

Climate Change, Agricultural Trade and Food Security in ECOWAS

By: Aklesso Y.G. Egbendewe, Boris K. Lokonon, Coulibaly Naga, and Calvin Atewamba

EXECUTIVE SUMMARY

This research investigated the impact of climate change on agricultural trade flows within and outside the Economic Community of West African States (ECOWAS). To achieve its objectives, the study used a trade module of trade cost minimization built within a bio-economic optimization model of cropland allocation. The results showed that the pattern of trade in ECOWAS region induced by climatic factors will depend on socio-economic conditions that may prevail during the century. No specific pattern of trade flows is predicted, but there are some countries that may export food to other countries some years and may later become importers in other years. Furthermore, several countries may become dependent on trade outside ECOWAS to meet their domestic food demands. The factors that may ease the cost of trade in ECOWAS on food imports may be an adjustment of the common exterior tariffs. In fact, the study showed that a trade policy that reduces the common exterior tariffs by about 5% and 10% could induce the reduction of total trade cost of about 3% to 7%, respectively.

CONTEXT



The impact of climate change on agriculture is expected to be more pronounced on the African continent if nothing is done in terms of greenhouse gas (GHG) emissions reduction and appropriate definition of adaptation strategies (IPCC, 2014; Rosenzweig and Parry, 1994). Today, there is a consensus that mitigation in terms of reduction of GHG emissions is more concerned with global agreements among large emitters from industrial countries. Whether these agreements are reached or not, adaptation measures can be designed to reduce the impact on food security, particularly, in countries located within the tropics.

Certainly, African countries also have to do what is required in emission reduction, particularly, from reforestation and investment in cleaner energy sources. Given that climate models predict an increase in temperature but random scenarios in precipitations, some countries may experience more rainfall than others. This means that while some countries may be experiencing good crop harvest, some other countries may not. Therefore, food trade across countries may be one way to resolve food insecurity issues.

This study focused on countries in the West African (ECOWAS) region as a case study to understand the climate, agricultural production, food trade, and food security nexus. It aims at examining how food trade can be a strategy to reduce food insecurity in West Africa.

CRITIQUE OF POLICY OPTIONS



Currently, the adaptation scenarios for agriculture in West Africa include the adoption of new technologies that could increase production, investment in the agricultural sector for research and development, and deployment of irrigation techniques. However, the resources needed for such adaptations are enormous and many countries do not have these resources. Therefore, there is a need for an alternative thinking on what could be done in a very short time.

Trade is seen as a way to move food from regions that have the excess supply to the regions that have deficits. In fact, previous studies have already shown that climate change may affect food supply within the tropics but the possibility of food imports from the northern hemisphere may be a way to adapt to climate change effects (Rosenzweig and Parry, 1994).

APPROACH

This study looked at the potential impact of climate change scenarios that included a baseline scenario without climate change, a business as usual scenario (Representative Concentration Pathways: RCP 8.5) and a mitigation scenario (RCP 4.5) on trade flows in the ECOWAS region. Crop production under these climate change scenarios has been evaluated with four hypothetical shared socio-economic pathways (SSPs). These socio-economic scenarios are used to drive prices and costs dynamically in the crop production process.

KEY FINDINGS

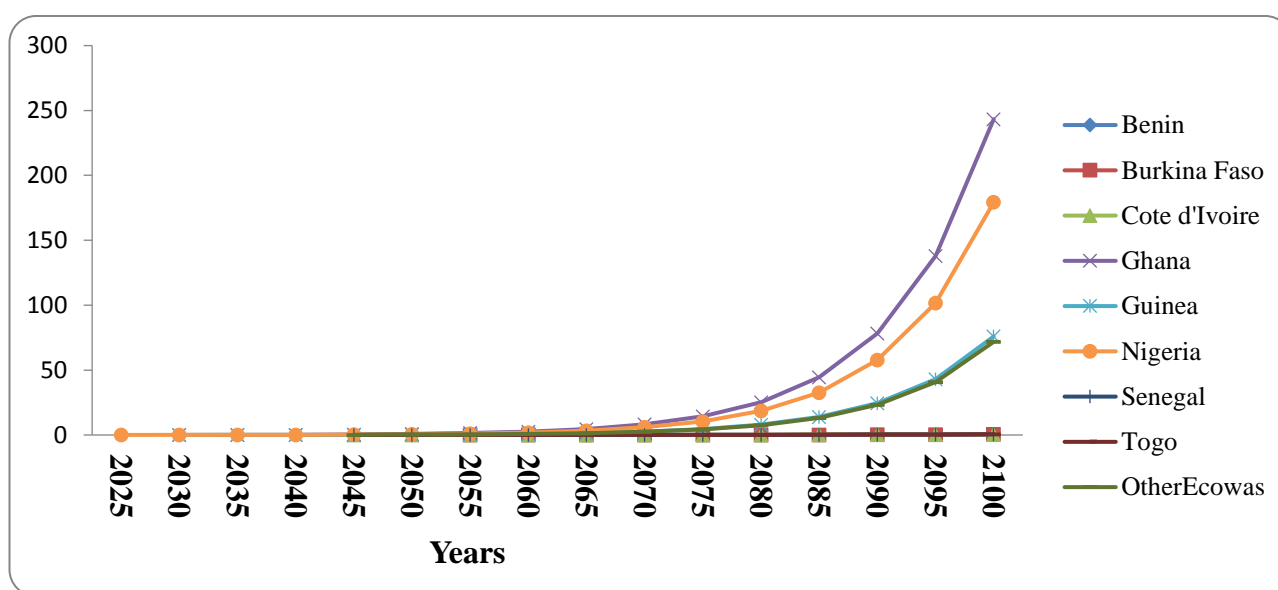
The results suggested that the impact of climate change on crop trade flows will depend on crop types, climate change, and socio-economic scenarios that are being considered. The study showed that trade within ECOWAS may be limited due to supplier shortages but no clear pattern has emerged in terms of the net exporters and the net importers. Some countries that are net exporters for some years may become net importers some other years.

The findings thus revealed that many West African countries will continue to import food from outside the ECOWAS region given that demands are rising more than what the ECOWAS production zone can handle. For instance, the analysis on rice import changes, (Table 1 below) suggested that with climate change, food imports from outside ECOWAS might increase for some countries.

Table 1. Outside ECOWAS rice import changes from baseline under RCP 4.5 and SSP1

	2020	2025	2030	2035	2040	2045	2050
Benin	0.0	0.0	0.0	0.0	0.0	643.9	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.2	3.7
Cote d'Ivoire	0.2	0.2	0.2	1.0	806.9	0.0	0.0
Ghana	710.9	494.9	0.0	0.0	0.0	0.0	0.0
Guinea	181.0	38.6	0.0	0.0	0.0	0.0	0.0
Nigeria	433.8	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.4	0.0	0.0
Togo	0.1	0.1	0.1	259.1	287.4	0.0	0.0
Other ECOWAS	0.4	1.6	26.2	2203.2	259.4	0.0	0.0

The results for the marginal values of rice import are given in the Figure below. These values show how expensive importing food resources from outside ECOWAS could become over time.



Marginal value of food imports

Since the ECOWAS zone might be net importer of food, all imports will then be subjected to the exterior common tariffs established in 2015. Therefore, trade policy scenarios of 5% and 10% decrease in the Exterior Common Tariff (ECT) were ran. The sensitivity results showed that these policy measures may reduce adaptation cost by about 3% and 7%, respectively. However, the change in the ECT will not have any significant impact on the trade flow apart from reducing the cost of trade. This is due to the model structure which is built for meeting the food demand both from inside zone and outside zone imports. The results of the sensitivity analyses are presented in Table 2 below:

Table 2: Sensitivity in ECT decrease under RCP 8.5

	SSP1	SSP2	SSP3	SSP4
<i>5% decrease</i>				
Original	13789.3	52780709	54534409	24053103
New	13749	52592467	54340235	23985026
Change	-0.003	-0.004	-0.004	-0.003
<i>10% decrease</i>				
Original	13789.3	52780709	54534409	24053103
New	13708.8	52404226	54146062	23916950
Change	-0.006	-0.007	-0.007	-0.006

POLICY CONSIDERATIONS

The main implication of trade flows observed under the various climate change scenarios is that, as long as ECOWAS countries have the opportunity to import food from countries outside the region (i.e. Europe, Asia, Australia, America and other African countries), the question of food availability will be resolved. This study, did not however, address whether people will be able to have economic access to food or whether food imported will be safe.

The results call for more efforts to be sustained in the ECOWAS zone in terms of increasing agricultural production. These efforts may include more investment in agricultural research, extension services and irrigation equipment, and the adoption of high-yielding and climate tolerant crop cultivars to improve food production in ECOWAS.

In addition, this study assumed that demand is heavily influenced by average population growth rate of 3.5% throughout the 21st century. However, it is possible that population growth may decline before the end of the century. Therefore, the demand projections might be overestimated. A future research that considers all the available arrays of adaptation measures including irrigation, biotechnology and other sustainable methods of crop yields increase could be undertaken.

REFERENCES

Intergovernmental Panel on Climate Change (IPCC). 2013. "Climate change impacts, adaptations and vulnerability, contribution of Working Group 2 to the fifth assessment report of the Intergovernmental Panel on Climate Change", Cambridge University Press: Cambridge, UK and New York, NY.

Rosenzweig, C., and Parry, M. 1994. "Potential impact of climate change on world food supply", *Nature*, 367.

ACKNOWLEDGEMENT

This work was carried out with the aid of a grant from the African Climate Policy Centre (ACPC) of the United Nations Economic Commission for Africa (UNECA).



UNITED NATIONS
UNIVERSITY
UNU-INRA
Institute for Natural Resources in Africa



Economic Commission
for Africa
ACPC
African Climate Policy Centre

ABOUT THE AUTHORS

Prof. Aklesso Y.G. Egbendewe is a Lecturer at the Department of Economics and Management Sciences (FASEG), University of Lomé, Togo. He was a Visiting Scholar of UNU-INRA.

Dr Boris K. Lokonon is a Lecturer at the Department of Economics and Management Sciences (FASEG), University of Parakou, Benin. He was a Visiting Scholar of UNU-INRA.

Dr Coulibaly Naga is also a Lecturer at the Department of Geoscience (FASEG), University of Abobo-Adjamé, Cote d'Ivoire. He was a Visiting Scholar of UNU-INRA.

Dr Calvin Atewamba is a Former Research Fellow for Green Economy, UNU-INRA.

This Policy Brief is prepared from a UNU-INRA Working Paper entitled:

Impact of Climate Change on Agricultural Trade and Food Security in ECOWAS

This policy brief and the working paper are available at collections.unu.edu

CONTACT

United Nations University Institute for Natural Resources in Africa (UNU-INRA)

Location: Second Floor, International House, Annie Jiaage Road, University of Ghana, Legon, Accra, Ghana
Address: PMB, KIA, Accra, Ghana

Tel: +233-302- 213850. Ext. 6318
Email: inra@unu.edu
Website: www.inra.unu.edu

 @UNUINRA

 @UNUINRA

 United Nations University-INRA