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Trade can induce climate-resilient reforms for food security in Africa

by

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Context

Commodity-based economic growth that has driven Africa's development in the past decades is now in jeopardy owing to the impact of climate change on natural resources and agricultural commodities. The effects of temperature on the aggregated macroeconomic productivity in poor countries have been found to be linearly related[1] to an increase in temperature, primarily through the effects of temperature on workers and crops. Lobell and others (2011)[2] demonstrated the nonlinearity between warming and yield relationships in African maize, in particular how the final yield of maize under rain-fed conditions was reduced by 1 per cent for every day spent above 30ºC, even by just one additional degree. Through those findings, it was underscored that approximately 65 per cent of Africa's maize-growing areas will experience temperature-induced yield losses at 1ºC of warming, even under optimal rain-fed management.

Emerging scientific evidence further suggests that climate-response measures will require crop varieties better suited to new climatic conditions, following the severity of the impact of climate change on agricultural production in Africa. Higher temperatures are shortening the length of the growing period of crops, in particular during the period when there is an accumulation of biomass and yield.[3] Unfortunately, the rapid rise in temperature in the tropics limits the ability to intervene using breeding and adoption of new varieties of maize, for example, which requires up to 30 years to fully develop. The situation is made worse by recurrent drought that is redefining the production areas of key base crops, such as maize, which is widely consumed by some 300 million people in Africa as a staple food. Similarly, there are correlations reported between the spatial patterns of yield losses in maize with the spatial patterns in increased aridity in sub-Saharan Africa.[4]

There are also regional and subregional trends in the projected impact of climate change on maize production under various climate scenarios. For example, under a 4ºC scenario, the Sahel and Southern Africa region will experience widespread losses of up to 50 per cent, while the Ethiopian highlands and the Horn of Africa will experience slightly higher maize yields, and the Central Africa region will stay more or less the same.[4] All this is redesigning the

[1] Marshall Burke, Solomon M. Hsiang and Edward Miguel, "Global non-linear effect of temperature on economic production", *Nature*, No. 527 (12 November 2015) pp. 235-239.
[2] See David B. Lobell, and others, "Nonlinear heat effects on Africa maize as evidenced by historical yield trials", *Nature Climate Change*, vol. 1, No. 1 (April 2011).
[3] See Andy J. Challinor, and others, "Current warming will reduce yields unless maize breeding and seed systems adapt immediately", *Nature Climate Change*, vol. 6 (October 2016).
[4] See Amy Dale, and others, "Climate model uncertainty in impact assessments for agriculture: a multi-ensemble case study on maize in sub-Saharan Africa" *AGU Publications, Earth's Future*, Research Article, vol. 5, No. 3 (22 March 2017).

agricultural production geography of Africa, especially for key priority crops that require strategic policy orientation in addressing food security.

There are opportunities for the utilization of trade to support climate response in adaptation by generating the pull factor for trade-induced solutions to extreme climate episodes, such as droughts and their associated consumption shocks, as is currently the case in some countries in the Horn of Africa. In the *Economic Report on Africa 2015: Industrializing through Trade*,[5] the authors laid out trade as a catalyst for commodity-based industrialization and structural transformation in Africa. The authors made some key recommendations that underscored how trade-induced industrialization occurs when concrete efforts are made to enhance integrated and coherent trade and industrial policies under the framework of national development strategies.

Under the contemporary changes in demographic dynamics and urbanization occurring in Africa, there are mixed challenges and opportunities for food security that could be harnessed through trade, as highlighted in the report. Regional value chains are currently underexploited and regional imports constitute only 12 per cent of total imports on the continent. The report's authors therefore recommend the establishment of regional value chains and service hubs to boost national abilities in exploiting each other's capabilities and enhancing competiveness, on the premise that an integrated African market will provide favourable conditions to enhance a productive capacity that underlines the development of solid regional value chains and the facilitation of diversification. In this context, it is important to build on the recommendations in pursuit of climate-resilient food security in Africa.

Main objective

The main objective of the present brief is to draw attention to the opportunities that exist for harnessing agricultural production and regional trade to safeguard food security in Africa under the impact of climate change.

Approach

The brief draws on a diagnostic study conducted in the Economic Community of West African States (ECOWAS) and the East African Community to understand the role of trade in responding to the impact of climate change on agricultural production in Africa. The study was designed to investigate the emerging evidence of the effect that climate change has on agricultural systems, trade and food security and how this can inform policies and institutional and regulatory frameworks for effective adaptation in the regional economic communities. The methodological approach included a vulnerability assessment of agriculture, land-use change, agricultural trade and food security based on future climate change and climate variability (e.g., socioeconomic analyses of various climate projections to 2030, 2050 and 2100 under the Special Report on Emission Scenarios and policy analyses of agriculture, agricultural trade and adaptation measures, including a combination of cost-benefit, cost-effectiveness and multi-criteria analyses (based on the availability of data required)).

[5] Available from www.uneca.org/sites/default/files/PublicationFiles/era2015_eng_fin.pdf.

Key results

Temperature remains the main variable that determines where crops grow in both regions. Mean temperature will increase under future climate change. An increase in daytime temperatures will be faster than night-time temperatures in many ECOWAS countries, resulting in a substantial increase in summer days along the Sahel band. With regard to rainfall, there is an increase in very heavy precipitation events in almost all the ECOWAS countries and more extended wet spells along the Gulf of Guinea (Côte d'Ivoire, Ghana, Liberia, southern Nigeria and Sierra Leone), with an amplified risk of flooding as a result of very intense and long-lasting precipitation events. There will be a shift in the various moisture zones in both regions.

The spatial implications of climate change on land allocation and agricultural production reveals that climate change will induce shifts in land used for agricultural production – in and among countries in response to its impact on crop yield – pushing farmers to seek alternative routes to maximize the profit of their farm activities.

An evaluation of the impact of climate change on agricultural trade flows and food security was also undertaken to identify countries that are net suppliers, as opposed to those that have a deficit, in order to establish axes of food trade in various climate scenarios and the cheapest ways to move food from excess supply countries to countries with high demand. The results indicate that the impact of climate change on crop trade flows depends on the crop types and the climate change and socioeconomic scenarios. Trade in the region, for example in ECOWAS, may be limited owing to shortages in supply. There was, however, no clearly emerging pattern in terms of net exporters and importers as a trade axis. It was clear that there is reliance on food imports from outside the region to boost food availability in the ECOWAS zone. The nominal cost of rice imports from outside the region for example, is changing dramatically. In West Africa, the import of rice increased from 1.7 million tons in the early 1990s to 5.2 million tons in 2011.[6] Accordingly, as African nations increase their import of stable foods such as rice and maize, so will their exposure and dependency on the external market.

The demand for food will continue to increase, especially under a rapidly increasing population and rising middle class,[7] owing to economic prosperity, with increased consumption and shifts in dietary preferences. As a result of the high volume of food import needs, the cost of trading will increase under higher temperatures (climate scenario representative concentration pathway 8.5). These costs could be overturned by decreasing tariffs. In summation, how climate change affects the countries from where food is imported will have direct implications in the region regarding how they meet their food needs. This could be described as ex situ vulnerability, whereby one is vulnerable to another person's vulnerability.

[6] See Sahel and West Africa Club secretariat and Organization for Economic Cooperation and Development, "The 2008 rice crisis: shock and new challenges", June 2011. Available from www.oecd.org/swac/publications/48356981.pdf.

[7] African Development Bank, "The middle of the pyramid: dynamics of the middle class in Africa", 20 April 2011. Available from www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/The%20Middle%20of%20the%20Pyramid_The%20Middle%20of%20the%20Pyramid.pdf.

Key messages

- Intraregional trade is insufficient in tackling the increasing impact of climate change on agriculture, following the irregularities generated by the impact on supply and demand throughout countries in the region, especially under various climate scenarios.

- Promoting and facilitating interregional trade is crucial in dealing with shortages and erratic supply triggered by the impact of climate change on agriculture production. This will include managing tariffs and other trade policies to stimulate investment in value addition along the regional value chain.

- Not only is increased production required, but so are innovation and technologies that result in value addition in boosting trade opportunities for an agricultural commodity in order to engender industrialization and structural transformation in Africa. This answers an anecdotal question of whether increased productivity causes trade or whether it is triggered by trade.

- There are negative externalities associated with imported commodities, including those due to the impact of climate change. The international dependency on tradable agricultural commodities to satisfy the food needs of the continent creates another layer of risk exposure that cannot be managed locally.

- Trade connections between countries and communities at varying scales could mitigate the effects of climate change on agricultural production, especially among the poor majority in nations and communities. It is therefore important to look deeply into how trade can be harnessed as an insurance against climate change by regions that are affected by reduced agricultural productivity in upsetting the deficit in food availability.

Policy recommendations

- The attainment of food security unequivocally requires trade. Agricultural production and trade are linked solutions in dealing with the impact of climate change on the flow of key agricultural commodities and in mitigating the ripple effects of possible climate-induced deficits on food security in Africa.

- There is an urgent and increasing need to refocus and strengthen the regional value chains of key agricultural commodities for harnessing the emerging opportunities in the nexus of climate change, agricultural production and trade as solutions to the impact of climate change on food security.

- The future orientation of a climate-resilient food security strategy should emphasize the opportunities for building a business case for trade in order to capitalize on the differential impact of climate change on agriculture production in Africa that generates supply and demand for agricultural commodities.

- Suitability mapping should constitute the entry point for configuring new areas and habitats where crops can be grown as “new food baskets”, given that the impact of

climate change has altered the productive capacity of ecosystems for agricultural production.

- Suitability mapping should play a big role in assisting policymakers and the private sector in planning and adapting to changes, building on the comparative advantage of growing specific crops induced by climate change.

Conclusion

The World Economic Forum[8] recently echoed the need for a redesign of food production systems to generate the desirable shift required for food systems in promoting sustainability. This will trigger building climate resilience throughout the value chain, beyond just the level of production. This will also fulfil the need of moving consumption behaviour towards more resource-efficient demands and flows. Part of the redesign of production systems in dealing with future global change scenarios requires expanding the dependency beyond just a few crops and beyond just a few regions that can produce them.

As climate change impacts narrow the production-base of key agricultural commodities, trade will increasingly become an impetus for adapting to climate change and reducing the impact on food security in the region. This makes the facilitation of intraregional and interregional trade very crucial. It is likely to trigger an impetus for reorienting a food security strategy towards commodity value chains and underscores the reshaping of food security beyond just a production issue, which has predominated food policy in the region for a long time.

[8] World Economic Forum, *Shaping the Future of Global Food Systems: A scenarios analysis*, (January 2017) p. 20. Available at http://www3.weforum.org/docs/IP/2016/NVA/WEF_FSA_FutureofGlobalFoodSystems.pdf.