe. The main objectives of constructing the dam is to provide water for irrigation on the lower side of the dam and for fish project for local people. In the holistic sense, the idea was to improve sustainable utilization of natural resources by reducing pressure on the most utilized natural resources. This is an important step towards building climate change adaptive capacity and to capacitate livelihoods of people in the community who will benefit more from such developmental activity.

The Government will be anticipating that as an income-generating project, fishing would occupy people and leave them without time for craftwork thereby curbing tree cutting and bark stripping that are exacerbating climate change thus mitigating climate change. Basically, in Zaka there is Sea dam which support community with irrigation projects and instrumental to boost crop and vegetable farming in order to improve food security. Fishing is mainly an income-generating project.

Available institutional and policy framework by the Zimbabwe Government in response to climate change

To prove its readiness and commitment to mitigate and adapt to climate change through reducing GHG emissions, the government of Zimbabwe has structured policy frameworks and initiatives at institutional level. These include establishment of a parent ministry for climate change, establishment of Government departments that are mandated to deal with This global challenge of climate change. This below list shows the available policy mechanisms available to guide the implementation of the country's response to climate change. Zimbabwe's Vision 2030 buttressed by the Transitional Stabilization Program (TSP) also lays a foundation towards adapting and ameliorating the effects of climate change. The following are the frameworks in place by the Zimbabwean Government in dealing with climate change:

1. The national climate change response strategy (2013)
2. The climate change policy (2017)
3. Low greenhouse gases emissions development strategy (2020-2050)
4. National climate change adaptation plan (2019)
5. Environmental Management Act (chapter 20:24)
6. National agriculture policy framework (2018-2030)
7. National climate change gender inclusive action plan (2017)

The above policy frameworks are an indication that Zimbabwean government is committed to the capacitation against climate change through blue prints and roadmaps to the achievement of Sustainable Development Goal Number two and relatively all SDG's. Some of the major achievements to date include the construction of biggest inland dams including Tokwe Mukosi, Marovanyati dam, Mutirikwi to mention a few that have been instrumental in assisting irrigation activities and agricultural production in these areas. The country has made immense contribution and efforts to introduce sustainable agricultural practises that are in line with climate change adaptation and mitigation such as the famous *pfumvudza* concept (crop diversification) so as to capacitate rural communities to adapt to climate change.

Government Climate Change Response Strategy in various ministerial levels

1. Cabinet Committee on Climate Change adaptation and mitigation
2. Minister of Environment, Water and Climate Change
3. Minister of Agriculture Lands and Rural resettlement
4. National Climate Change Platform (Multi stakeholders
5. Technical sub-committee on Climate Change
6. Sub-Committee on Capacity Building Resource Mobilization and Awareness
7. Provincial Climate Change Platform
8. Technical sub-committee
9. Sub- Committee on Capacity building, Resource mobilization and Awareness
10. Local Urban and Rural (RDC) Authority Climate Change Platform
11. Technical sub-committee
12. Sub-committee on capacity building, resource mobilization and awareness
13. Community based committees
14. Disaster Risk Management committee

Recommendations

The government must be responsible in crafting instrumental policies and giving strategic mechanisms to cope and adapt to the effects of climate change. The implications of this study are that governments around the world should treat climate change as a global problem and help developing countries to enhance their adaptive capacity. Relevant ministries have a role to play in assisting farmers and equip them with necessary

knowledge and technology to adapt to climate change.

Adaptation strategies to climate change are supposed to be centred on the needs of peasant farmers as they have proved to be the most affected. Peasant farmers in communal lands are supposed to be encouraged to diversify to other economic activities as these strengthen households' adaptive capacity. Other diversification activities complement each other and they ensure that food security at the household level remains stable. Diversification is an important resilience tool and must be encouraged at all cost. The Zimbabwean Government has responded to climate using various mechanisms to ameliorate effects of climate change and helping peasant farmers in Zaka communal lands and Masvingo Province. However, their impact may not be sufficient and they need help from the international community and civic society groups in the country to equip all communities with adaptive capacity mechanisms.

The designing and implementation of adaptation strategies by the central government are supposed to be based on social dimensions and perceptions of peasant farmers in communal lands not much on technical aspects as has been ascertained by the research. The integration of household's perception ensures that there is an exchange of climate change information which is useful with other stakeholders involved in the implementation of adaption projects. The study noted that there are peasant farmers who are still ignorant to climate change. Therefore, the study recommends the need of climate change campaigns informing communities about the impacts of climate change and possible adaption strategies they can carry out. Campaigns will also help to promote already adopted strategies.

Conclusion

The study has shown that agricultural activities of peasant farmers depend on rain-fed water hence such vulnerability has been exacerbated by climate change. This suggests that agricultural activities are impacted negatively, livelihoods and food security in general are at threat due to climatic changes and upheavals. Zimbabwe is one of the most vulnerable countries and the exposure of climate change is widely exacerbated by poverty, unstable economy and limited mechanism put in place to cope effectively with the changing climate. If we are to closely look at preconditions that determine adaptive capacity, it is clear that Zimbabwe as a country is vulnerable because adaptive capacity is lacking due to poor technologies. This research has clearly shown the role of government and other stakeholders in the initiation of policies of climate change adaptation and ensures implementation is fast tracked. The mandate of government is to ensure that the country adapts to climate change through policies that attracts developmental partners to assist in the fight against global warming. The research conclude that the role of the government remains critical in the formulation and implementation of policies and frameworks at policy level to ensure farmers are equipped to adapt to climate change and to be able to mitigate its effects. Through the National Climate Change Response Strategy and the National Adaptation Plan launched in 2013 and 2015 respectively in Zimbabwe and the help of the international community and civic society groups, Zimbabwe might make strides in eradicating poverty and ending hunger and malnutrition. Such policies remain critical for climate change adaptation in Zimbabwe and the mitigation of climate change effects on rural households.

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