ii) Develop comprehensive national policy frameworks for promoting agricultural technology development and innovation systems: Policy frameworks should be informed by current and future projections on the relative importance of crop and livestock types and cultivars/breeds as changes occur nationally, regionally and globally in food supply patterns and food taste preferences, against changes in costs of production of specific crops and livestock products.

iii) Harmonize climate change policies, strategies, programmes and interventions at national and sub-national (provinces or districts) scales: This is particularly relevant for the agricultural, environmental and health sectors. National Ministries of Environment should effectively coordinate climate change policies and climate change adaptation processes linked to activities in the agriculture sector.

v) Develop mechanisms to support establishment/strengthening of interactive platforms at community, sub-national (district and province), nationals and regional scales to promote research to policy engagements and dialogue: To enhance supply of new information and evidence to policymakers, and to enable policymakers to demand research products and evidence on the missing links.

v) Enhancing crop-livestock interactions: Available evidence suggests that research in Southern Africa has focused more on crops at the expense of other subsectors including livestock, forestry (natural resources) and fisheries. With increasing challenges of climate change, livestock production is projected to offer more favourable adaptation strategies than cropping. The region also faces critical problems of feed shortages, particularly during the long and expanding dry seasons. Therefore, future policies aimed at increasing productivity and competitiveness of the agricultural production systems must consider the management of crop-livestock interactions as a critical component.

Recommended Reading

CEPA (2012) Policy Framework for Climate Change Adaptation and Disaster Risk Reduction in Malawi: A Review of Key Policies and Legislation, Blantyre, Malawi: Centre for Environmental Policy and Advocacy

FAO, 2010. "Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. 41 p.

Government of Malawi (2012) National Climate Change Policy, Lilongwe, Malawi: Environmental Affairs Department, Ministry of Environment and Climate Change Management

Government of South Africa (2004) A National Climate Change Response Strategy for South Africa, Pretoria, South Africa: Department of Environmental Affairs and Tourism

IPCC (2001) Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, UK: Cambridge University Press

SADC (2012) Regional Agricultural Policy (RAP): Priority Policy Issues and Interventions, Gaborone, Botswana: Directorate of Food, Agriculture and Natural Resources, Southern African Development Community

About AfricaInteract : AfricaInteract is a platform enabling research-to-policy dialogue for adaptation to climate change among a broad range of African stakeholders in sub-Saharan Africa. These include civil society, researchers, policy-makers, donors, and the private sector working on adaptation to climate change in the agriculture and health sectors as well as urban areas with water and gender as cross cutting issues. The overall objective of AfricaInteract is to develop a platform for the effective and efficient transfer of information to policy makers, with the ultimate aim of enhancing the resilience of vulnerable populations. AfricaInteract is funded by the International Development Research Centre (IDRC) and coordinated by the West and Central African Council for Agricultural Research and Development (CORAF/WECARD) under the auspices of the Forum for Agricultural Research in Africa (FARA). The regional focus of AfricaInteract is based on the Regional Economic Communities in the four sub regions of sub-Saharan Africa. Focal organizations coordinating regional activities are as follows: The Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) – East Africa; Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) – Southern Africa; Commission des Forets d'Afrique Centrale (COMIFAC) – Central Africa; and Energie-Environnement et Developpment (Enda) – West Africa.

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Policybrief

Enabling research-to-policy

dialogue for adaptation to climate change in Africa

Research and Policies for Climate Change Adaptation in the Southern Africa Agriculture Sector

Context and Importance of climate change in Southern Africa Agriculture

The agriculture sector in Southern Africa supports 60-90% of national populations, who draw their livelihoods directly from climate-sensitive crop, livestock, forestry and fisheries systems. Climate change impacts in Southern Africa are exerting additional pressures on diminishing natural resource base for most communities, and demanding extraordinary adaptation solutions to sustain agricultural productivity and developing new income opportunities for the young and growing populations. This may require new forms of production technologies and institutions as the size and quality of land and environmental resources decline.

IPCC projected that Southern Africa will experience longer dry seasons and increased rainfall uncertainty (IPCC 2007a), and this will demand adaptation measures. The IPCC data shows temperature increases of 0.1-1°C between 1970 and 2004 in countries, including South Africa, southeast lowveld areas of Zimbabwe and southern as well as coastal parts of central Mozambique. During the same period, corresponding temperature increases in the rest of Zimbabwe, Malawi and many parts of Zambia, Botswana and Namibia averaged between 1 and 2°C. IPCC projections (IPCC 2007b; 2001) suggest that Southern Africa will suffer negative impacts from temperature increases in three main areas: i) influence on freshwater resources in lakes and dams; ii) breakdown in resilience of dominant ecosystems; and iii) influence on productivity patterns of food, fibre and forest products.

Southern Africa falls within the regions where a decrease of 10-30 percent in water availability and runoff from rivers is anticipated by the middle of the 21st century. This is likely to increase water scarcity in a region already suffering severe water stress for agriculture and domestic use. Increased frequency of droughts coupled with warmer temperatures and climate-induced floods are likely to demand major changes in land use patterns with a high likelihood of over-exploitation of resources from major natural ecosystems (e.g. Campbell 1996). IPCC projections suggest that there will be a decrease in growing season lengths and an expansion of semi-arid and arid zones in the context of agricultural production in

Southern Africa. Localized increases in temperatures of 1-2°C are projected to result in decreased crop productivity, significantly increasing the risk of hunger in many communities (IPCC 2007a). Southern Africa is therefore one of the regions where yields from rain-fed agriculture could be reduced by up to 50 percent by 2020, potentially heightening prevailing conditions of food insecurity and malnutrition. The agricultural sector in Southern Africa still suffers from lack of access to appropriate information, knowledge and technologies by different farmers and this may greatly limit the scope for climate change adaptation.

Several studies have revealed that a combination of increased rainfall variability and increasing ambient air temperatures will cause a significant decline in yields of major staple crops, particularly maize (Dixon et al. 2003; Kiker 2002; Phillips et al. 1998; Makadho 1996). Lobell et al. (2011) used a data set of more than 20,000 historical maize trials in combination with daily weather data and showed that for each degree day spent above 30°C final maize yield was reduced by 1 percent under optimal rain-fed conditions, and by 1.7 percent under drought conditions. Furthermore, maize yields are projected to decline by up to 20 percent in the next 50 years in Malawi (Ibrahim and Alex 2008; Lobell et al. 2008), and by 10-57 percent by 2080 in Zimbabwe (Fischer et al. 2005; Lobell et al. 2008) mainly due to increased rainfall variability. Using the IMPACT global model for food and agriculture, the area suitable for maize production in South Africa was projected to decline by 25 percent between 2010 and 2050, raising concern that the country could become a net importer of maize if no countermeasures are taken.

A report to policymakers already reveals lack of evidence and good African examples regarding impacts of climate change and adaptation options (IPCC 2007a), suggesting a need for deliberately supporting empirical research to address these knowledge gaps. The complexity and heterogeneous features of agriculture in Southern Africa imply critical challenges for decision-makers in formulating relevant policies for climate change response strategies and adaptation.

Regional policies related to Climate Change Adaptation in Southern Africa

In Southern Africa, national policies on climate change adaptation are informed by the international and regional conventions and discourse on climate change, particularly those derived from UNFCCC, NEPAD and SADC. One of the African Union's major development initiatives is NEPAD (AU/NEPAD 2003), and all the countries subscribe to its programmes. Particularly relevant to the regional agriculture sector is CAADP, which implicitly embraces climate change issues under its strategic Pillars 1 and 3. All countries in Southern Africa are members of the African Union and SADC and are therefore signatories to major regional treaties and protocols that guide economic development to safeguard natural resources and the environment for the benefit of the region's populations. SADC has developed a Regional Agricultural Policy (RAP) (SADC 2012) which seeks to harmonise policy for agriculture and natural resources and strengthen the interventions guided by the SADC Regional Indicative Strategic Development Plan (RISDP). The policy identifies the regional agriculture sector as vulnerable to climate change and variability, and recognises the critical need for adaptation.

In 2002, the Common Market for Eastern and Southern Africa (COMESA), approved an Agricultural Policy aimed at harmonising national policies of member states towards the COMESA Free Trade Area FTA. The COMESA policy initiative offers an appropriate policy environment for broad-based climate change adaptation and disaster risk reduction management interventions in the region.

In Malawi, climate change adaptation is covered in several government agricultural policy and strategy documents including the Food Security Policy 2006, National Agricultural Policy (2010-16), Agriculture Sector Wide Approach (ASWAp) of 2010, National Water Policy (revised 2005), National Disaster Risk Management Policy, National Land Resources Management Policy and Strategy and National Irrigation Policy and Development Strategy of 2000. (CEPA 2012. In South Africa the guiding policies and strategies for agriculture are contained in the Integrated Growth and Development Plan 2012 (Government of South Africa 2012). This policy framework addresses the critical challenges of climate change, and dovetails with the Comprehensive Rural Development Programme (CRDP) of the Department of Rural Development and Land Reform (DRDLR).

The development of climate change policies and strategies by national governments in Southern Africa is essentially work in progress. Malawi and South Africa have completed development of their climate change response policies and strategies. The Government of Malawi, through the Environmental Affairs Department of the Ministry of Environment and Climate Change Management, launched a National Climate Change Policy in 2012 to 'reduce vulnerabilities and promote community and ecosystem resilience to the impacts of climate change'. Climate change adaption is ranked first out of eight key priority areas.

Current national climate change policy frameworks require supporting empirical evidence and technical inputs based on field experiences to inform the development of community level relevant climate change adaptation plans. Research to policy dialogue processes have been derived from interventions characterized by participatory action research, co-learning and innovation system approaches involving stakeholders including communities, farmer organizations, policymakers and public and private research and extension services. Agricultural policy instruments supporting institutionalization of these approaches will broaden opportunities for development of context-specific climate change adaptation options in the Southern Africa region.

Current evidence suggests that changing gender roles in response to impacts of climate change and variability, as well as interventions that yield a critical analysis on the direction and magnitude of such changes and their effects on livelihood systems are required. This may help to inform the discourse on gender and climate change in agriculture. While national policies indicate increasing awareness of gender issues among stakeholders, there is no clear evidence of content. Studies are required to explain how the evolution of local cultures and social values within vulnerable communities are shaped by environmental marginality and socio-political systems. Such studies could provide insights into current value systems as an outcome of climate change adaptation processes.

Key research findings to be considered for informed decision making in climate change adaptation in Southern Africa

Several studies have revealed that a combination of increased rainfall variability and increasing ambient air temperatures will cause significant declines in yields of major staple crops, particularly maize (Dixon et al. 2003; Kiker 2002; Phillips et al. 1998; Makadho 1996). Regional studies have used simulation modelling to evaluate the potential effects of projected rainfall variability on the production of major crops, particularly staple maize, that has a strong bearing on food security. In South Africa, each 1 percent decline in rainfall is predicted to cause a 1.1 percent decline in maize and a 0.5 percent decline in winter wheat production (Bilgnaut et al. 2009). Gbetibouo and Hassan (2005) also predicted reduced yields for a variety of crops including maize, wheat, sorghum, sugarcane, groundnut, sunflower and soybean, due to increased rainfall variability and warmer ambient temperatures

Climate change may also impact negatively on livestock reproduction. Research findings indicate declines in livestock productivity with the rise in ambient temperature and increased frequency of droughts predicted for Southern Africa by the IPCC models (IPCC 2007b). There are also projections that global warming will alter heat exchange between animals and their environments, potentially jeopardizing animal feed intake, growth, reproduction, maintenance and longevity (ILRI 2009).

Studies have demonstrated the value of modelling in informing future options for climate change adaptation in Southern Africa agriculture, and also the glaring knowledge gaps arising from lack of field data on how farmers' current decision-making process may influence projected outcomes. Research by Tadross et al. (2005) provide insights into how improved understanding of climatic factors controlling critical seasonal rainfall events, such as onset and cessation, could improve targeting of adaptation options. Research in Malawi has shown success of options that integrated pond aquaculture with traditional crops reduced farmers' vulnerability to drought and provided a high-quality protein source (Jamu and Chimatiro 2004).

A predicted decline in rainfall in Southern Africa against increased temperatures, rise in evaporation rates and increased demand for irrigation water is expected to decrease runoff by 10-30 percent (IPCC 2007a). This is expected to cause declines in fish stocks. Reduced dry season flow rates predicted for the region's river basins are also expected to impact negatively on spawning and larval dispersion, resulting in reduced fish yields (FAO 2007). In Lake Malawi and Lake Chilwa, there is reduced primary productivity due to a sharpened water density gradient between warmer surface water and cooler deep water, which has slowed vertical mixing. Due to lower wind speeds, there has been reduced mixing in the lakes and primary productivity may have decreased by about 20 percent, accounting for about 30 percent decrease in fish yields (Allison et al. 2007). The variations in the Kapenta fish catches were most significantly influenced by the lake's water levels, followed by maximum temperature, evaporation and rainfall (Ndebele-Murisa et al. 2011). These findings suggest that local-level climatic effects could impact significantly on ecosystem components that currently underpin livelihood activities of poor communities in these countries.

Policy options for consideration in the Southern Africa Region

The major constraint to policy formulation on climate change adaptation in Southern Africa is, not necessarily lack of empirical evidence, but failure by policymakers to use available research information for policy formulation in climate change adaptation. Policy options for consideration in Southern Africa include the following:

i) Develop national and regional policy frameworks to support transformative change processes that take agriculture beyond current models of smallholder farming systems towards more productive, market oriented and resilient systems: Implementation strategies driving such policies should embrace participatory action, co-learning and co-innovation approaches and processes that enable communities to self-mobilise, self-organise and intensity their market participation at local, national, regional levels.