

FINANCIAL AND FISCAL COMMISSION
POLICY BRIEF
**MAKING VULNERABLE COMMUNITIES
RESILIENT TO CLIMATE CHANGE
THROUGH FISCAL INSTRUMENTS**
EXECUTIVE SUMMARY

The DEA and the NDMC need to prioritise the development of climate change and disaster vulnerability indices in order to improve the effectiveness of intervention mechanisms.

This study investigated the response of the agricultural sector to climate change and the vulnerability of municipalities. The study found that higher temperatures and lower rainfall adversely affected net farming revenue.

The effects were more severe among crop farmers, while mixed farmers were the least affected. The study identified 20 municipalities that are vulnerable to climate change. Policy options for improving the resilience of rural economies to climate change include providing for ecological infrastructure in the Municipal Infrastructure Grant (MIG), expanding rural agricultural extension and support services for small-scale farmers (to assist them to take up climate-resilient farming strategies), subsidising climate change resilient inputs (such as drought-resistant seeds).



BACKGROUND

The Millennium Development Goals provide a framework for the international community to work together to ensure that human development reaches everyone, everywhere, with the ultimate aim of halving poverty by 2015. South Africa still faces numerous challenges in meeting these goals and has identified rural development as a national priority. About 40% of the country's underprivileged population live in rural areas and depend either directly or indirectly on land for their livelihood. However, climate change will affect government's efforts to alleviate poverty and fast-track development in rural areas.

South Africa is particularly vulnerable to climate change because of its high dependence on climate-sensitive economic sectors. The poor typically have limited opportunities and are disproportionately affected, as they depend on sectors that will be directly affected by climate change: agriculture and water supply. Agriculture is highly dependent on climate and therefore particularly vulnerable. Climate change will have a significant impact on low-input farming systems in developing countries in Africa.¹ Smallholder farmers are expected to be more affected than commercial farmers, as they lack the means for adaptation. The effect of climate change on agricultural output will have direct impacts on rural communities, through reduced income and employment, and knock-on effects for rural economies as a whole.

The result will be considerable strain on rural municipalities tasked with providing services and promoting development at a local level. Local municipalities will need to plan for these and other impacts, as their burden will grow because of the expected increases in natural disasters, water scarcity and disease, and reductions in agricultural production and food security. Some municipalities will be more sensitive to these changes than others, and many municipalities may lack the capacity to adapt because of existing developmental challenges. These include low incomes, weak institutions, low levels of education and primary health care, lack of markets and infrastructure, and already-degraded ecosystems.

The Commission is concerned about the impact of climate change on rural economies. This policy brief provides policy options for increasing resilience to climate change in rural areas with a focus on the agriculture sector, the mainstay of rural economies.

FINDINGS

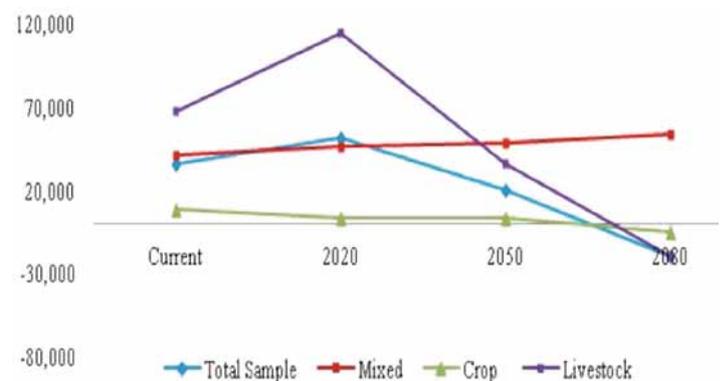
The study assesses the impact of climate change on agricultural productivity using a Ricardian framework,² which is a cross-sectional analysis of actual farm performance in varying climatic regions or agro-climatic zones. The study considers two types of farmers: subsistence farming households that participate in agriculture to supplement their household income and dietary requirements, and commercial farmers who engage in farming as a way of generating revenue (i.e. the farm is a business). The analysis is based on a nationwide sample of 1 128 subsistence farmers and 20 797 commercial farms distributed throughout the nine provinces of South Africa. In addition, since climate change is likely to affect different types of farmers differently, the farmers are classified by type of agricultural activity: crop, horticulture, livestock and mixed farming.



The study investigated the impact on net revenue of changes in rainfall and temperature, while controlling for soil type and farming characteristics. In general, the results show that a simultaneous decrease in rainfall and increase in temperature has an adverse effect on both subsistence farmers (151% loss in net revenue by 2080) and commercial farmers (111% loss in net revenue by 2080), as shown in Figures 1 and 2.³ Temperature is projected to increase by 1.2°C in 2020, 2.4°C in 2050 and 4.2°C by 2080. On the other hand, rainfall is projected to decrease by 5.4% in 2020, 6.3% in 2050 and 9.5% in 2080.⁴ By 2080 commercial farmers are likely to lose a total of R694 billion rand, as a result of climate change of the magnitude simulated.

For both commercial and subsistence farmers, the adverse effects on net farming revenue are likely to be more severe among crop farmers, while mixed farmers are least vulnerable to climate change. By 2080 the loss in net revenue for farmers is predicted to be approximately 144% for subsistence and commercial crop farmers, 127% for commercial and subsistence livestock farmers, 86% for subsistence and commercial horticultural farmers, and 71% for commercial farmers practising mixed farming methods. Subsistence mixed farmers are the only ones who stand to benefit somewhat from climate changes in the longer run. Their net revenue is predicted to increase by 30% for 2080. Mixed farming is about diversification, which minimises the risks associated with climate change.

Figure 1. Subsistence farmers

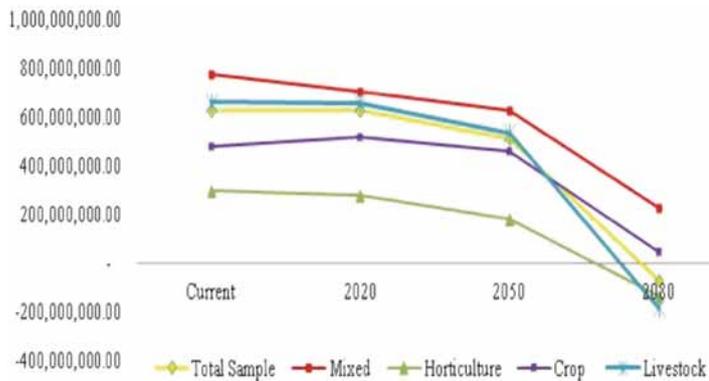


1. Benhin, J, Mutoko, M, Ritho, C and Mbatia, O. 2010. Analysis of economic efficiency in smallholder maize production in north-western Kenya. East African Agricultural and Forestry Journal 74, No 1 and 2.

2. The Ricardian framework is an empirical approach often used to evaluate the sensitivity of agricultural production to climate change. Based on cross-sectional data, the approach is used to evaluate the direct and indirect impacts of climatic variables on yields of different crops. In the background study to this brief, the Ricardian model used evaluated the impact of climate change by regressing land values (as captured by changes in net revenues across different environmental conditions) on (1) climate variables (2) soil types, and (3) socio-economic variables.

3. Figure 1 shows the predicted change in net revenue for subsistence farmers as a result of a decrease in rainfall and an increase in temperature. Figure 2 shows the predicted change in net revenue for commercial farmers as a result of a decrease in rainfall and an increase in temperature.

Figure 2. Commercial farmers



Note: The y-axis measures net revenues in rands.

To examine the vulnerability of municipalities, the study followed the conceptual structure of vulnerability outlined by the Intergovernmental Panel on Climate Change (IPCC).⁵ A map of South Africa's 234 local and metropolitan municipalities was the basic spatial summary unit for the vulnerability index. The overall vulnerability score for each municipality was assumed to be a function of exposure, sensitivity and adaptive capacity⁶ of a municipality. Overall vulnerability was found to be highest in the eastern half of the country, particularly in areas corresponding to former homeland areas, while most municipalities in the western half of the country and several in Gauteng and Mpumalanga are comparatively resilient. It would seem that vulnerability is strongly associated with wealth, as poor regions are more likely to be vulnerable than more affluent ones.

For both commercial and subsistence farmers, the adverse effects on net farming revenue are likely to be more severe among crop farmers, while mixed farmers are least vulnerable to climate change.



4. These predictions were obtained from a dataset from the World Climate (www.worldclimate.com). The data contains the current climate data and predicted data for 2020, 2050 and 2080.
 5. IPCC, 2007. Climate Change: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.
 6. Exposure considers flood frequency, fire frequency and density, percentage change in future rainfall, change in temperature, the proportion of low-lying coastal urban development and malaria exposure. Sensitivity looks at population density and water stress. Adaptive capacity includes socio-economic capacity, public infrastructure, municipal expenditure per capita and governance.

POLICY OPTIONS

The following policy options should be considered to make rural economies (and farmers in particular) resilient to climate change hazards:

1. The Department of Cooperative Governance should extend the goals of Municipal Infrastructure Grant (MIG) to include ecological infrastructure that enhances the resilience of vulnerable communities. The existing structure of Special Municipal Infrastructure Grants, a component of MIG, should be restructured in order to allow municipalities to access funds for rehabilitating ecological infrastructure. Such resources should prioritise and address directly vulnerabilities faced by poor households.
2. The Department of Agriculture, Fisheries and Forestry should expand the provision of agricultural extension and support services to small-scale farmers to improve the uptake of climate resilient farming strategies. Extension services should include measures for improving their resilience to climate change hazards, such as advice on diversification, mixed-cropping, drought-resistant crops and efficient irrigation systems.
3. The government, through the Department of Environmental Affairs and the National Disaster Management Centre, should develop a standardised Vulnerability Index that will be used to target the most vulnerable communities and will enable municipalities to plan for and manage risk better. The index should take into account the exposure, sensitivity and adaptive capacity of an area with regard to climate change.



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