VUNA

changing farming for a changing climate

Adam Smith International

UKaid from the British people

INFORMATION BRIEF:

Climate Risks and Trends in Eastern and Southern Africa

This information brief highlights key findings in the Vuna report "Climate Risks and Trends in Eastern and Southern Africa" by Manyewu Mutamba (November 2016). Online: http://www.vuna-africa.com

Key Points

- Farmers in Eastern and Southern Africa have long faced climate risks, particularly in the form of droughts and flooding; climate change is increasing these risks.
- Temperature trends are unambiguous: Temperatures have increased over the last few decades and are likely to continue to do so.
- Rainfall trends are less certain: Precipitation appears likely to become more variable, with totals potentially increasing in some areas and decreasing in others.
- Rising temperatures and changing rainfall patterns are likely to change the distribution and intensity of agricultural pests and diseases.
- Many farming technologies already exist to offset the risks of climate change, including more drought-tolerant crop varieties and techniques for improving water-use efficiency.
- Continuing improvements in commercial markets are needed to encourage farmers to adopt these technologies.

Introduction

In order to target the development and dissemination of climate smart technologies, it is important to understand what is known–and what is less certain–about evolving climate risks. This paper briefly summarises available information on climate risks in Eastern and Southern Africa (ESA), highlighting some of the uncertainties about climate trends. The discussion is primarily drawn from the multiple reports of the Intergovernmental Panel on

Climate Change (IPCC) broadly identified as the Fifth Assessment Report (AR5) (e.g., IPCC, 2013; IPCC, 2014a; IPCC, 2014b; IPCC, 2014c).

The paper concludes that in the near term agricultural production levels and food security are likely to be affected more by rising population pressures and changing markets than by climate change. Priority still needs to be placed on improving responsiveness to the most costly current risks: drought and flooding. If these improvements are made, the region will improve its capacity to cope with future climate risks as well.

Climate risks: Current and projected

According to the AR5, current and projected trends for several key climate parameters in Eastern and Southern Africa are as follows:

Temperature

- **Current**: Recent temperature trends unambiguously show that average temperatures over most African regions have already increased (e.g., Rosenzweig et al., 2007), and that there also has been an increase in the incidence of temperature extremes (Niang et al., 2014). The effect on agriculture depends on the type of crop, the timing of these changes during the year, and whether the extremes occur as higher minimum or higher maximum temperatures.
- **Projected**: Global climate models (GCMs) generally agree in projecting continuing increases in average temperatures even under the best-case emissions scenario. Africa as a whole is projected to experience faster warming than the rest of the world (Niang et al., 2014). Rising temperatures can affect yields directly, and they also increase rates of evaporation, making less water available to crops.

Precipitation

- **Current**: Rainfall risks are endemic in much of Eastern and Southern Africa and pose the most significant climate-related threat to food production in the near term (FAO, 2016). Seasons often start late or end early, mid-season dry spells are common, and rainfall varies both by year and by intensity within the rainy season. All of these occurrences can contribute to yield losses. Because rainfall patterns are naturally variable, it has been difficult to establish how they have been affected by climate change.
- **Projected**: Available climate models based on greenhouse gases do not provide consistent projections of rainfall trends. Rainfall seems likely to become more variable. The majority of models project more rain in parts of Eastern Africa and less rain in parts of Southern Africa by the end of the century.

Droughts and flooding

- **Current**: Droughts and flooding are common hazards in ESA, resulting in degradation of rangelands, depletion of water sources, and significant crop and livestock losses (FAO, 2016). The probability of droughts and flooding is not well predicted by climate models based on greenhouse gases. However, the predictability of these threats has improved as a result of a better understanding of their correlation with changes in sea surface temperatures (SST). In Southern Africa in particular, droughts have been linked to the El Niño–Southern Oscillation (ENSO) phenomenon, while La Niña events are correlated with higher-than-average rainfall. Flooding in Eastern Africa has been linked with warmer SST in the Indian Ocean.
- **Projected**: Climate models cannot predict changes in drought and flood incidence with confidence. Scientists continue to search for ways to integrate models of SST into GCMs. If successful, projections of extreme events may improve.

Pests and diseases

- **Current**: Pest and diseases now cause losses estimated at 16–18% for major crops (Porter et al., 2014). No data are available for estimating recent changes in pest and disease incidence.
- **Projected**: Projections of the relationships between temperatures, precipitation, and pest and disease pressures remain rudimentary. However, scientists believe these problems are likely to worsen, especially as warmer temperatures allow pests to move into areas that are not prepared for them, potentially causing catastrophic yield losses (Niang et al., 2014).

> **There is a need to speed the adoption of the many existing technologies offering improved resilience to climate risks.**

We have the technology

Projections of crop losses associated with climate change commonly assume that farmers will not make changes in their use of agricultural technologies. Yet there are many ways farmers can respond to the risks of rising temperatures, variable rainfall, and drought—and even increase their productivity despite climate change.

Farmers can readily switch to varieties that are more drought-tolerant or that offer drought escape, generally through a shorter maturity period. Many technologies are available to help farmers make more efficient use of available water, including water capture (through infiltration pits or bunds) and efforts to reduce runoff and evaporation (through low-tillage systems and the use of mulch). Better weed control reduces competition for limited water supplies, and timely application of fertiliser can help roots grow and make more efficient use of available water in the soil. Efforts are needed to improve the adoption rates for these technologies.

Public investments in irrigation have been broadly promoted as a means to offset drought, yet these tend to be expensive and benefit only a small proportion of farmers. The payoffs to these investments can be improved with complementary investments to improve the efficiency of water use.

As pest and disease pressures shift, farmers will benefit from training in pest scouting and integrated pest management technologies.

Recent improvements in seasonal and short-term weather forecasting offer growing opportunities to help farmers pursue response farming.

Climate smart agriculture priorities

Many of the worst impacts of climate change are projected to become significant several generations from now. In the meantime, two strategic priorities are apparent. First, there is need to improve the region's current preparedness for drought and flood. These are costly risks right now, and they may worsen. In complement, there is a need to speed the adoption of the many existing technologies offering improved resilience to climate risks. In poorer outlying regions, the promotion of such technological changes will require continuing public support.

In regions where markets are stronger, the adoption of more climate smart technologies will be a by-product of successful commercialisation. Improved responses to today's climate risks will provide a foundation for successfully coping with future climate risks.

References

FAO, 2016. Climate change and food security: risks and responses. Rome. Food and Agriculture Organization.

IPCC. 2013. Climate change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J., Boschung, A., Nauels, Y., Xia, V., Bex & P.M., Midgley, eds. Cambridge, UK, and New York, USA, Cambridge University Press. 1535 p.

IPCC. 2014a. Climate change 2014: Synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, R.K. Pachauri & L.A. Meyer, eds. Geneva, Switzerland, IPCC. 151 p.

IPCC. 2014b. Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea & L.L. White, eds. Cambridge, UK, and New York, USA, Cambridge University Press.

IPCC. 2014c. Climate Change 2014: Mitigation of Climate Change. Exit Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart, 2014. Africa. In Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1199-1265.

Porter, J.R., L. Xie, A.J. Challinor, K. Cochrane, S.M. Howden, M.M. Iqbal, D.B. Lobell, and M.I. Travasso, 2014. Food security and food production systems. In Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 485-533.

Rosenzweig, C., G. Casassa, D.J. Karoly, A. Imeson, C. Liu, A. Menzel, S. Rawlins, T.L.Root, B. Seguin, and P. Tryjanowski, 2007. Assessment of observed changes and responses in natural and managed systems. In Climate Change 2007. Impacts, Adaptation and Vulnerability" Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry,M.L., O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson (eds.)].Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 79-131.