

CCARDESA's

Climate Change Adaptation Strategy



Centre for Coordination of Agricultural Research & Development for Southern Africa
Centre De Coordination De La Recherche Et Du Développement Agricole De L'Afrique Australe
Centro Para A Coordenação Da Investigação E Desenvolvimento Agrário Na África Austral

CCARDESA Secretariat,
4701 Station Exit Road,
Private Bag 357, 00357
Gaborone, Botswana

Tel: +267 391 4997
Fax: +267 316 7211
Email: ed@ccardesa.org
Website: www.ccardesa.org

CCARPASA

Enhancing Evidence Based
Climate Change Adaptation

Research and Policy for Agriculture in Southern Africa



FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

CCARDESA's Climate Change Adaptation Strategy: Evidence from CCARPASA Project

INTRODUCTION

Adapting to climate change is a serious challenge facing the human development at present and continuing in the future.

The scale is global, with trajectory of onset of uncertain climate and weather conditions and associated impacts, some of which are potentially catastrophic (IPCC, 2013). Agricultural water (under rainfed or irrigation settings) holds significant scope for addressing climate change vulnerability and adaptation needs as well as in ensuring water and food security in the region (SADC 2011). In response, all involved actors in agricultural adaptation will need to elevate the level and quality of their efforts.

CCARDESA in its endeavor to support the national agricultural research and innovation system will have a key role to play as a critical link between farming populations and sources of new information and tools, so that practices can be appropriately adapted in southern Africa.

This brief outlines the challenge of adapting to climate change, identifies recent engagements and practices, and proposes future regional and country-level responses, with a focus on the constraints and conditions of smallholder farmers in the region, and the natural resource base upon which agriculture depends. This CCARDESA Climate Change Adaptation Strategy eventually becomes an integral part of CCARDESA's Medium Term Operation Plan (MTOP) and longterm overall strategy to deliver its mandate in an effective manner.

Box 1:

Key terms used in this brief in the context of climate change adaptation in agriculture

Climate Smart Agriculture: Climate Smart Agriculture in the context of climate change is defined as set of agricultural practices that sustainably increase productivity and system resilience while reducing greenhouse gas emissions (FAO, 2010).

Vulnerability: "The degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change" (IPCC, 2007a).

Resilience: "The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner..." (IPCC, 2012).

Adaptation: "In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects..." (IPCC, 2012).

Mitigation: The efforts undertaken to "reduce anthropogenic [greenhouse gas] emissions or to enhance natural sinks of greenhouse gases" (IPCC, 2007b).

Living with Extremes, Uncertainties and the “New Normal”

The frequency of extreme weather events and the damage they cause to humanity is increasing (Figure 1) and making populations more vulnerable to climate change variability.

Climate change will exert increasing pressure on a complex web of relationships among social, environmental, economic and food systems. This will affect our ability to meet other major challenges, especially feeding the growing population in Southern Africa.

Future climate changes, as well as differences in climates from one location to another, may involve changes in climatic variability as well as changes in means, often predicted by climate models with some prediction uncertainties associated with the different climate model assumptions, the mathematical model boundaries, climate forcing, green house emission scenarios, etc.

Figure 2 shows Projected changes in temperature and precipitation in the 2050s in the southern African region (CCARDESA, 2014), presented at a spatial scale of an area of 2.5x2.5o square grid. It was simulated by one of the GCM models, MPIECH-5, a SCENGEN Designation for Model from Max Planck Institute for Meteorology, Germany, known with its ECHAM5/MPI-OM.

Implications for Smallholders and the Rural Poor in Southern Africa

Global climate change has sobering implications for natural resource management (NRM), food production and reliance on agriculture for poverty reduction and economic growth (World Bank, 2010). Climate change remains a challenge for food security, and livelihoods making the southern African region vulnerable to a variety of stresses. It is estimated that the livelihoods of nearly 70 % of the region which depends on rain-fed agriculture, an activity that is characterized by small-scale, subsistence farms is affected (Challinor et al. 2007; World Bank 2009).

One of the hallmarks of the vitality of rural communities is their ability to adapt to changes affecting their livelihoods. But the fewer assets that rural families have – human, financial, natural, social, political, physical – the more challenging this becomes and the longer it takes to recover from even modest shocks.

In a recent study, most farmers in Zambia are unable to afford certain alternatives, such as those of agro-forestry or conservation, they face difficulties in accessing markets due to poor road infrastructure, fluctuating market prices, high costs and late deliveries of farming inputs (Makondo et al., 2014). This coupled with low presence of systematic early warning systems in place against natural hazards and disasters, the adaptation capacity of farmers remains limited.

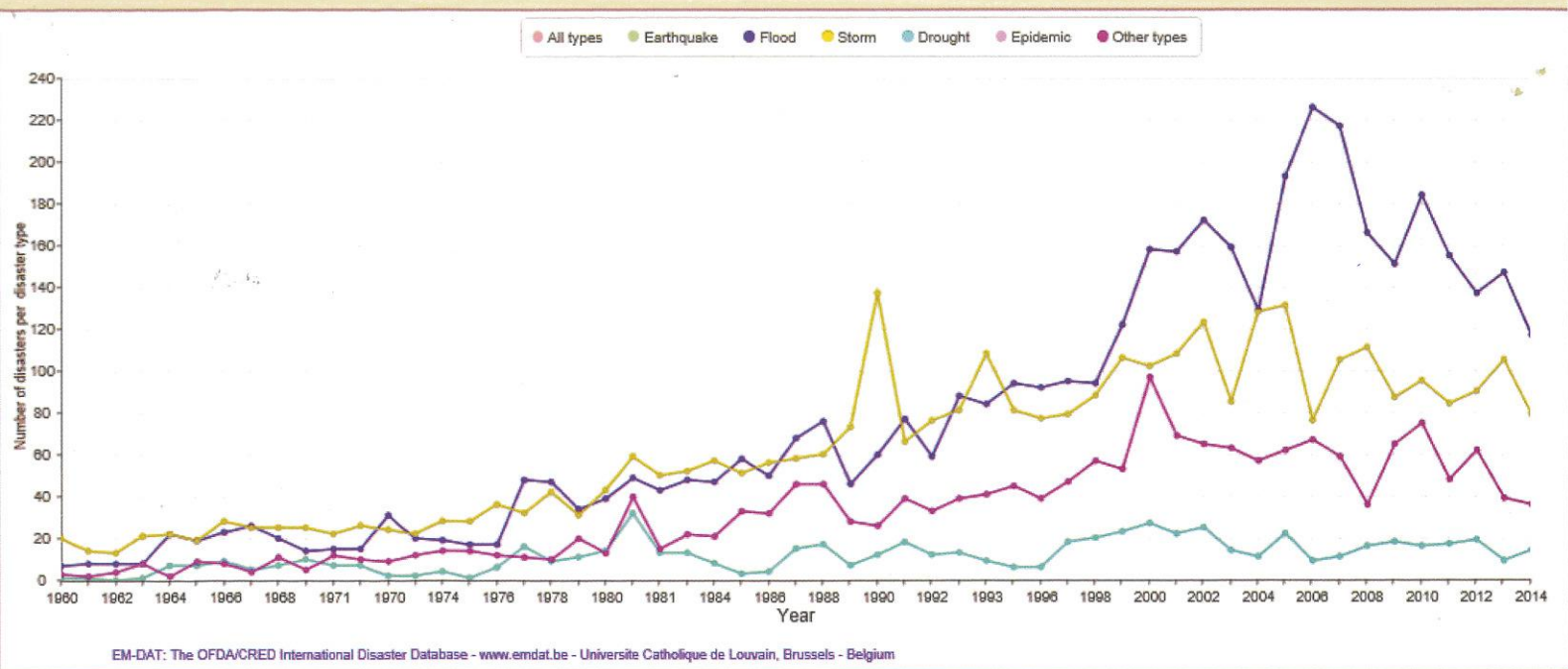


Figure 1: Numbers of extreme weather events globally, 1900–2014

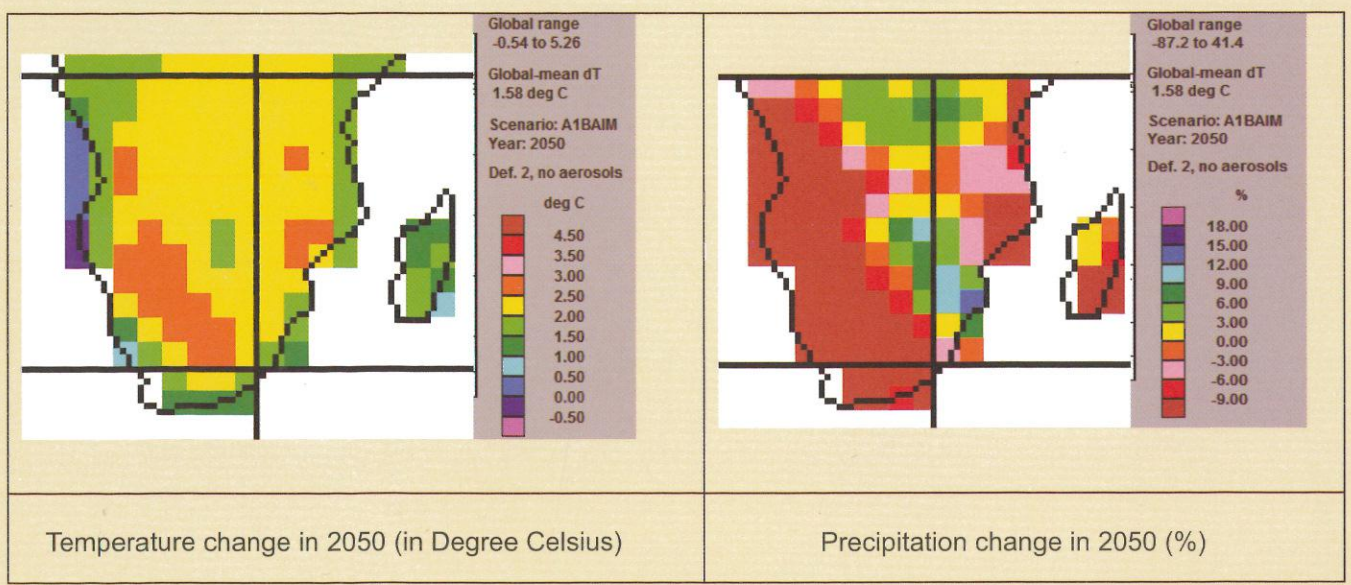


Figure 2: GCM Model predicted changes in temperature and precipitation by MPIECH-5

The challenges of scaling out climate change adaptation in the region

With the cumulative effects of climate change, NARS in the SADC will increasingly need to assist vulnerable rural communities:

(I) to enable them to mitigate risks of further climate change by conserving carbon stocks, reducing CO₂ emissions, and helping to sequester atmospheric CO₂ in trees and soil organic matter;

(ii) to assist them adapt their livelihoods to changes in weather patterns, and restore natural resources; and

(iii) to strengthen the resilience of natural and human systems to withstand and recover from shocks.

Evidence for CCARDESA's Climate Change Adaptation Strategy

This Climate Change Adaptation Strategy released through this Policy Brief is a result of evidence gathered as part of the CCARDESA-commissioned study on - "Enhancing Evidence-Based Climate Change Adaptation Research and Policy for Agriculture in Southern Africa (CCARPASA Project)".

The CCARPASA project implementation process constituted three components, namely:

- Review and synthesis of knowledge on climate change and variability and agricultural drivers in the region
- Agricultural impacts assessment under climate variability and change scenarios
- Recommendation of framework for formulation of adaptation measures and

dissemination; and reporting

The study was based on an integrated modeling approach of climate change scenarios, biophysical and agricultural impacts and tradeoffs related to various adaptation practices through modeling as well as field validation (**Box 1**).

The project finally recommended a spectrum of quick-win strategies to promote AR4D in the area of climate change adaptation in the southern African region, which was a basis for developing this Policy Brief for wider dialogue and dissemination among CCARDESA's stakeholders.

Adaptation strategies across various scales and farming systems could be through outscaling of various adaptation practices summarized in **Box 2**.

BOX 2:

Field Evidence for Climate Change Adaptation Strategy

The CCARPASA study conducted field evidence gathering as part of its project mission in Zambia in 2014. A survey on farmers involvement and benefits of Conservation Farming and Climate Adaptation Practices in the three districts of southern Zambia region were conducted with communities in Chogwe, Chisamba and Chipembi Districts.

During discussions farmers indicated the challenges of vulnerability to food insecurity due to climate change and variability at household and community levels. Nonetheless, they have local and indigenous knowledge systems and they also appreciate how improvements in conservation farming, water harvesting, water access and climate resiliency could help them protect their deteriorating agricultural and livestock productivity in their community.



Farmers involving women discuss the need for soil-water conservation practices to adapt to drought and climate change situation (Zambia)

A mix of common conservation farming practices were identified and used for validation during field evaluation and consultation with the farmers, extension service staff and research leaders. These conservation farming practices included:

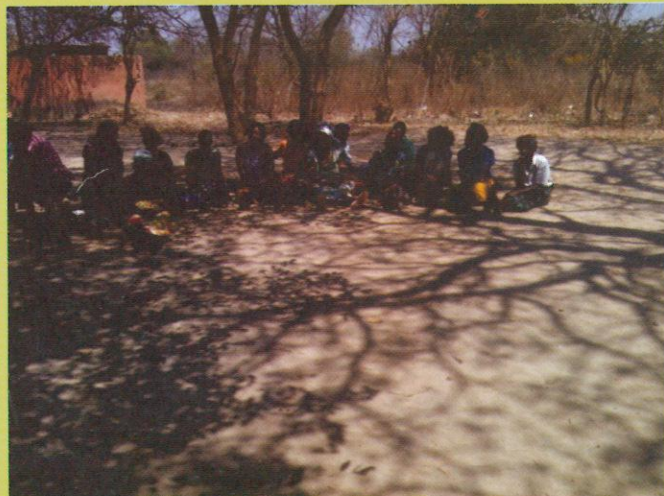
- Dry-season land preparation using minimum tillage;
- Crop residue retention;
- Seeding and input application in fixed planting stations;
- Nitrogen-fixing crop rotation

- Infield water conservation
- Crop-livestock system for soil fertility
- Crop-livestock system for income generation
- Mixed farming of maize with soyabeans, groundnuts, etc.

The realized common benefits of conservation farming in each farming community were:

- Reduced cost of production
- Increased crop yields
- Reduced food security risks
- Reduced risk of crop failure in drought years
- Increased profits
- Improved fertility of their land
- Gardening and vegetable for income and nutrition

These identified conservation farming practices and their benefit varied from village to village with different degree of importance in each community owing to the local soil and rain conditions, agronomic practices and agro economic settings.



Farmers in the community including women and the youth discuss farming challenges to develop community resilience and maintain livelihood in the face of climate change (Zambia)

BOX 2: COMPENDIUM OF TECHNICAL EXAMPLES OF ADAPTATION AND MITIGATION IN AGRICULTURE

Crop management

- Applying conservation agriculture – minimum disturbance of soil, in combination with maintenance of year-round soil cover plus crop rotation, preferably with inclusion of leguminous crops to boost soil nitrogen.
- Adopting new crops, crop rotation and/or crop varieties, adjusting the time of planting/harvesting;
- Introducing integrated soil-fertility management systems that cater to the nutritional needs of the crop without polluting the environment;
- Integrated water management practices.

Rangelands and pasture management

- Managing grazing systems and grazing intensity,
- Fire management, and
- Pasture rehabilitation.

Livestock management

- Modifying herd composition: varied species/breeds;
- Adapting grazing management practices to increase soil carbon;
- Reducing greenhouse gas emissions from livestock by improving animal nutrition breed selection and manure management.

Agroforestry

- Provides incentives and help to achieve inclusive social, economic and environmental goals,
- Offers good opportunities to reduce deforestation

- Offers huge potential for increased carbon sequestration.

Restoration of degraded lands with high production potential

- Applying erosion control methods
- Soil and water conservation,
- Organic amendments,
- Perennial or deep root crop systems.
- Improving land and soil, including drainage, desalinization, and addition of gypsum to renovate sodic soils.

Coastal management and aquaculture

- Promoting non-destructive fishing techniques to maintain resilience of marine ecosystems;
- Aquaculture in areas inundated by rising sea levels.
- Achieving carbon sequestration in mangrove plantations and culturing of seaweed and algae for food and biofuel.

Bioenergy and sustainable energy

- Using crop residues, cellululosic crops (e.g. Switchgrass), non-food
- Biofuel crops (e.g. Jatropha, pongamia), dual-purpose biofuel crops (e.g. Sugar cane, sweet sorghum, cassava) and biogas.
- Sustainable energy options and their use for farming and associated infrastructure

Vulnerability and disaster management

- Improving risk management and preparedness
- Better agro-meteorological warning systems,
- Drought contingency plans,
- Response to flooding, awareness-raising, weather-indexed risk insurance.

CCARDESA's Climate Change Adaptation Strategy

STRATEGY AREA 1: Integrated plan for climate adaptation and climate smart agriculture

CCARDESA needs to promote integrated plan for climate adaptation and climate smart agriculture (CSA) in the region. Intensification of AR4D in the areas of climate adaptation requires thematic action in embracing and promoting CSA in an integrated manner. In this process, CCARDESA should have a coordination role to lead and sustain actions in promoting climate resilience of farmers, women and farming system of the region in the face of climate change. This need resulted in the conception of a project on "Enhancing Evidence-Based Climate Change Adaptation Research and Policy for Agriculture in Southern Africa" CCARPASA. The CCARPASA project aimed at assessing climate impact and adaptation measures and to recommend a quick-win intervention for CCARDESA to play its coordination role. An Integrated Climate Smart Agriculture Plan is recommended as an AR4D tool for CCARDESA to promote climate resilience and impact oriented climate smart agriculture (CSA) in the region.

STRATEGY AREA 2: Establishing and strengthening CCARDESA National Focal Centres for CSA

CCARDESA shall strengthen its efforts of developing national nodal points to national nodal centres tailored to CSA outscaling in the region. This will foster national and transnational learning processes and platforms to intensify CCARDESA's AR4D coordination efforts in an effective manner. This would entail resource mobilization, project implementation and M&E in various agroecological regions with similar agricultural commodities, farming systems and value chains.

STRATEGY AREA 3: Provision of knowledge, data and tools

CCARDESA should consolidate the collection and dissemination of CSA practices across the southern Africa region. The data

collection, archival and dissemination capacity requires resources that are worth investing in early. Such information can be used as a platform for the region and the continent at large in climate negotiations and support the NEPAD/ CCADP processes.

STRATEGY AREA 4: Risk assessment and promotion of adaptation interventions

Research on risk assessment and management in southern Africa including promotion of research and development on local level adaptation measures should be intensified by CCARDESA. This can be achieved through national and transnational learning processes and platforms created by CCARDESA to create relevance of AR4D streamlined to address the problems associated with local soil and rain conditions, agronomic practices and agro economic settings.

STRATEGY AREA 5: Mainstreaming Adaptation and CSA

The environmental and agricultural adaptation plans need to be consolidated to CSA for fostering national development planning processes as well as for good alignment with measurable commitments such as in line with CAADP compacts. CCARDESA shall continue to strengthen capacity by having a central role in fostering national development planning processes to align CSA with CAADP compacts.

STRATEGY AREA 6: Monitoring and Evaluation

CCARDESA should strengthen and expand its M&E in the promotion of CSA in AR4D efforts.. Sustainability of CSA investments from projects level to institutional and country-level ownership of projects implemented beyond the project life cycles should be fostered through continuous empowerment of member countries and NARES. The internal M&E capability shall also be enhanced and capacity updated. This process would be

continuous as complexity of projects and the increased web of role players becomes evident.

STRATEGY AREA 6: Awareness raising and capacity building

The central coordinating role of CCARDESA through the national networking can be used as a platform for spearheading awareness raising and capacity building efforts in the southern African region.

STRATEGY AREA 7: Outscaling and partnerships

In order to scale out the implementation of this Climate Change

Adaptation Strategy, CCARDESA should strive to work with partners and actors in various sectors and entities in the agricultural research and development arena, including but not limited to:

- Technology developers and innovators
- Input supply and investment partners
- Capacity building and training fraternity
- Private-public partnerships
- Other development partners in the region and internationally
- FARA, AGRA, CAADP, etc.
- CGIAR research centers, NARS, etc.

REFERENCES

- CCARDESA (2014) Enhancing Evidence-Based Climate Change Adaptation Research and Policy for Agriculture in Southern Africa, CCARPASA Project, Final Report, CCARDESA Secretariat, Gaborone, Botswana. Pp. 70
- FAO 2010, "Climate-Smart" Agriculture - Policies, Practices and Financing for Food Security, Adaptation and Mitigation, UN Food and Agriculture Organization (FAO), Rome, 2010, pp.41
- Intergovernmental Panel on Climate Change (IPCC). (2007a). Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden & C. E. Hanson (Eds.). Cambridge and New York, NY: Cambridge University Press (IPCC/WGII/AR4).
- Intergovernmental Panel on Climate Change (IPCC). (2007b). Mitigation of climate change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (Eds.). Cambridge and New York, NY: Cambridge University Press (IPCC/WGIII/AR4).
- Intergovernmental Panel on Climate Change (IPCC). (2012). Summary for policymakers. In C. B. Field, V. Barros, T. F. Stocker, D. Qin, D. J. Dokken, K. L. Ebi, ...P. M. Midgley (Eds.), Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (pp. 1–19). A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge and New York, NY: Cambridge University Press.
- Intergovernmental Panel on Climate Change (IPCC). (2013). Summary for policymakers. In T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, ...P. M. Midgley (Eds.), Climate change 2013: The physical science basis. Working Group I contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York, NY: Cambridge University Press.
- SADC, 2011. Climate Change Adaptation in SADC: A strategy for the water Sector, SADC Secretariat, Gaborone, Botswana. November, 2011, 40 pp.
- Makondo, C.C., Chola, K. and Moonga, B. (2014) Climate Change Adaptation and Vulnerability: A Case of Rain Dependent Small-Holder Farmers in Selected Districts in Zambia. American Journal of Climate Change, 3, 388-403. <http://dx.doi.org/10.4236/ajcc.2014.34034>
- Challinor, A., Wheeler, T., Garforth, C., Crauford, P. and Kassam, A. (2007) Assessing the vulnerability of food crop systems in Africa to climate change, Clim. Change, 83, 381–99. <http://dx.doi.org/10.1007/s10584-007-9249-0>
- World Bank. (2010). World development report 2010: Development and climate change. Washington, DC: World Bank.
- World Bank (2009) Agriculture and rural sector South Asia: Shared Views on Development and Climate Change (Washington, DC: World Bank) chapter 7 pp 97–107

ACKNOWLEDGEMENTS:

This policy brief was prepared and extracted from CCARPASA Project Report by:
 Timothy Simalenga, Simon Mwale, and Baitisi Podisi of CCARDESA.
 Berhanu F. Alemaw of University of Botswana

The brief was made possible by the generous support of the American people through USAID, Feed the Future program. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States government.



Centre for Coordination of Agricultural Research & Development for Southern Africa
 Centre De Coordination De La Recherche Et Du Développement Agricole De L'Afrique Australe
 Centro Para A Coordenação Da Investigação E Desenvolvimento Agrário Na África Austral

CCARDESA Secretariat,
 4701 Station Exit Road,
 Private Bag 357,
 Gaborone, Botswana

Tel: +267 391 4997
 Fax: +267 316 7211
 Email: ed@ccardesa.org
 Website: www.ccardesa.org