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THE COMPLEXITIES OF CLIMATE CHANGE ADAPTATION IN SOUTH AFRICAN AGRICULTURE

KIERAN FINDLATER

SUMMARY

- Agriculture is a complex and politically contentious industry in South Africa, given its connection to food security, water, health and land reform, and the historic resource imbalances between black and white farmers.
- As a large country with many fully allocated water basins, different parts of South Africa will face unique challenges related to climate change.
- Given the varying levels of adaptive capacity between large-scale commercial operations and emerging smallholder farms, South Africa's national policy response must be prioritized to ensure cohesive and nuanced support for climate change adaptation.

BACKGROUND

Given its wide-ranging impact on food security, water, health and land reform, the strength of South Africa's agricultural sector is of strategic importance to the nation (Republic of South Africa [RSA], 2011a). As a climate-dependent industry in a water-scarce region, however, South African farming is also vulnerable to the variations in weather patterns associated with changes in global temperatures.

Although the agricultural sector is dominated by industrial farming operations, small-scale and subsistence farmers are of outsized political importance — a reflection of national redress policies following the end of Apartheid (Atuahene, 2012; Lahiff and Cousins, 2005). As compared to small scale farmers, commercial farmers have greater resources at their disposal and tend to not only be more resilient to climate variability ,but also better equipped to adapt. (Challinor et al., 2007). Since each group has different tool adaptation sets,

ABOUT THE AUTHOR

Kieran Findlater

Kieran Findlater is a Ph.D. candidate and the Killam Doctoral Scholar at the Institute for Resources, Environment and Sustainability at the University of British Columbia (UBC). His current research interests involve interdisciplinary inquiry in renewable energy technology, energy access, energy policy, rural development, agricultural productivity and adaptation to climate change. Kieran earned his M.Sc. from UBC in 2009, and completed his B.Sc. at the University of Alberta in 2005.

however, differentiated support policies are also required to deliver effective programs in response (Wreford et al., 2010).

CLIMATE CHANGE IN SOUTH AFRICA

South Africa is considered a semi-arid country, receiving an average of only 450mm of precipitation per year. High temporal and regional variability in rainfall results in scarce surface and groundwater resources, which are already fully allocated in many basins (RSA, 2011d). Exacerbating this sensitivity, Kruger and Shongwe (2004) suggest that South Africa has experienced measurable warming since the early 1980s, with higher mean temperatures that result in greater heat stress and higher rates of evapotranspiration — the sum of evaporation and plant transpiration from the Earth's land surface to atmosphere.

Future precipitation trends are less certain, though broad patterns can be considered likely. In keeping with existing regional variability, South Africa is expected to experience regional differences in future precipitation change. Most of eastern South Africa, roughly coinciding with the summer rainfall area, is expected to experience similar or increased median precipitation, becoming more variable and resulting in frequent and more severe flood and drought events. In contrast, the country's winter rainfall area, in the west, is expected to experience a significant decrease in precipitation (RSA, 2011d).

These changes in temperature and precipitation patterns are projected to affect South African agriculture directly through changes in rainfall, temperature and CO₂ fertilization, and indirectly via changes in the incidence of pests and disease, and loss of ecosystem services such as pollination (Smit and Pilifosova, 2007). Both challenges will require adaptation in agricultural systems and cropping patterns to ensure the sector's stability and the country's food security.

ADAPTATION IN SOUTH AFRICAN AGRICULTURE

South African farmers are necessarily adaptive as they face variable weather. It is therefore difficult to distinguish between climate change adaptation and routine actions that increase resilience to climate variability. Unplanned adaptation is likely to occur spontaneously and privately, with decisions taken at the farm level in response to weather trends and short-

term forecasts (Thomas et al., 2011; Wreford et al., 2010). The nature and success of these private responses may have important national and regional implications for food, water, energy and land reform. Cohesive public policies are therefore needed to align private adaptation (both spontaneous and planned) with national priorities in these related sectors (Howden et al., 2007).

The scarcity of South Africa's freshwater resources contributes to the country's agricultural vulnerability. There is little capacity, for example, to increase the amount of water used for irrigation to help mitigate increased evapotranspiration and heat stress. While agricultural land accounts for 82 percent of the South Africa's total land area, only 1.3 percent of agricultural land is under irrigation, with the remainder dependent on rainfall (RSA, 2012). Despite the small proportion of irrigated land, however, the overall agricultural sector accounts for 62 percent of the country's water withdrawals while irrigated lands generate 30 percent of the gross value of South African crop production (RSA, 2011d).

The enormous diversity of South Africa's agricultural sector makes it difficult to characterize typical adaptive capacity and strategies. The sector includes large-scale commercial producers, either under private or corporate ownership, and small-scale farmers, with either subsistence or emerging commercial aspirations (Thomas et al., 2011). Because large-scale producers have more substantial resources, larger cash flows and greater diversification, they typically have much longer planning horizons and are able to access credit, make capital investments and respond to market fluctuations. Small-scale producers typically have fewer resources and less diversification, requiring much quicker returns on investments and increasing vulnerability to short-term market fluctuations (Wreford et al., 2010).

Large and small-scale farmers therefore adapt to climate changes using very different strategies. The commercial sector may respond through technology development and adoption, crop shifting and diversification, insurance, and improved financial management, while small-scale farmers may respond through employment diversification, communal risk sharing and low-cost water-saving measures (Challinor et al., 2007; Wreford et al., 2010). Adaptation also involves both short-term and long-term components. Near-term strategies include changes in irrigation techniques, tilling

practices, planting dates and crop varieties, while longer-term plans include technology and infrastructure investments, crop switching and diversification (Wreford et al., 2010).

POLICY IMPLICATIONS

The South African government has competing agriculture policy objectives. On one hand, the government would like to promote land reform — the transfer of land from historically wealthy commercial farmers to previously disadvantaged groups. For example, South Africa’s National Development Plan for 2030 emphasizes the expansion of both dryland and irrigated agriculture, “beginning with smallholder farmers where possible” (RSA, 2011b). On the other, the government’s National Climate Change Response Paper acknowledges that emerging farmers — recipients during the land reforms — are less resilient to climate change because they are resource poor and constrained in their ability to invest in longer-term planning (RSA, 2011a).

It is critically important that South Africa’s agricultural policies are harmonized to clarify the relative importance of competing objectives. Prioritizing the transfer of ownership to small-scale farmers should be contextualized by the tradeoffs that it may require. Without sufficient extension programs, a policy-driven shift toward small-scale agriculture risks increasing the sector’s vulnerability to climate change, as production is transferred from commercial to small-scale operations. Adaptation may still take place largely through spontaneous private responses to perceived trends, but will certainly require substantial public policy support for resource management, climate monitoring and forecasting, technology development and infrastructure investment, as well as targeted capacity building for farmers with low adaptive potential.

The cross-sectoral implications of climate change are also important. For example, increased irrigation pumping will draw more electrical power from the national grid, requiring the need for further generation capacity. South Africa’s power sector is currently dominated by thermal coal power plants that require water for cooling, creating further competition for water between the power and agricultural sectors (Smit and Pilifosova, 2007).

CONCLUSION

Adaptation policies must be flexible and multi-targeted, with separate measures set out for large and small-scale farmers that account for differences in available resources and planning horizons. Policy makers should also be aware of regional differences in climate change predictions, with adaptation policy differentiating for needs of farmers who may experience increased variability versus others who will face chronic water shortages. It may also be useful to emphasize the co-benefits of adaptation measures, including cost reductions, improved resource management, water and energy savings, and climate change mitigation benefits (Smit and Pilifosova, 2007).

Policy support for climate change adaptation in agriculture will require a nuanced, multi-faceted approach, accounting for the diversity of operations and the motivations that farmers have typically exhibited in adopting new measures to make their operations more resilient to existing climate variability. The agricultural sector will undoubtedly respond to climate change, just as it has always reacted to changing resource availabilities, input costs and market fluctuations, but the overall success of the sector will depend on coherent policies to encourage, guide and support private adaptation. The various national and provincial policies affecting the agricultural sector need to be harmonized to prioritize and reduce competition among stated policy objectives. Integrated adaptation planning will help insure South Africa's food security, enable politically and culturally important small-scale farmers to succeed, improve environmental sustainability and contribute to policy objectives in other sectors.

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MASTHEAD

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The Centre for International Governance Innovation
57 Erb Street West
Waterloo, Ontario N2L 6C2, Canada
www.cigionline.org



57 Erb Street West
Waterloo, Ontario N2L 6C2, Canada
tel +1 519 885 2444 fax +1 519 885 5450
www.cigionline.org

