

HOW CAN AFRICAN AGRICULTURE ADAPT TO CLIMATE CHANGE? INSIGHTS FROM ETHIOPIA AND SOUTH AFRICA

# Micro-Level Analysis of Farmers' Adaptation to Climate Change in Southern Africa

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**A**gricultural production remains the main source of livelihood for rural communities in Sub-Saharan Africa, providing employment to more than 60 percent of the population and contributing about 30 percent of gross domestic product. With likely long-term changes in rainfall patterns and shifting temperature zones, climate change is expected to significantly affect agricultural production, which could be detrimental to the region's food security and economic growth. An assessment of the factors influencing farm-level adaptation can facilitate the formation of policies and investment strategies that help moderate potential adverse consequences of long-term climate change. Because smallholder farmers tend to have a low capacity to adapt to changes in climatic conditions, policies that help these farmers adapt to global warming and associated climatic extremes are particularly important.

This brief is based on a study that assesses smallholder farmers' adaptation to climate change in southern Africa. The study identifies farmers' perceptions of climate change and the determinants of farm-level adaptation strategies, and recommends policies that could help stabilize national and regional food production given the anticipated adverse effects of climate change.

## SURVEY OF FARMERS' PERCEPTIONS

Using cross-sectional survey data for South Africa, Zambia, and Zimbabwe, the study finds that most farmers detect a rise in temperature over the past 20 years, drier conditions, and pronounced changes in the timing of rains and frequency of droughts. In response to these perceived changes in climate, 67 percent of survey respondents are adopting some form of adaptation. Common adaptation measures include diversifying crops, planting different crops or crop varieties, replacing farm activities with nonfarm activities, changing planting and harvesting dates, increasing the use of irrigation, and increasing the use of water and soil conservation techniques. In assessing farmers' perceptions of barriers to using various adaptation measures, the authors find that lack of credit, lack of information on climate, and insufficient access to inputs are key obstacles to adaptation (Figure 1).

## DETERMINANTS OF FARMERS' USE OF ADAPTATION STRATEGIES

The study uses an econometric model to identify the factors that affect farmers' use of adaptation strategies. Modeling results confirm

that awareness of climate change is an important determinant of farm-level adaptation. Access to credit, markets, and free extension services also significantly increase the likelihood of farmers adopting adaptation measures. In addition, households with access to electricity and technology such as tractors, heavy machines, and animal power are more likely to adapt to changes in climatic conditions. With access to electricity and technology, farmers are able to vary their planting dates, switch to new crops, diversify their crop options, use more irrigation, and apply water conservation techniques. Farmers with access to technology are also more likely to diversify into nonfarming activities, although households with large investments in farm equipment and machinery may find such diversification to be costly.

Another important determinant of farm-level adaptation is land ownership. Farmers who own their land are more likely to invest in adaptation options, including crop and livestock management practices and water conservation. The type of farming system also determines farmers' use of adaptation strategies: those engaged in mixed crop and livestock farming, as well as those engaged in subsistence farming, are more likely to adapt to changes in climatic conditions than are farmers in specialized farming systems.

Finally, the study finds that female-headed households are more likely to take up adaptation options than male-headed households. In most rural smallholder farming communities in South Africa, women do much of the agricultural work and therefore tend to have more farming experience and information on various management practices. Farming experience increases the probability of uptake of all adaptation options.

## POLICY IMPLICATIONS

Providing smallholder farmers with necessary resources increases farmers' productivity and helps them adapt to the adverse consequences of changing climatic conditions. For instance, policies that ensure access to affordable credit increase farmers' financial resources, allowing them to make better use of available information on climate change and to meet the costs associated with the various adaptation options. Likewise, policies that ensure farmer access to free extension services have the potential to significantly increase farmers' awareness of changing climatic conditions and their knowledge of appropriate adaptation measures.

Because property owners are more likely to invest in adaptation

measures, governments should also ensure that tenure arrangements are safeguarded, even in the communal systems that characterize most of the region's smallholder farming systems. Similarly, policies targeting women's groups and associations in smallholder rural communities could further promote adaptation given that women do much of the agricultural work in many rural smallholder farming communities in the region.

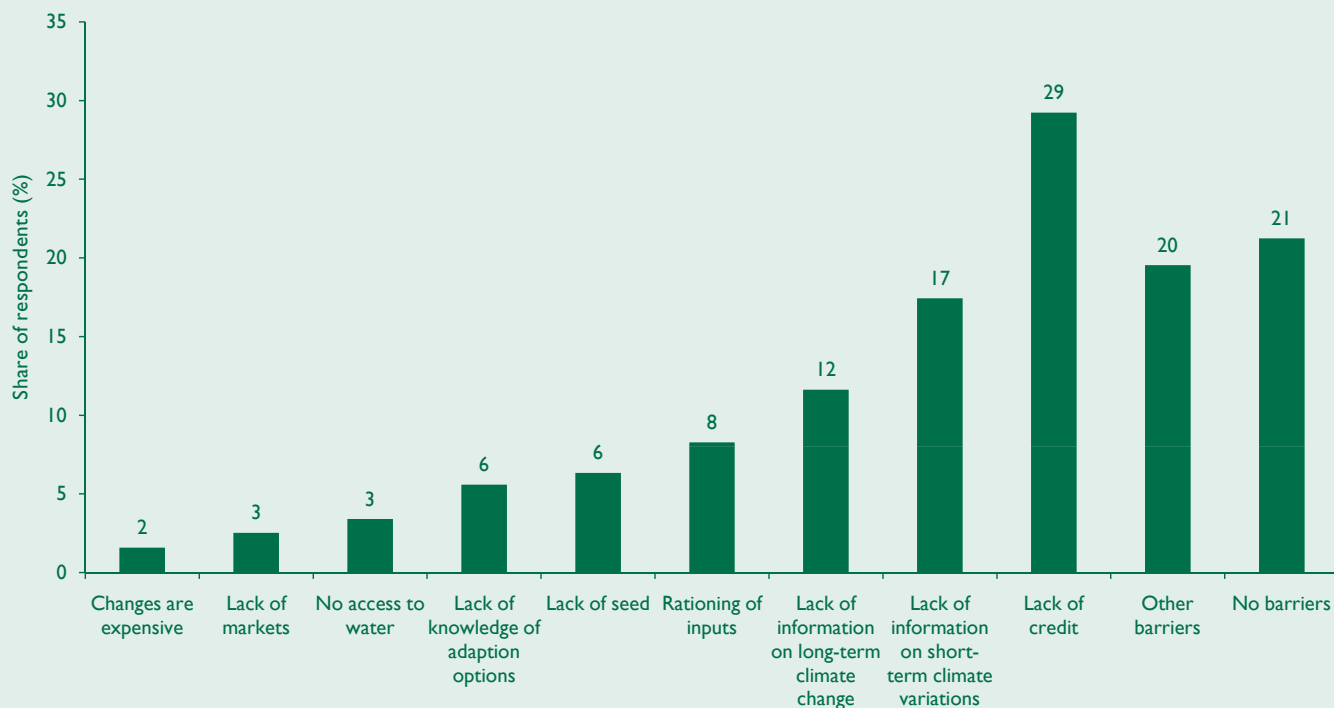
Finally, governments need to support research and development in the agricultural sector, disseminate appropriate technologies, and ensure that cheap technologies are available to smallholder farmers. Examples of these policy measures include developing drought-resistant crop technologies, improving the forecasting and

dissemination of climate information, and promoting farm-level adaptation measures such as the use of irrigation technologies. Government policies designed to promote adaptation at the farm level will lead to greater food and livelihood security in the face of climate change.

## FOR FURTHER READING

Nhemachena, C., and R. Hassan, *Micro-Level Analysis of Farmers' Adaptation to Climate Change in Southern Africa*, IFPRI Discussion Paper No. 714 (Washington, DC: International Food Policy Research Institute, 2007).

**Figure 1 Perceived barriers to adaptation**



**SOURCE:** Nhemachena, C., and R. Hassan, *Micro-Level Analysis of Farmers' Adaptation to Climate Change in Southern Africa*, IFPRI Discussion Paper No. 714 (Washington, DC: International Food Policy Research Institute, 2007).

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