Evidence to support climate change adaptation in Lesotho, Malawi and Swaziland

P Mapfumo, K Thabane, A M Mtimuni, M S Nkondze, A Mumba and L M Sibanda

January 2015

What is the issue?

In southern Africa, the predicted 2°C rise in temperature will destabilize farming systems. Coping mechanisms, livelihood strategies and the cost of adaptation options for smallholder farmers are not sufficiently understood in the region because the majority of research is focused on ecological assessment and identifying the vulnerability of households. In addition, most research is conducted at national and regional levels, with a gap in scientific evidence at a local level to inform policy decisions for effective smallholder adaptation.

In response, the IDRC-funded *Strengthening Evidence-Based Climate Change Adaptation Policies* (SECCAP) project, led by the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), sought to: (i) generate scientific understanding of localized climate scenarios in three countries: Swaziland, Lesotho and Malawi; (ii) integrate localized climate scenarios with crop growth and adaptation models and district-wide household vulnerability information; and (iii) determine the socio-economic feasibility of recommended cropping options.

What did we do?

The study focused on generating empirical evidence to inform the policy and decision making process on how climate change will affect food security and livelihood options for rural communities in semi-arid districts of Lesotho, Malawi and Swaziland.

Using global climate information known as General Circulation Models (GCMs), local

Key messages

- In Lesotho, Malawi and Swaziland, at least 15% of moderately vulnerable households are likely to become highly vulnerable under projected changes in climate.

- Adaptation choices are partly influenced by the perceived cost of the available options. For example, around 50% of farmers in Malawi cited high costs as a key barrier limiting the use of chemical fertilizers and adoption of conservation agriculture practices.

- In Lesotho, a combination of late planting and fertilizer application proved to be the most efficient adaptation option. Use of chemical fertilizers invariably enhanced the effectiveness of the adaptation options used by households.

- Projections indicate an average decline of 20% in maize across three countries by 2050, with a 5-25% decline in land suitable to grow staple cereal crops. This has implications for agronomic practices and critically, increases vulnerability in 21% of households.

- Lack of empirical climate and agronomic data is a major constraint to provision of targeted adaptation solutions and policies in Lesotho, Malawi and Swaziland.

projections were developed to predict future changes in crop yield. A locally developed tool, the Household Vulnerability Index, revealed

how vulnerable different households were to the effects of climatic changes on their farming systems. The tool was useful in identifying households to target with climate solutions. The project also analysed the costs and benefits offered by the different options.

To communicate the possible outcomes of the research, the SECCAP project used Theatre for Policy Advocacy (TPA) and information sharing workshops as innovative ways of communicating with communities. The project shared new knowledge with a variety of actors working with communities, including NGOs (e.g. World Vision), farmer organizations at national and regional levels, research institutions and extension agencies. The project also aimed to inform the processes underpinning the National Adaptation Plan of Action (NAPA) and the National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) in the three countries. Relevant ministries and environmental secretariats were specifically targeted, and evidence was disseminated to the national steering committees responsible for developing national frameworks responding to climate change.

The project also initiated the development of climate and agronomic databases by local meteorological offices and research stations, respectively, for wider use by stakeholders. Most of the data were transformed from analogue to digital, increasing access and sharing with other institutions.

A Household Vulnerability Index was used to match families with adaptation strategies

© FANRPAN
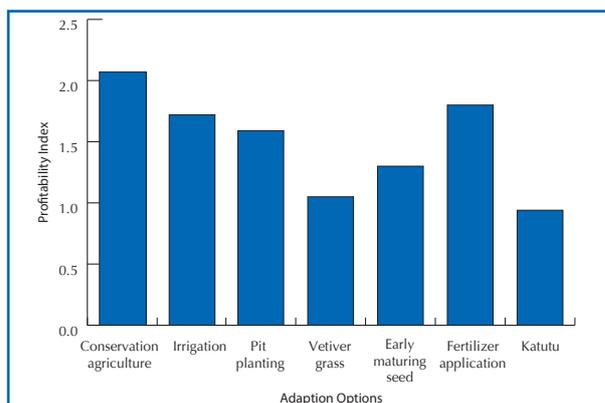
Figure 1: Profitability index (PI) of available adaptation strategies by smallholders in Malawi

What did we learn?

Across all three countries, 58-98% of households were classified as moderately vulnerable, requiring urgent but temporary external assistance to recover from shocks. However, projected rises in temperature by an average of 1.8-2.4 °C, coupled with variable rainfall, easily pushed at least 15% of these households into high vulnerability in the short-term. Due to financial constraints, highly vulnerable households had poor access to improved crop varieties, fertilizers and other agronomic technologies in all three countries.

The study indicated increasing temperatures and high rainfall variability in the three countries. These patterns suggest a 5-25% decline in land suitable for staple cereal crops, combined with reduced productivity, indicating that communities should explore alternatives. However, in Lesotho, maize yields are estimated to increase by about 7% as a result of rising temperatures. In Swaziland, 66% of interviewed households indicated that they were taking advantage of early rains to plant their crops. Early planting helped to ensure that critical plant growth stages did not coincide with harsh seasonal conditions, such as dry spells and end of season drought.

Choice of adaptation options is influenced by the perceived cost attached to the option. For example in Malawi, 21% of farmers failed to use adaptation options involving fertilizers, which they considered expensive, while 38% also cited high labour costs of conservation agriculture and pit farming. This finding implies that it is important to understand the source of household vulnerability and attach costs to adaptation strategies and actions in order to inform decision making and policy processes.

In Malawi, conservation agriculture recorded the highest profitability index of 2.07, followed by fertilizer application at 1.80, and irrigation at 1.72 (Figure 1). A profitability index of 2 indicates that farmers would earn twice their initial level of investment over a specific time period. This implies that strategies to cope with the change in climate are available, but that choice of strategy will depend on a given household's level of vulnerability.

Stories of change

The SECCAP project approach of linking biophysical assessments, livelihood assessments and economic assessments was replicated by FANRPAN, in conjunction with the Financial and Fiscal Commission of South Africa and the universities of Cape Town, Limpopo and Fort Hare, to develop a proposal on helping local municipalities in South Africa to better understand adaptation options for climate change. The proposal was awarded with a grant by Canada's International Development Research Centre (IDRC) and developed evidence which will be presented to the Finance Portfolio Committee of the Republic of South Africa for the 2015/16 financial year, and the Eastern Cape and Limpopo Province legislature.

Researchers need to assess the costs and benefits of different adaptation options

Maize production is predicted to fall by 20% on average, across the three countries by 2050

What are the policy implications?

In response to diminishing land areas suitable for cultivating staple cereal crops, new policy mechanisms are required to improve the productivity of crops in favourable areas. In addition, the study results indicated the need for farmers to change planting dates because of delayed rains. This highlights the importance of institutional systems that can disseminate timely climate information, including planting dates, to smallholder farmers. The results also show that adoption of adaptation options was influenced by the resource endowment of smallholder farmers, suggesting the need for a mechanism to target different vulnerability groups of smallholder farmers with different adaptation options.

What next?

Investigating how best to deliver climate change research data to decision makers at different levels is essential. For instance, at the grassroots level, there is need to explore how current risk reduction management options that create dependency may compromise efforts to build adaptive capacity of households and communities to climate change. At the technical level, research should focus on how information on projected future scenarios can be used to address the choice of adaptation options, and also relate to cost-benefit analysis.

Earth banks are an affordable way of protecting nursery beds against flooding

© FANRPAN

This will guide policymakers in knowing how much investment is required. Further research is also needed to determine optimal levels of resource endowment for effective adoption of adaptation strategies by farmers.

Need more information?

Dr Lindiwe M Sibanda, FANRPAN
Lmsibanda@fanrpan.org

Prof. Paul Mapfumo, University of Zimbabwe
paulmapfumo@gmail.com

Website: www.fanrpan.org/projects/seccap

 @FANRPAN

References

Nkondze M.S., Masuku M.B. and Manyatsi A. (2013) Factors affecting households vulnerability to climate change in Swaziland: a case of Mpolonjeni Area Development Programme (ADP). *Journal of Agricultural Science*, 5 (10), pp.100-122. http://bit.ly/12BLUdv.

Masuku M.B., Manyatsi A. and Shongwe P. (2014) Cost benefit analysis of climate change adaptation strategies on crop production systems: a case of Mpolonjeni Area Development Programme (ADP) in Swaziland. *Sustainable Agricultural Research*, 3 (1), pp. 37-49. http://bit.ly/1wiB7AL.

Thabane K. (2013) The impact of climate change on maize yields and household level vulnerability at Maphutseng. Unpublished thesis (MSc), National University of Lesotho.

Zinyengere, N., Mhizha, T., Mashonjowa, E., Chipindu, B., Geerts, S. and Raes, D. (2011) Using seasonal climate forecasts to improve maize production decision support in Zimbabwe. *Agricultural and Forest Meteorology*, 151 (12), pp.1792-1799

Zinyengere N., Crespo O., Hachigonta S. (2013) Crop response to climate change in southern Africa: A comprehensive review. *Global and Planetary change*. 111, pp. 118-126.

Zinyengere N., Crespo O., Hachigonta S., and Tadross M. (2014) Local impacts of climate change and agronomic practices on dry land crops in Southern Africa. *Agriculture, Ecosystems & Environment*. 197, pp. 1-10.

Shongwe P., Masuku M.B. and Manyatsi A.M. (2014) Factors influencing the choice of climate change adaption strategies by households: a case of Mpolonjeni Area Development Programme (ADP) in Swaziland. *Journal of Agricultural Science*, 2 (1), pp. 86-98. http://bit.ly/1zGyKZq.

IDRC | CRDI
International Development Research Centre
Centre de recherches pour le développement international

Canada