



Do Smallholder Farmers in Heterogeneous Settings in Malawi Use Commercial Input Purchasing to Adapt to Recurrent Weather Shocks?

Clifton Makate and Marshall Makate

October 2022 / No.CCEDA-007

Key messages

Farmers in Malawi rely on rain-fed agriculture, which is highly sensitive to climate risk and face persistent weather shocks which shape their agriculture decision-making. This policy brief examines the response of smallholder farmer commercial input purchase decisions for key inputs (fertilizer, agrochemicals, seed, and labor) to climate shocks. A few highlights arise from this research:

- **Commercial input purchasing for key inputs: fertilizer, agrochemicals, seed, and labor is widespread across regions and has increased over**

time. Nearly 60% of farmers in Malawi purchase inputs, and for specific inputs: 40, 4, 50, and 20% purchase fertilizer, agrochemicals, seed, and hired labor, respectively. Average input purchasing rates and intensities contrast by input, regions, socioeconomic status, and access to information and have increased over time.

- **Climate risk prompts commercial input purchasing across regions in Malawi.** Long-term rainfall variability, and recent exposure to drought shocks, inspire commercial input purchasing across regions in general and for specific inputs: agrochemicals, fertilizer, seed, and labor. Farmers hence, use commercial input purchases to adapt to increasing rainfall variability and drought shocks.
- **Climate shocks have heterogeneous effects on commercial input purchases.** Although drought shocks enhance the propensity to purchase inputs across regions, they sometimes reduce purchase intensity. This upshot implies that drought shocks also affect the purchasing power of farmers, which may limit the extent of input purchasing. In addition, farmers with fewer asset endowments, female-headed households with fewer assets, and households without access to information are less likely to invest in commercial inputs post-shock exposure compared to their counterparts and hence are vulnerable to shocks.
- **There is a need for deliberate demand and supply-side policy interventions to enhance access to inputs to aid adaptation.** On the supply side, targeting interventions that reduce constraints faced by input suppliers to enhance their service to farmers is needed. On the demand side, scaling up policy interventions that enhance access to market information, credit, and extension services will reduce transaction costs and enhance access to purchased inputs by farmers. Policy efforts must also be inclusive of the most vulnerable (e.g., the poor) for greater impact.
- **Promote access to diverse inputs adapted to geographic regions to aid climate change adaptation.** Diversity in inputs is key for climate change adaptation in smallholder farming, and policy efforts should promote diversity in input availability suited to local contexts.
- *Harmonize policy interventions for greater impact on resilience.* For example, care should be taken in designing input subsidy programs to maximize their benefit to society and reduce their potential negative effects on the role of the market as an important player in enhancing agricultural input development with increasing climate change.

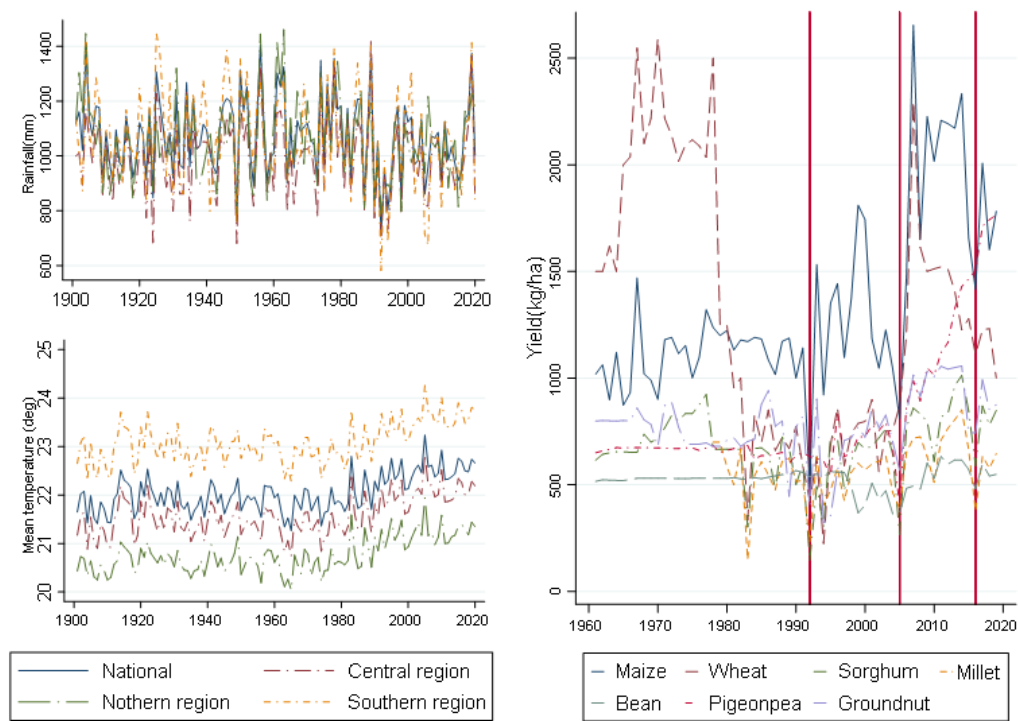
Introduction

Agriculture in Malawi is mainly rain-fed, making it highly sensitive to climate risk, particularly weather shocks. Historical climate trends in the country show high climate variability, and extreme climate events such as drought and flood have been linked to low agricultural yields (Figure 1). Therefore, efforts toward building the resilience of smallholder farmers to persistent weather shocks are vital for sustainable livelihoods. Promoting strategies that enhance smallholder farmers' resilience to climate risks is high on the policy agenda of Malawi. This notion is evidenced by remarkable progress in incorporating climate change adaptation and management in the country's development plans, policies, and strategies in the past twenty years. Through the National Agricultural Policy (NAP), Malawi supports climate change adaptation in agriculture through Climate-smart agriculture (CSA). As evidenced in the recently launched National Agriculture Investment Plan (NAIP), which is the main implementation vehicle for NAP, resilient livelihoods and agricultural systems is one of the four programs¹ targeted at transforming agriculture. To successfully transform smallholder agriculture with increasing climate risk, smallholder farmers need access to diverse inputs to adapt to climate change. Commercial input purchasing offers farmers the opportunity and autonomy to alter input choices and diversity in ways that improve the resilience of their agricultural activities to weather shocks.

However, the effectiveness of commercial input purchasing as an avenue to enhance the resilience of smallholder farmers to climate change relies on well-functioning input markets and the purchasing power of smallholder farmers. When input markets face fewer challenges in operation, they can improve the availability of diverse quality inputs in local accessible areas at affordable prices and at the correct time. Also, working on improving access to financial services for smallholder farmers will enhance their chances and extent of relying on commercial inputs. The lack of proper investments and policies to support local market development coupled with low purchasing power by smallholder farmers renders commercial input purchase less viable as an avenue to diversify inputs and enhance climate resilience.

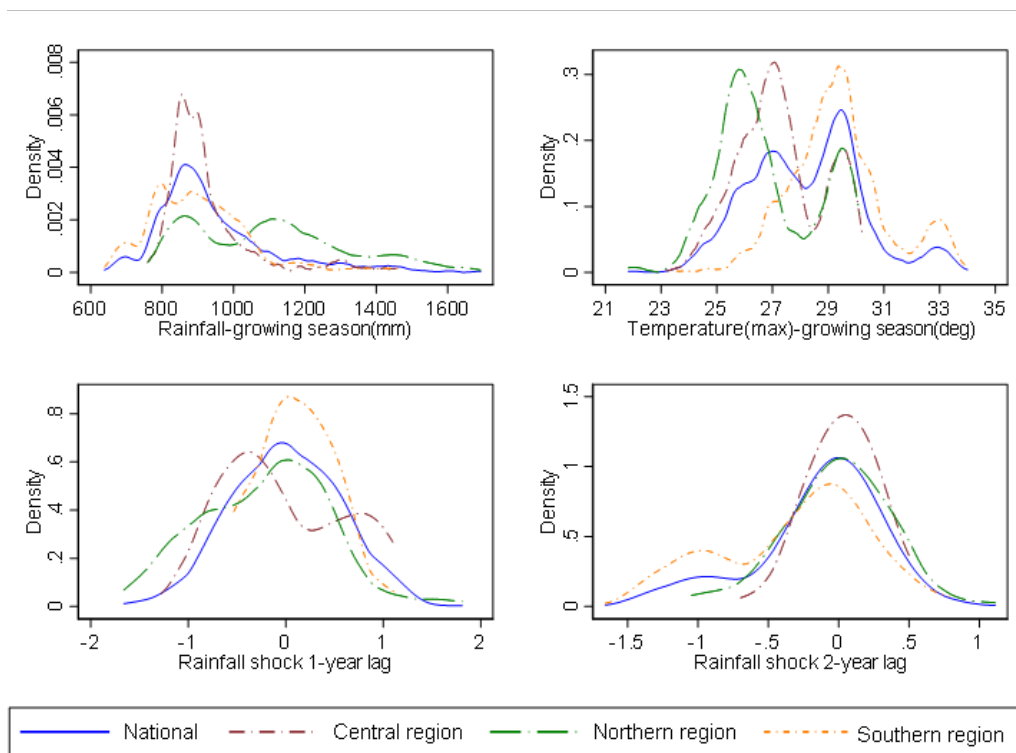
1 Malawi's National Agriculture Investment Plan (NAIP) has four programs: (1) Policies, institutions, and coordination, (2) Resilient livelihoods and agricultural systems, (3) Production and productivity, and (4) Markets, value addition, trade and finance.

Figure 1: The left panel summarizes the mean annual climate (Rainfall mean temperature) trends of Malawi (National) and by three main regions (Northern, Central, and Southern) from 1901-to 2020: Data source:CCKP; The right panel summarizes the average crop yields for selected food crops in Malawi from 1961 to 2019; The three vertical redlines show selected main drought years experienced in Malawi in the recent past (1992, 2005, and 2015/16), Data source:FAOSTAT.



This policy brief aims to assist policymakers and other development partners working towards building resilient livelihoods and agricultural systems in Malawi to identify interventions that can enhance input market development to enhance the role of input markets in adaptation to elevated climate risk in Malawi and related contexts. This brief particularly focuses on (a) examining the level of commercial input purchase for key inputs (fertilizer, agrochemicals, seed, and labor) in heterogeneous regions and socioeconomic settings in Malawi; (b) finding out the extent to which farmers use commercial input purchasing in Malawi as a response to short-term climate shocks, and long-term weather variability, and (c) to examine the potential role of regional and socioeconomic heterogeneity in shaping the impacts of climate risk on the use of commercial inputs. The three main regions in Malawi (North, Central, and Southern) have contrasting climates (Figure 2), making them interesting cases to study.

Figure 2: Distribution of historical climate variables (Rainfall, Maximum temperature, 1 & 2-year lags of rainfall shocks (Z scores)) in our sample based on worldClim Data. National refers to plots based on the pooled sample, and then the rest of the plots are based on the three regional subgroup samples. Plotted are kernel density plots.



Analyzing commercial input purchase as a pathway to diversify inputs and adapt to climate risk across regions in Malawi

The brief focuses on general investment decisions in commercial inputs and specific inputs, including fertilizer, agrochemicals, seed, and labor (hired labor), to which when farmers have adequate access, they can support their agricultural activities for better livelihoods. Traditionally, farmers rely on locally available cheap and less-risky inputs, e.g., organic manure, farmer-saved seed, family labor, and natural crop protection methods. However, with increased climate variability, the use of conventional input options alone may become less reliable, which calls for diversifying traditional inputs with modern inputs that can help enhance resilience. With increased climate change, crop pests and disease may increase, which requires complementing traditional crop protection methods with agrochemicals. Also, the use of traditional crop varieties

alone with increased climate risk renders crop yields more vulnerable, which calls for diversification of local with improved varieties. On-farm organic fertilizer sources may become less reliable with increased climate variability, demanding farmers complement traditional (on-farm) sources with off-farm sources. Likewise, adapting to climate change may require supplementing family labor with off-farm labor. Supplementing family labor can be beneficial when the household faces labor shortages (in general) or when new skills are required to effectively implement climate-smart innovations or technologies.

We analyze to what extent farmers in Malawi use commercial input purchasing to adapt or cope with climate shocks. We do this by analyzing multiple survey rounds of Malawi's rich and representative Integrated Household Surveys covering the period between 2010 and 2019, combined with historical monthly weather data for 39 years. Drawing on these data, we analyze (a) rates and trends in commercial input purchases for major inputs (fertilizer, agrochemicals, seed, and labor) using descriptive statistics and (b) the relationships between climate risk factors and commercial input purchasing using parametric approaches. We model commercial input purchase decisions across regions and socioeconomic farmer groups using double hurdle models that distinguish the probability and intensity of investment in specific inputs we consider.

Key findings

The results point to the fact that commercial input purchasing is a widespread practice across regions in Malawi, particularly for fertilizers, seeds, and labor. Average proportions and purchase intensity for purchasers are shown in *Figure 3 and Figure 4, respectively*. Based on the national sample, we see that nearly 60% of farmers purchase some of their inputs through available commercial markets, and for specific inputs: fertilizer (40%), agrochemicals (4%), seed (50%), and hired labor (20). We also reveal that input purchasing rates and intensities have increased over time (*Figure 3 and Figure 4*). In addition, male-headed households, wealthier households, and those with access to information have higher input purchase rates and intensity of purchase. The results imply that commercial input purchasing is an important source of inputs for farmers in Malawi, with implications for agricultural development in the country.

Results also reveal that long-term rainfall variability and recent past exposure to drought shocks largely encourage input purchasing in the following season across regions, particularly for agrochemicals, fertilizer, seed, and labor (*Table 1*). Smallholder farmers are using commercial input purchases to adapt to rainfall variability and drought shocks.

However, in some regions, we have established that drought shocks, although they enhance the likelihood of input purchasing, also reduce purchase intensity (*Table 1*). For instance, we established that drought shocks reduce the intensity of input

purchasing in the northern region and the intensity of labor hiring in the southern region. This upshot implies that although rainfall shocks enhance the incentives to use commercial inputs, they also affect the purchasing power of farmers, which may limit the extent of inputs purchased.

In addition, farmers with fewer asset endowments, female-headed households with fewer assets, and households without access to information are less likely to invest in commercial inputs post-shock exposure compared to their counterparts and hence are more vulnerable to shocks.

Overall, findings from this study suggest that to enhance the role of input purchases in supporting livelihoods and smallholder agriculture systems that are resilient to climate change in Malawi, policies need to target supply and demand-side interventions. On the supply side, there is a need for deliberate interventions that will reduce constraints faced by input suppliers to enhance their service to farmers (improving the availability of low-cost inputs). On the demand side, policies need to continue targeting improving access to extension, affordable credit, and financial services to resource-poor farmers to enhance their capacity to invest in commercial inputs and enhance their resilience.

Figure 3: Share of farmers using purchased inputs by survey round across regions in Malawi. R1, R2, and R2 denote respective survey rounds analyzed (2011 (IHS3), 2016 (IHS4), and 2018 (IHS5). Source: Authors' elaboration of LSMS-ISA data for Malawi.

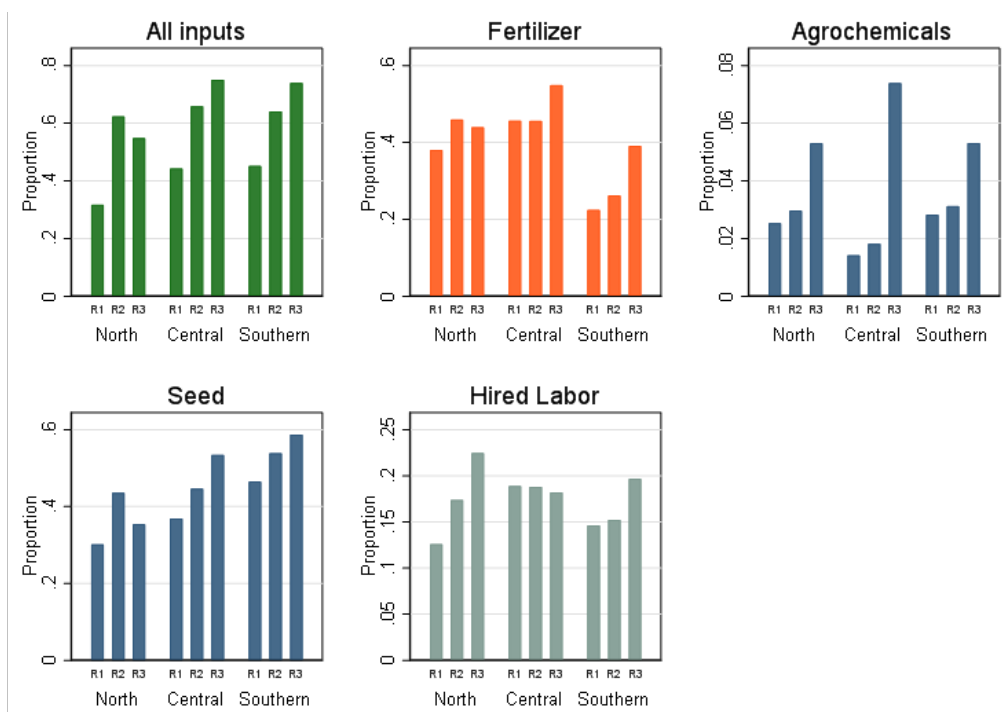
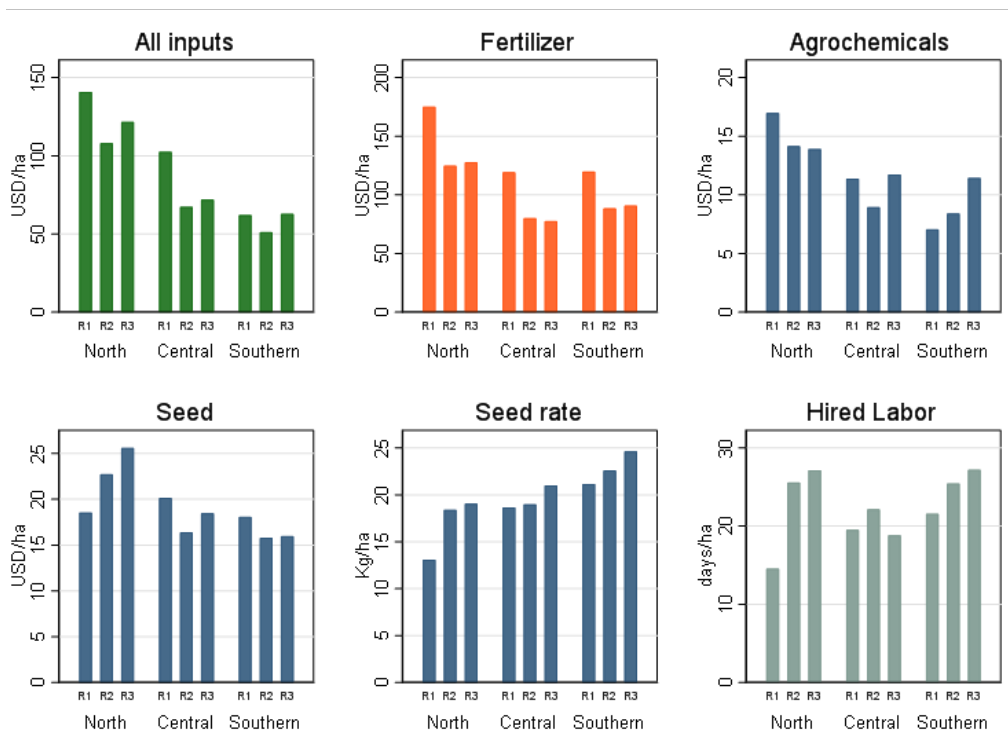


Table 1: Highlights of some key findings from regression analysis

	Purchase any input	Fertilizer	agrochemicals	Seed	Labor
Impact of climate risk variables	<p>Drought shocks enhance the probability and intensity of purchasing inputs in central and southern regions but reduce the intensity of purchase in the northern region</p> <p>Higher rainfall ore purchase</p> <p>Higher temperature less purchase</p>	<p>Drought shocks enhance purchase and intensity of purchase in central and southern regions</p> <p>Flood shocks enhance the intensity of purchase in the northern region but reduce the intensity of purchase in central regions</p> <p>Higher rainfall enhances purchase</p> <p>Higher temperatures reduce purchases</p>	<p>Drought shocks enhance purchase in all regions and reduce the intensity of purchase in the southern region</p> <p>Flood shocks reduce the chance of purchase in the southern region</p> <p>Higher rainfall and temperature enhance purchase</p>	<p>Drought shocks enhance purchase in north and southern regions but reduce the intensity of purchase in the central region</p> <p>Flood shocks reduce the probability of purchase in the central and southern region</p> <p>Higher rainfall and temperature enhance purchase</p>	<p>Drought shocks enhance labor hire in the national sample and reduce the intensity of hire in the southern region</p> <p>Flood shocks enhance the intensity of purchase in the national sample</p> <p>Higher rainfall, more labor hire in national and southern regions</p> <p>Higher temperature reduces labor hire in national, central, and southern regions</p>

Figure 4: Intensity of input purchasing by region and survey round: R1, R2, and R3 denote respective survey rounds analyzed (2011 (IHS3), 2016 (IHS4), and 2018 (IHS5)). Source: Authors' elaboration of LSMS-ISA data for Malawi.



Policy options for consideration

Evidence from this study identifies a few broad areas that could be targeted to support the role of the market in supporting adaptation to recurrent climate shocks in smallholder farming in Malawi and related contexts:

- Improve input market access for smallholder farmers to aid adaptation
- Promote access to diverse inputs adapted to geographic settings to help farmers adapt to climate change
- Harmonize policy interventions for greater impact on resilience

Improve input market access for smallholder farmers to aid adaptation

Given that findings from this study have shown the market as an important avenue aiding farmers to alter their input mix post-shock exposure, policy should continue targeting reducing barriers to market access to aid adaptation. There is a need to scale up efforts to improve market access for smallholder farmers for key inputs (fertilizer, seed, agrochemicals, and labor). This requires simultaneous demand and supply-side interventions.

- On the demand side, deliberate efforts are needed to capacitate farmers to access diverse inputs, especially the costly improved inputs that can make a difference with persistent climate variability and shock exposure. One way of doing this would be to improve access to cheap credit under flexible terms for smallholder farmers, which they can use to invest in input options that enhance their resilience. In addition, scaling up quality extension services may help farmers effectively use the market for adaptation. When farmers have access to appropriate climate change adaptation advisory services and financial services, they can purchase inputs (from available markets) and make informed choices that maximize benefit at the lowest possible transactional costs, a policy goal.
- On supply-side interventions, there is a need for the continual promotion of active participation by both public and private marketing institutions in local input distribution and marketing to improve the availability of diverse agricultural inputs at lower transaction costs. In addition, efforts towards improving accessibility of remote rural areas by upgrading road infrastructure and supportive regulation for participation by private players in input businesses will help.

Promote access to diverse inputs adapted to geographic settings to help farmers adapt to climate change

From the study findings and discussions, it is factual that diversity in inputs is key for climate change adaptation in smallholder farming. Therefore, input providers should focus on enhancing access to a diverse set of inputs well-adapted to climate shocks and other attributes that speak to diverse preferences for farmers in heterogeneous settings (e.g., regions).

Harmonize policy interventions for greater impact on resilience

Policy efforts to enhance resilience to climate change in smallholder farming should

be harmonized for maximum benefit. For instance, care should be taken in designing input subsidy programs to maximize their benefit and reduce their potential negative impacts on the role of the market as an important player in enhancing agricultural input development with increasing climate change. Overall, the aim of policy interventions should be to enhance access to a dynamic and diverse portfolio of inputs that can support the attainment of food security outcomes with increasing climate risk in smallholder farming in Malawi and related contexts.

Historically, the challenges in Malawi have not been a lack of appropriate policies but challenges in fully implementing great policies. However, with the launch of the National Agricultural Investment Policy (NAIP) as the main implementation vehicle for National Agricultural Policy (NAP) a few years back (2018) in Malawi place, prospects are high that investments toward building resilient livelihoods and agricultural systems, developing markets, and enhancing trade in agriculture will incorporate policy suggestions from this study.

References

This policy brief is written by Clifton and Marshall Makate and is based on the project report titled: “*Do climate shocks promote commercial input purchasing by smallholder farmers in contrasting regions of Malawi? Lessons for adaptation*”, which is part of the AERC collaborative project “*Climate Change and Economic Development in Africa*”. This research policy brief was fully supported by a grant from the African Economic Research Consortium (AERC).



Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

www.aercafrica.org

Learn More



www.facebook.com/aercafrica



www.instagram.com/aercafrica_official/



twitter.com/aercafrica



www.linkedin.com/school/aercafrica/

Contact Us

African Economic Research Consortium
Consortium pour la Recherche Economique en Afrique
Middle East Bank Towers,
3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@ercafrica.org