**JCTR**
**Policy Brief**

**Promoting of Social Justice and Concern for the Poor**

**First Quarter 2012**

# CLIMATE CHANGE-HOW READY IS AFRICA AND ZAMBIA TO MITIGATE AND ADAPT?

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## 1.0. Introduction

Climate change is not only an environmental injustice, but a humanitarian and development emergency of global proportions. It is poised to significantly impact food security, livelihoods, health and other basic services. Those affected most will be the poorest and most vulnerable economies, which have the least cause to the problem. It is therefore not surprising that climate change has become a subject of local, national, regional and international importance, it is scientifically accepted that it has already began to have negative impacts on the global environment. Studies on the economic impact of climate change have been conducted in many African countries. These inquiries, are seeking to establish the present magnitude of the impact of climate change and the scale of adaptation measures required to address CC's negative impacts. A recent study by Stockholm Environment Institute (SEI) indicated that specifically the Southern Africa region (including Zambia) is responsible for a tiny percentage of the world's carbon emissions but is likely to one of the worst effected area. The United Nations Framework on Climate Change (UNFCCC), to which Zambia is a party has met for the past 17 years and has still not agreed to binding reduction commitments or to a process that will effectively combat climate change.

In addition to many significant development challenges facing Zambia, the effects of climate change are likely to result in increased food insecurity, accelerated land degradation and an increase in severe weather events such as flooding and/or droughts. Environmentally sustainable development is fundamental to reducing farmer's vulnerability to climate change. In other words, bold measures that protect the environment need to be fostered and promoted by government working together with all stakeholders involved in the agricultural and environmental sector.

## 2.0. Climate Change Policy Frameworks

In terms of policy, the response to climate change in Zambia has been fairly consultative. There has been active facilitation of civil society participation in all activities relating to climate change mitigation strategies undertaken by the Government. The relationship between Ministry of Tourism and Environment MTER, through the Climate Change Facilitation Unit (CCFU), and Zambia Civil Society Climate Change Network (ZCSCCN) has been progressive. In fact, ZCSCCN will be a member of the National Climate Change and Development Council (NCCDC) proposed in the NCCRS. This would be a mile stone for civil society participation if it materializes, given that ZCSCCN is part of another broad framework of Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs) under the Zambia Community Based Natural Resources Management (ZCBNRM) Forum.

The impacts of climate change are unevenly distributed, both socially and geographically. Marginalised and vulnerable groups are likely to be worst affected as they have the least means to cope with or reduce their vulnerability to the impacts of climate change. These groups, which are already poor, physically unwell or impaired, and/or resident in geographically vulnerable locations such as flood-prone areas, depend on sensitive livelihood systems particularly those reliant on rain-fed agriculture - are particularly more vulnerable to climate change (Ministry of Tourism, Energy and Natural Resources Report, 2011).

## 3.0. Climate Change and the Economy

Commensurate with these concerns, economic assessments have estimated particularly high economic costs attributed to climate change in Africa. Conservative estimates suggest that African economies could lose up to 1-2% of Gross Domestic Product (GDP) annually, the equivalent of US$10-20 billion across Africa. In Zambia, there is the assumption that the economy can be interpreted in broad terms to carter for all these other concerns. But how the economy is measured is how it should be understood. In this vein, economies are measured, largely, in terms of the GDP. Climate Change should not only be measured in term of GDP losses but also on the negative impacts it could have on key economic sectors, particularly the agriculture sector. [1]The Intergovernmental Panel on Climate Change (IPPC) makes it clear that warming of the climate system is “unequivocal”, as observations of increases in air and ocean temperatures, widespread melting of snow and ice, and sea level rise have made evident (IPCC, 2007).

GDP losses are not, however, necessarily the best way to understand climate change impacts on natural resources. What short-term GDP based models fail to capture is the decline in the natural resource stock (and the quality of these stocks) that generate these flows. Since the value of natural resource assets such as wetlands are not recorded in GDP calculations, their demise is not recorded as a decline in GDP. It is only when the wetland collapses to the extent that it prohibits tourism or mining activity, or restricts the flow of clean water to a manufacturing site resulting in reduced productivity on the site, that GDP is affected, and the impact is recorded. In this sense GDP losses are poor conveyors of natural resource losses (MTENR, 2011b).

## 4.0. Climate Change and Agriculture

The relationship between climate change and agriculture is two-way; agriculture contributes to climate change in several major ways and climate change in general adversely affects agriculture. Agriculture needs to find ways to feed the world while being environmentally sustainable. Yet, it is increasingly clear that the current path of conventional agriculture is not sustainable nor can it feed the world without doing

[1] The 2011 Economics of Climate Change Report for Zambia

great damage to the planet. Agriculture will therefore have to cope with increased climate variability and more extreme weather events. In Zambia, degrading land resources and poor water management are serious impediments to the development of agriculture. Further, the country has three agro-ecological regions. The agro-ecological Regions I, II and III are characterised using measurements of rainfall against topography. Zambia is further divided into 36 agro-ecological zones that are characterised using the same rainfall against topography data but also include other factors like vegetation cover and soil. The agro-ecological regions and soil status are described below;

- ✓ Region I is low rainfall region (less than 800mm annually) situated at altitudes of 300 – 900 metres above sea level in the valley areas. This region has an agriculture growing season of 80-120 days. The region contains a diversity of soil types ranging from slightly acidic Nitosols to alkaline Luvisols with pockets of Vertisols, Arenosols, Leptosols and Solonetz. The use of these soils is limited by lack of adequate water availability and high soil erosion potential[2].

- ✓ Region II has moderate rainfall (800-1200mm annually) situated at altitudes of 900 – 1300 metres above sea level on the central and eastern plateau. This region has an agricultural growing season of 100 – 140 days. The region is sub-divided based on soil types. In Sub-region IIa, in the centre of the eastern parts of the country, soils are largely classified as Lixisols, Luvisols, Alisols, Acrisols and Leptosols with respective association and Vertisols in the Kafue floodplain. These soils types comprise some of the best agricultural land in Zambia and host much of the country's commercial farming sector. Subregion IIb in the western of the country contains a range of Arenosols, Gleysols, Histosis and Podzols that are limited by soil acidity, poor drainage and water logging conditions[3], and

- ✓ Region III with annual rainfall above 1200 mm covers the northern areas with altitudes of 1100 –1770 metres above sea level. This region has an agricultural growing season of 160 days. Soils in this region are predominantly Acrisols, Alisols, Solonchaks, Leptosols and some Ferallsols developed under conditions of high leaching intensity[4].

[2] PaViDia, 2009, Field Manual, Volume 3: Sustainable Agricultural Practices
[3] PaViDia, 2009, Field Manual, Volume 3: Sustainable Agricultural Practices
[4] MACO/JICA, PaViDia, 2009, Field Manual, Volume 3: Sustainable Agricultural Practices

## 4.1. Climate Change and Sustainable Agriculture

Sustainable agriculture, by its very definition, reduces harm to the environment, for example through the reduction or elimination of polluting substances such as pesticides and nitrogen fertilizers, water conservation practices, soil conservation practices, restoration of soil fertility, maintenance of agricultural biodiversity and biodiversity etc. sustainable agriculture practices can also mitigate climate change. Organic agriculture, for example, uses less fossil fuel based inputs and has a better carbon footprint than standard agricultural practices (Zeisemer, 2007).

Sustainable agriculture practices and climate change adaptation strategies are mutually supportive. By adopting an approach to farming that focusing on improving soils through essential increasing the organic matter content and conserving soil moisture will not only increase the nutrients available to the growing plants but also enable soils to absorb, hold and release increased moisture. This latter factor is vitally important to enable crops to survive extended or unexpected dry periods during the rainy season.

## 4.2. Sustainable Agriculture

Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs.
A basic fundamental idea behind Sustainable Agriculture (SA) is that farmers should cooperate with nature and not fight against it. Most of today's agricultural activities, involve a constant battle with nature. Trees are cut, soils are ripped, torn apart and hardened, single crops are grown on large areas continuously and chemicals are used in ever increasing rates to control weeds, insects and diseases. On the contrary Sustainable Agriculture encourages a more gentle approach to farming.
Sustainable Agriculture promotes the land's capacity to remain productive while maintaining the resource base. Therefore sustainable agriculture can be defined as a way of farming that anchors on agricultural practices governed by ***3 basic principles,*** i.e., it is environmentally friendly, economically viable and socially just.

### 4.2.1. Principles of Sustainable Agriculture:

a) **Environmentally friendly:** This means that the quality of the natural resources is maintained and the viability of the entire eco-system (from humans, crops and animals to soil organisms) is enhanced. This is best ensured when the soil is managed and the health of crops is maintained by natural methods. Resources are used in a way that minimizes losses of nutrients, biomass and energy, and avoids pollution.
b) **Economically viable:** This means that farmers can produce enough for the family's consumption and gain sufficient cash to pay for labour and other costs in production and for the needs of the family (e.g., education, health care, clothing).
c) **Socially just:** This means that social responsibilities such as working and living conditions of laborers, the needs of rural communities, and consumer health and safety both in the present and the future are fulfilled.

Sustainable agriculture stresses the improvement and preservation of the land while increasing productivity and decreasing dependency on external inputs. Sustainable practices are not new.

### 4.3. Sustainable Agriculture practices

Sustainable agriculture practices are classified into three main categories. These are: soil improvement practices, pest control practices and tillage practices. Practices under each category are elaborated below:

**1. Soil Improvement practices:**

**Need to nourish and improve the soil** – there is need to add organic matter to the soil as a first step to increasing productivity of the soil. Soil fertility and organic matter can be improved by:

- **Crop rotation** - growing more leguminous crops, shrubs or trees in the rotation
- **Composting** - adding manure and compost
- **Mulching** – applying a layer of material (usually crop residue or grass) over the surface of the ground. Mulching reduces the evaporation of moisture from the soil by keeping it protected from the direct rays of the sun. When mulch decays on the surface it increases the humus content of the soil.
- **Mulching plants** – growing a green manure crop specifically for adding fertility to the soil and for improving the structure of the soil. In addition to recycling nutrients and fixing nitrogen, this green manure crop conserves the soil by providing shade and ground cover to prevent soil erosion and retain moisture. It also acts as living mulch keeping down the weeds.
- **Agroforestry and improved fallows** – allowing fallow period, i.e., a period of time when a farmer decides to let his land rest in order for it to regain fertility. In an improved fallow system, fast growing, nitrogen-fixing trees or shrubs are grown for 1-3 years in order to raise the fertility of the soil in a short period of time.

**2. Pest Control practices:**

**Need to Control Pests** - pest control is another way of increasing production in sustainable agriculture. This can be done by:

- **Encouraging the growth of trees and bushes in areas that will not be cultivated**. In these areas insects, lizards, bats and birds (predators) will find a suitable place to live. Predators help in pest control as insects are part of their diet.
- **Reduced or total elimination of the use of all forms of insecticides**. Insecticides will kill the harmful insects and the useful predators too.

**3. Land Preparation practices:**

Need to prevent the formation of or break the plough/hard pan. When ploughing, the soil is cut, moved and turned. The plough cuts through the soil and the pores under the plough share get closed. The fine particles from the ploughing process move downwards and complete the closing and sealing of the pores. After a while a

plough/hard pan is formed which prevents water and roots penetrating into the soil. Prevention of or breaking the plough pan can be achieved by:

- **Minimum Tillage**
  - ✓ **Ripping** - using the Magoye ripper or the sub soiler. These open the soil for easy root and water penetration with minimum disturbance to the soil.
  - ✓ **Pot Holing/Planting Basins** – this opens the soil at and around the planting station for easy root and water penetration with minimum disturbance to the rest of the soil. The hole/basin traps and thus conserves water and moisture thus enabling the plants to survive severe water stress conditions (drought).

Generally, adoption of the soil improvement, pest control and land preparation agricultural practices outlined above, governed by the three principles of environmentally friendly, economically viable and socially just, defines Sustainable Agriculture as practiced and promoted by KATC.

Threats to the environmental sustainability of agriculture threaten agriculture itself. Greater emphasis is therefore needed on not only safeguarding natural resources for future generations but also to begin the challenge of restoring Zambia severely depleted soils. Agro ecological practices centered on sustainable agricultural systems are desperately needed if farmers are going to be able to survive within a deteriorating climatic environment, as well as tapping the traditional knowledge held by local communities and farmers, which can work in partnership with formal science and technology.

## 5.0. Climate Change and Poverty

According to World Food Summit of 1996, food security exists ***"when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life***". This definition caters for both physical and economic access to food that meets people's dietary needs and preferences. Therefore, the combined effects of high vulnerability and low adaptive capacity due to severely degraded soils and now climate change are likely to have the greatest negative impact on the resource poor in Zambia in Africa. This impact is further likely to impact upon the ability of countries to meet strategic poverty alleviation and pro-poor growth objectives as well as the millennium development goals (MDGs).

Additionally, inhabitants of most rural communities are failing to adapt to ever increasing intensity of livelihood vulnerabilities brought about by environmental degradation such as lack of water and food insecurity. Hence, majority of rural households have now resorted to charcoal production as a source of livelihood. In terms of environment, changing climate is also increasingly having disastrous effects on the vulnerable communities particularly the poor and women.

## 6.0. Climate Financing

Financing climate mitigation and adaptation in developing countries represents a key challenge in the negotiations on a post-2012 international climate agreement. The current state of climate finance has been criticized for its insufficient scale, relatively low share of private-sector investment, and insufficient institutional framework[5]. Financing for both adaptation and mitigation is now being made available by industrialized countries to support CC efforts in developing countries[6]. Financing for climate change activities remains a challenge. As efforts in international fora continue, Zambia should also mobilize local resources to fund its environmental sector.

## 7.0. Conclusion

Sustainable agricultural practices have gained a lot of support not only from members of the green movements but Governments as well. The benefits have also been verified through research and also documented. Apart from being ecologically friendly, they have also been proved to increase the yields. The National Agricultural Policy (NAP), Fifth National Development Plan (FNDP), Sixth National Development Plan (SNDP) as well as the strategic plan for the agricultural sector have highlighted the importance Government attaches to sustainable agricultural practices. It is however argued that whereas conservation farming is explicitly highlighted in the policy documents and the various plans, organic farming has received no attention beyond being mentioned briefly in these documents and being implied in most of the places. The implementation of conservation farming has spread to over 43 of the 72 districts in the country, an indication of Government commitment to the promotion of sustainable farming practice. The actual number of farmers that have been trained in the methods of conservation farming however is just about 20.0% (Simasiku al, 2010).

The modes of implementation among different actors need to be harmonized to avoid a situation where promoters begin to crowd each other out. Harmonization is also needed to promote efficiency by avoiding unnecessary duplication of efforts among promoters. The Government needs to take an upper hand to guide implementation. Harmonization should not only be restricted to the modes of implementation but should also extend to the operational definitions that promoters are using. The operational definition should be the same among different promoters so that farmers do not receive different and in some cases conflicting messages. The fact that the promotion of sustainable agricultural practices is heavily dependent on funding from cooperating partners has an implication on sustainability of these

5 The Harvard Project on International Climate Agreements 2009 November Issue

6 CAMCO, Report on the National Stakeholders Consultative Meeting for the Development of a comprehensive National Climate Change Response Strategy (NCCRS) National Workshop, Held at the Mulungushi International Conference Centre, Lusaka on 15th June 2010

programs. The Government should put more resources to ensure continuation of the program beyond the expiry of the donor funded projects. This is quite important considering that more than 50.0 % of the targeted farmers are yet to be trained (2011 JCTR Knowledge, Attitudes and Practices Survey Report).

Climate change has been acknowledged as a real challenge in Zambia by both practitioner and farming communities for example through experiencing the full brunt of floods and droughts in some districts. One area of opportunity for policy implementation would be to link sustainable agriculture policies to the Farmer Input Support Programme (FISP) wherein the beneficiaries should practice conservation agriculture in using the inputs as a way of mitigation. To do this, Government would have to redesign the entire extension service with the skills and competencies to teach farmers about conservation agriculture. Similarly, sustainable agriculture systems can place people on better food security status if applied properly. The use of sustainable agriculture as a strategy for climate change adaptation in different areas should recognize that even if the principles and practices are uniform, their application must be location specific.[7]

The availability of champions for sustainable agriculture systems that include the Golden Valley Agricultural Research Trust (GART) and the Kasisi Agricultural Training Centre (KATC) should be leveraged. It would also be useful for the public and private Tertiary institutes of agriculture, livestock and fisheries to also strengthen sustainable agriculture, climate change, adaptation and mitigation in their curricula.

## 8.0. Policy Recommendations

- ***Raising the policy profile of climate change. -*** measures include: Government putting climate change on the agenda of high-level consultations with development cooperation agreements; preparing country briefs on climate change; promoting exchange programmes between the Zambia and partner countries to foster mutual understanding on climate change and related aspects.

- **Rapid mitigation[8] required if warming and associated impacts are to be limited-** There is growing evidence that decisions about macro-economic policy, agricultural policy, multilateral development, bank lending, insurance practices, electricity market reform, energy security and forest conservation often treated as being a part of climate policy, can significantly reduce emissions. Therefore, policies that ensure the enhancement of mitigation potential are promoted in all sectors and levels.

[7] Can Sustainable Agriculture Practices Remedy the Negative Effects of Climate Change on Food Security in Zambia?2011 Report

[8] Mitigation, therefore, means taking actions before, during and after a disaster has happened in order to reduce the negative effects of disasters

- **Adaptation Must Begin Now** - Adaptation to the effects of drought and climate change in agro-ecological regions I and II- Adaption efforts, aimed at reducing the vulnerability of communities to climate change impacts in agro-ecological regions I and II should be strengthened. Adaption should further be mainstreamed into agricultural planning at national, district and community levels to make the case for investment in agricultural sector. [9]

- **Alternative energy sources** – The planting of trees on commercial basis should be encouraged to supply firewood to those that will still continue to depend on firewood. Further, the policy on charcoal production should be reviewed and communities should be encouraged to use other forms of renewable energies

- Capacities and systems to anticipate assess and prepare for climate change risks should be developed at national and sub-national levels down to the communities.

- Adaptation learning generated from the projects should be used to guide the mainstreaming of adaptation in national fiscal, regulatory and development policy to support adaptive practices on a wider scale

[9] Adaptation is key in context , defined as adjustment to natural or human system in response to experience or future variability and extreme events which may be beneficial or adverse(NAPA 2008)

## Annex 1: List of Reference


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2012

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