



**ZAMBIA NATIONAL POSITION PAPER**  
**Video Conference on High Value Agriculture in Eastern and Southern Africa:**  
***Environment and Sustainability in Horticulture in Zambia***  
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**1. Present status of environmental impact and sustainability measurements for horticultural production**

*Environment and sustainability Issues of Concern*

All development programmes in Zambia depend to some extent upon natural resources. The country is mainly a primary commodity producer of non-renewable resources that require special care, management and application. According to the National Policy on Environment (NPE) document, the country at present faces daunting challenges of de-forestation at the rate of 250-300 thousand ha per year; land degradation in many places verging on desertification; wildlife depletion especially in the protected areas and all accompanied by soil erosion, loss of productivity, inadequate sanitation and air and water pollution.

With regard to climatic change, The United Nations Development Programme (UNDP) Climate Change Country Profile of Zambia reports that the mean annual temperature in Zambia has increased by 1.3°C since 1960, a rate of change which is confidently projected to continue (Zambia Briefings, 2010). This translates to a rate of about 0.6°C per decade which is ten times higher than the global or Southern African rate of increase in temperature. This has the effect of increasing the frequency of days and nights which are particularly warm, a trend which constrains crop yields in tropical latitudes. The implication of higher temperatures for rainfall is more difficult to predict, especially as Zambia is affected by the periodic El Nino phenomenon, a complexity beyond the scope of current climate models. The UNDP Climate Change Country Profile of Zambia, further reports that the mean annual rainfall over Zambia has decreased by an average rate of 1.9 mm per month (2.3%) per decade since 1960. This annual decrease is largely due to decreases in December-January-February rainfall, which has decreased by 7.1mm per month (3.5%) per decade. Daily precipitation observations show some indication of reductions in the contribution of heavy events to total rainfall, and the magnitude of maximum 1 and 5 day rainfalls, but none of these trends are statistically significant.

The trends are towards higher average temperature, a possible decrease in total rainfall and some indication of heavy events of rainfall. These trends are uncertain and include the natural driving forces such as Inter Tropical Convergence Zone (ITCZ) and El Nino Southern Oscillation (ENSO) and the variability in the country between north and south. Moreover, the effect of weather extremes may also be compounded by changes in sensitivity, e.g. cultivation of flood prone land due to scarcity of land.

Data on emergency events from Zambia suggest a drastic increase mainly in the flood events. The data does not reveal whether this is caused only by an increase in precipitation or whether it is also caused by more sensitivity to such events due to demand for land and land-

use practices. There is evidence that current climate variability has a large impact on development in Zambia both through 'low frequency – high impact' extreme weather events (like major droughts and floods resulting in disasters) but also through 'high probability – low impact' events (like erratic rain fall patterns, increase in warmer days and nights, and emergence of pests).

Slight changes in temperatures which can negatively affect crop yields and occurrence of floods and droughts can mean total crop failures which can lead to catastrophic consequences for livelihoods since the majority of the people in Zambia depend on agriculture. An article at the Centre for Tropical Agriculture (CTA) Seminar 2008 on the Implications of Climate Change for Sustainable Agricultural Production describes how in the 2007/8 season villagers in Zambia's Southern Province had never experienced 13 days of continuous rainfall for the past 50 years and had their houses, food, crops and livestock all washed away by floods. The same article cites a University of Zambia report that says that Southern Province will continue to experience more rainfall than ever because of changing weather patterns globally. This poses risks such as a growing number of deaths from thermal stress caused by heat waves, more floods, bush fires, draughts and cyclones which will go together with an increased transmission of vector-borne, food-borne and water-borne diseases.

A quantification of the likely impacts of climate change is provided by a World Bank study based on the Ricardian method. The study used a multiple linear regression model with net farm revenue as response variable, fitted with climate, hydrological, soil and socio-economic variables as explanatory variables. According to the findings, 20% decrease in mean precipitation between January and February and 1°C increase in mean temperature between November and December would result in 252% and 243% reduction in maize production, respectively. A 1°C increase in mean temperature between January and February would result in 237% increase in maize production, while the effect of increase in mean annual run-off is insignificant, only resulting in 2.5% increase in maize production for 1 cm increase in mean annual run-off (Jain S., 2007; M. de Wit, 2006).

#### *Environmental and Sustainability Issues on Horticultural Production and Marketing*

There is no data on environmental and sustainability issues on horticultural production and marketing in Zambia. These have been regarded as part of general agricultural production and marketing. The issue of land degradation due to use of inappropriate land-use management practices have been widespread including cultivation along river banks for especially vegetables. Conventional tillage methods have reduced land productivity especially in the southern parts of the country where use of ox-cultivation is very common. This in addition to frequent rain season dry spells among other issues prompted the promotion of conservation agriculture. Contamination of surface and underground water as a result of fertilizer and chemical usage in agricultural production in general including horticultural production. On the marketing side, however, horticultural products are the heaviest users of public market infrastructure which themselves have little investment in both hard and soft market infrastructure. Coupled with their perishable nature, it is not uncommon to see heaps and heaps of fresh horticultural produce rotting near and around markets which has been posing greater and greater challenges to the local authorities to deal with. Poor information flow along the supply chains exacerbates the situation as quite often demand and supply are not matched.

Some of the main impact and long-term consequences of climate change on horticultural production are:

- Reduced water availability for irrigation: The ground water table has tended to have a downward trend especially if rainfall amounts are below normal for a number of subsequent seasons. For example, the Food Security Research Project's (FSRP's) experience with the vegetable trade volumes and price data collection work shows that supplies of tomato into Lusaka's Soweto market greatly reduced in April/May/June of 2007 due reduced water levels in Lusaka West, one of the major supply areas. This led to sharp increases in prices in what would have been normally a low price season. Large commercial farmers who predominantly grow the cabbage that is supplied to Lusaka markets have also been reported to have reduced areas planted due to declined water sources.
- Increased mean daily temperatures have meant that more irrigation water was needed for the crop in order to satisfy rapid evaporation due to excess heat as well as the transpiration needs of the plants. This entails irrigations per station taking longer with its attendant increased energy costs.
- Increased heat due to rising temperatures have led to poor produce quality which translates into reduced earnings for farmers. Quite often crops like tomatoes would be forced to ripen quickly with a poor quality with even a reduced shelf life. Excess heat in some crops causes fruit splitting.
- Most horticultural produce in Zambia is produced in the cool dry season when the incidence of pests is low and thus expensive pest and disease control measures with pesticides are rarely required. Due to increase in mean daily temperatures even in the cool season, the incidence of pests and diseases is increasing which means that the producer has to incur high pest and disease control costs comparable to those of the wet warm seasons.
- Production of some horticultural crops such as rape in some parts of the country is highly dependent on the timely onset of the rains. This is the time when smallholder farmers can cultivate relatively larger fields away from the dambos/wetlands and river banks, the rationale being that the early rains will help the crop establishment and subsequent rains see the crop to maturity and harvest before the pest and disease incidence peaks up in February. Apart from escaping the pest and disease pressure the smallholder escapes the need to draw water from wells in the dambos or by the river bank situated 100 to 500m away from the field. When the rain season starts late, either the early planted crops dries due to lack of water or some growers avoid planting altogether knowing that later planted crops would be ravaged by pests and diseases. This denies the smallholders valuable income sources. According to nationally representative survey data, horticultural produce accounts for 18% and 39% of smallholders' total household income and total household cash income respectively.

#### *Institutional Arrangements Addressing the Main Issues*

There is no national institution that addresses the issues of climate change, environment and sustainability in horticultural production and marketing. These issues are dealt with at a broader ministerial level though environmental issues are as a matter of policy being mainstreamed in all sectors and their respective ministries. Issues relating to environment in Zambia are a mandate at the policy level of Ministry of Tourism, Environment and Natural Resources (MTENR). Under the ministry, there is also the Environmental Council of Zambia (ECZ) which is a statutory body mandated to protect the environment and control pollution so as to provide for the health and welfare of persons, and the environment. Its mission is to

safeguard human health and the environment through effective environmental management to provide for present and future generations.

The challenges the country faces as a result of climate change are immense, and thus the UNDP and other cooperating partners have been supporting the Government of Zambia in preparing the response to these. This assistance has been channeled through building capacities and institutions required to effectively combat climate change at the national level. In 2009, the government of Zambia established the climate change facilitation Unit (CCFU) within the MTENR charged with the responsibility of coordinating climate change issues in the country as part of this support. The unit is also supported by the Norwegian Government and the United Nations Environment Programme (UNEP).

With regard to national programmes or protocols, the Government of Zambia, being a State party to the United Nations Framework Convention on Climate Change (UNFCCC), has undertaken certain mandatory activities pursuant to its obligations under the Convention. These include participation in UNFCCC processes (initial communications, developing greenhouse gas (GHG) inventories); mitigation and adaptation measures; and the development of National Adaptation Programmes of Action (NAPA). The NAPA which was submitted to UNFCCC in 2007 addresses immediate pressing adaptation priorities in the food security and public health sectors as well as the economic impact of climate change in Zambia i.e. the importance of climate change to short, medium and long term development priorities for Zambia as set in the Fifth National Development Plan (FNDP). The Government has also developed the:

1. Methodological development, National Mitigation Analysis and Institutional Capacity Building Programme which aims to:
  - Establish and enhance national framework for developing climate change mitigation in Zambia in line with general development objectives.
  - Establish or enhance the national capacity to comply with the requirements of the framework convention on climate change, primarily with regard to mitigation, but including enhancement of greenhouse gas inventories where necessary, and
  - Develop and test a methodological framework for sub regional climate change mitigation analysis and strengthen regional awareness and responses to climate change.
2. National capacity self assessment for implementation of Rio Convention: The programme focuses on identification of gaps in national capacity for effective implementation of UNCBD, UNCCD and UNFCCC Comprehensive national climate change awareness program- It aims to ensure national ownership and success of future climate change related efforts.
3. Documentation of National Implementation Plans (NIPS)-Management of persistent organic pollutants (POPs) under the Stockholm Convention

With regard to specialists, the University of Zambia offers a Bachelors of Science degree course in natural resources management which covers environmental and climate change issues. The university has specialists such as economists, agronomists, policy specialists conversant with the impact of climate change on agricultural production and not specifically horticultural production. These and other professionals undertake ad hoc studies on the impact of climate change and other environmental sustainability issues.

## **2. Present management of climate change impact on horticulture**

A myriad of adaptation and mitigation strategies have been taken at production level. For example, households located in areas that were flooded due to unusually heavy rainfalls have considered and are re-locating to higher grounds and are planting their gardens slightly further away from river banks and valleys. These households normally plant their vegetables on river banks and dambos (wetlands) for easy access to irrigation water, normally in the dry season. Farmers are also turning to different farming techniques such as planting early or drought resistant crops, using drip irrigation with a higher water use efficiency, water harvesting, mulching, minimum tillage (and other conservation agriculture techniques) and various soil fertility improving techniques which enhances soil water retention such use of compost and other organic manures.

At the national level, there is no specific ways through which environmental and sustainability issues on horticultural production and marketing are managed in the country apart from through the general broad framework lead by the MTENR. The CCFU with support from UNDP has initiated the development of a National Climate Change Response Strategy (NCCRS) whose purpose is to address present and future changes and impacts related to climate change in Zambia. The NCCRS will build in existing national and regional priorities for addressing climate risks and opportunities in Zambia. There have been a number of activities related to climate change risk management, adaptation and mitigation in Zambia. These have all made contributions to increased awareness and priorities for how to address the challenges of climate change in Zambia. Zambia has been reacting to climate-sensitive issues with ad-hoc and uncoordinated initiatives due to lack of a framework to coordinate climate change response. In the agriculture sector, there have been pilots for conservation agriculture/farming, crop diversification, crop rotation, and small scale water harvesting, as well as provision of food supplements in the most vulnerable areas. In wildlife, Zambia Wildlife Authority (ZAWA) has been implementing a wildlife translocation programme when the climatic conditions reduce the habitats' carrying capacity. In the energy sector, studies have been conducted to support the promotion of renewable energy. In the health sector, the Ministry of Health has a programme to distribute mosquito nets to combat malaria.

Given the ad-hoc nature of the efforts made so far, the achievement of mainstreaming, mitigation and adaptation to climate change in Zambia remain minimal at this stage. The NCCRS is expected to include a national institutional and implementation framework that considers mainstreaming, mitigation, adaptation, research, capacity building and awareness on climate change with priority actions for different sectors of the economy. The NCCRS builds in existing policies and priorities on climate change in Zambia. The strategy will identify the main gaps and opportunities for addressing climate change in Zambia. An institutional assessment will be developed for recommendations on an efficient coordination and implementation framework. The framework will oversee implementation of activities through a prioritized, coordinated and harmonized programmes and projects, across the sectors.

The necessary local expertise is available locally and in the region for identification and characterization of specific constraints. However, no ad hoc committee to spearhead these efforts exists. This is a role which the Horticultural Working Group that stakeholders are forming can play.

There have been a number of donor assisted activities in this area. The UNDP in addition to assistance to the CCFU has also helped Zambia to build an inventory of greenhouse gas emissions; assess the impacts of climate change on the most vulnerable sectors; analyze potential measures to limit greenhouse gas emissions; and develop capacities for reporting on climate change through the National Communication report to the UNFCCC.

The UNDP is also supporting processes to help enhance Zambia's chances of entering the international carbon market. One such process is the Clean Development Mechanism (CDM). UNDP is also supporting Zambia in readiness for emerging carbon markets in Reduced Emissions from Deforestation and forest Degradation (REDD). In collaboration with Global Environmental Fund's (GEF's) small grants programme, UNDP has also allocated grants up to USD 50,000 for non-governmental and community-based organizations for climate change mitigation and adaptation; conservation of biodiversity among others. In addition, throughout 2009 UNDP took part in awareness-raising activities, organizing discussion fora among journalists, government representatives and students, traditional leaders and members of parliament. UNDP also supported the production of the documentary film "Climate change: the Zambian story".

### **3. On-going strategy at regional level**

Zambia was part of the 12th Ministerial Session of the African Ministerial Conference on Environment (AMCEN), which recognized the need to integrate Africa's existing and new climate change programmes under a consolidated framework. The framework is intended to ensure coherence and efficient coordination of all climate change programmes, projects and initiatives on the continent. To assist with this effort, AMCEN's African Group of Experts developed an indicative outline for the framework of programmes that will serve as a tool for future programming work especially with regards to filling gaps on areas that require future attention. The core features of the indicative outline closely follows the four pillars of the Bali Action Plan which include (a) adaptation and (b) mitigation as the two implementation areas as well as (c) supporting measures such as technology transfer, capacity building and finance, as components that support programme implementation.

Zambia takes part in the following regional climate change adaption programmes:

1. The SADC Drought Monitoring Centre (DMC) whose main objective is to carry out climate monitoring and prediction for early warning and mitigation of adverse impacts of extreme climatic events on agricultural production, food security, water resources, energy, and health among other socio-economic sectors. The centre has played an important role in providing the sub-region with weather and climate advisories and more importantly, timely early warnings on droughts, floods and other extreme climate related events.
2. Southern Africa Regional Climate Outlook Forum (SARCOF): This brings together Climate scientists from SADC National Meteorological and/ or Hydrological Services (NMHSs) and the Drought Monitoring Centre (DMC) to prepare reports on seasonal climate status and outlook.
3. SADC Task Force for Monitoring Weather Conditions: This is found under the Food Security, Technical and Administrative Unit. It is specifically there to monitor weather conditions. The task force comprises the SADC's Regional Early Warning Unit, the

Regional Remote Sensing Project, the Drought Monitoring Centre and the Famine Early Warning System Project, all based in Harare, Zimbabwe. The early warning unit issues alerts to help member countries prepare for the prospect of drought or flooding and consider ways of mitigating their effects.

4. SADC Regional Early Warning System: This provides advance information on food crop yields and food supplies and requirements. The information alerts Member States and stakeholders of impending food shortages/surpluses early enough for appropriate interventions. National Early Warning Units have been established in all Member States to collect, analyse and disseminate early warning information at country level.
5. SADC Regional Remote Sensing Unit: The unit is a centre of technical expertise facilitating training programmes and technical support in the field of Remote Sensing, Agro-meteorology and GIS in support of early warning for food security, natural resources management and disaster management.
6. SADC Groundwater and Drought Management project: The objective of the project is for SADC member states to develop cooperatively a strategic regional approach to support and enhance the capacity of its member States in the definition of drought management policies, specifically in relation to the role, availability (magnitude and recharge) and supply potential of groundwater resources. This will assist in reconciling the demands for socioeconomic development and those of the principal groundwater-dependent ecosystems. Tools will be elaborated for regional cooperative management of trans-boundary aquifers and to guide sustainable downstream investments in proactive drought mitigation.

With regard to mitigation measures, Zambia participates in the Programme for Basic Energy and Conservation (ProBEC). This is a SADC project that manages and stimulates the establishment of various projects based on basic energy conservation in 10 member states in SADC. Currently ProBEC is also actively involved in Malawi, Lesotho, Mozambique, Tanzania, Swaziland, Botswana, Namibia and South Africa.

The regional programmes for supporting measures include:

1. COMESA Climate Change Initiative: The goal of COMESA's Climate Change Initiative is: "Achieving economic prosperity and climate change protection." The overall objective of the Initiative is to address climate change and its impacts in a manner that builds economic and social resilience for present and future generations. The specific objectives are to consolidate a shared vision for Africa on climate change and a common and informed voice for the continent in the Post Kyoto Climate Change negotiations and beyond; foster regional and national cooperation to address climate change and its impacts; promote integration of climate change considerations into regional, national policies, sectoral planning and development and budgeting; enhance human and institutional capacities of COMESA Secretariat, specialized institutions and Member States to effectively address the challenges of climate change; mobilize African and international scientific and technical communities to increase knowledge base and its management to support informed decision making processes; promote and enhance collaboration, synergy, partnerships and effective participation of Governments, business community, civil society and other stakeholders in climate change matters; and provide a framework for the establishment of an African BioCarbon Facility that combines market-based offsets, public and private funds.
2. SADC Regional Environmental Programme: The purpose of the Regional Environmental Education (EE) Programme is to enable environmental education practitioners in the

3. SADC region to strengthen environmental education processes for equitable and sustainable environmental management choices. This will be achieved through enhanced and strengthened environmental education policy, networking, resource materials, training capacity, and research and evaluation.
4. African Bio Carbon Fund: The fund is part of the Africa Bio-Carbon Initiative which seeks to advocate for broader eligibility for bio-carbon in the Kyoto and related regional and national frameworks for climate change. This objective will contribute to the overarching goal of increasing the benefits for sustainable agriculture and land-use practices, biodiversity conservation, maintenance of environmental services, successful adaptation to climate change, and improvements in rural livelihoods, in addition to the delivery of cost-effective and verifiable reductions in greenhouse gas emissions in Eastern and Southern Africa and beyond.

### **References**

- Chishakwe, N., E. (2010). Southern Africa Sub-Regional Framework on Climate Change Programmes Report. SADC, UNEP.
- Government of the Republic of Zambia (2005). National Policy on Environment. Ministry of Tourism, Environment and Natural Resources.
- Government of the Republic of Zambia 2007. 'National Adaptation Programme of Action (NAPA)'.
- Jain S. An empirical economic assessment of the impacts of climate change on agriculture in Zambia. The World Bank, Policy Research Working Paper 4291 2007.
- M. de Wit. Climate change and African agriculture. Centre for Environmental Economics and Policy in Africa (CEEPA) of the University of Pretoria, Policy Note No. 27 of August 2006
- McSweeney, C.; M. New & G. Lizcano (2008). "Zambia". UNDP Climate Change Country Profiles <http://country-profiles.geog.ox.ac.uk>
- [www.nccrs-zambia.com](http://www.nccrs-zambia.com)
- [www.undp.org/africa](http://www.undp.org/africa)
- Zambia briefings: Poverty, food and energy in a changing climate (August 2010)