

Policy brief

Offsetting the negative impact of climate change on agriculture in the Economic Community of West African States

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1. Executive summary

Climate change is acknowledged to be among the most serious threats to the capacity of food supply systems to meet growing food needs (Leclère and others, 2014). Indeed, it is predicted that agriculture in the countries of the Economic Community of West African States will be seriously affected by climate change and the magnitude, and impact of that change will vary based on location. Agricultural crops in those countries are irrigated primarily by rain and are thus heavily dependent on climatic conditions. The use of technology and improved seed varieties is not widespread in the ECOWAS region, and the production of paddy rice, maize, sorghum, millet, oil seeds, cocoa, coffee and sesame is likely to decline in scenarios of both moderate and harsh climate change. The adoption of high-yield crop varieties is therefore necessary in all ECOWAS countries in order to offset the impact of climate change. It is also critically important to adopt improved irrigation and other technologies and to facilitate access to extension services to complement the adoption of high-yield crop varieties. Furthermore, Governments must advocate for international action to reduce greenhouse gas emissions to ensure that their populations enjoy a high quality of life in the years ahead.

2. Context and importance of the challenge

Climate change exacerbates other existing challenges, including extreme poverty and hunger (Nelson and others, 2010). It is expected to impede food production in the future and may hamper the achievement of the Sustainable Development Goals. Indeed, climate change is recognized as a factor that is already depressing major crop productivity, and it will have a significant impact on the overall supply of agricultural products in the coming years (Leclère and others, 2014; Intergovernmental Panel on Climate Change, 2014).

It is predicted that agriculture in developing countries, including ECOWAS member countries, will be seriously affected by climate change (Mendelsohn and others, 2006) because of factors that are dependent on climatic conditions, such as rain-dependent crop irrigation. Nevertheless, climate change is also expected to provide opportunities to improve on established farming practices (Gornall and others, 2010). Furthermore, Seo (2013) concluded that, although farmers can prepare for climate change, they are presently ill equipped for sudden weather-related change. It is therefore critical to identify the most appropriate climate adaptation strategies. Before considering those strategies, however, relevant stakeholders must assess the magnitude of the potential threats resulting from climate change. The extent to which climate change will affect land allocation and agricultural production in ECOWAS countries must be assessed and must be made a priority for in-depth research, in particular because large segments of those countries' populations remain dependent on agriculture for their livelihoods, while entrenched rural poverty remains widespread throughout the region.

Although earlier studies have provided useful tools to measure the impact of climate change on agriculture at both the continental and country levels within Africa, the question of how that impact may vary across landscapes remains unresolved (Seo and others, 2009). The effects of climate change will differ across agro-ecological and agro-climatic zones in Africa (Seo and others, 2009; van Wart and others, 2013). Agro-climatic zones are characterized by the relationship between agronomy/farming systems and climate, while agro-ecological zones are characterized by the relationship between agronomy/farming systems and various environmental factors, although not exclusively by climate-related factors (Williams and others, 2002). The Food and Agriculture Organization of the United Nations defines agro-ecological zones as geographic units that have a similar climate and soil for agriculture, while

agro-climatic zones are defined as divisions of a region based on homogeneity in weather variables that have the greatest influence on crop growth and crop yield (van Wart and others, 2013).

This policy brief is aimed at recommending policies that will help to offset the negative effects of climate change on crop production in ECOWAS countries on the basis of an in-depth investigation of the impact of climate change on agricultural production in ECOWAS countries across agro-climatic zones.

3. Critique of the policy options

A significant portion of the population of West Africa depends on agriculture for its livelihood. Although the agricultural sector employs some 60 per cent of the labour force, it contributes only 35 per cent to those countries' gross domestic product (GDP). This statistic highlights the fact that farmers in ECOWAS countries produce at rates on par with subsistence levels of agriculture, given that many farmers live in entrenched poverty and face numerous constraints on their agricultural productivity, including climate shocks, soil acidity and nutrient-depleted and degraded soils that impede agricultural development. The most important food crops grown and consumed in ECOWAS countries include cereals (maize, sorghum, millet and rice), roots and tubers (cassava, sweet potatoes and yams) and legumes (cowpeas and groundnuts), while the major cash crops include cocoa, coffee and cotton. The use of technology and improved varieties of seeds is not widespread; rather, traditional agricultural practices are common and agriculture tends to rely primarily on family labour (Lokonon and others, 2015). Significant inefficiencies continue to hinder agricultural production in ECOWAS countries. In the light of those countries' growing populations, poverty levels will remain high and the achievement of the Sustainable Development Goals will remain problematic if nothing is done to improve agricultural practices. The agricultural sector is particularly vulnerable to climate change, which is expected to impede overall food production in ECOWAS countries. The only exception is expected to be the production of vegetables and fruit, given that climate change is beneficial to vegetable and fruit production in those countries, as shown in table 1.

Table 1
Impact of climate change on food production under representative concentration pathway 4.5

	<i>Paddy rice</i>									<i>Maize, sorghum, millet</i>								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-3.7	-8.0	-1.3	5.3	12.5	-1.3	-23.3	-11.6	-7.3	-7.1	-6.5	-9.3	-5.0	-10.2	-28.8	-51.7	-66.3	-69.4
Burkina Faso	-1.2	-2.9	1.3	6.9	18.4	6.3	-11.8	-5.3	-0.7	-4.1	-21.3	-10.0	-5.1	-4.4	-19.6	-28.3	-15.9	-9.2
Côte d'Ivoire	-5.4	-6.7	-0.9	5.5	3.1	-10.7	-61.0	-16.0	-9.0	-5.4	-3.3	-5.8	-0.3	6.8	-44.4	-37.0	-36.0	-11.3
Gambia	-5.0	-10.1	-5.5	0.1	12.3	-3.4	-19.1	-10.8	-7.9	-6.5	-23.6	-10.0	-5.0	-4.4	-18.6	-27.8	-20.9	-9.7
Ghana	-7.6	-8.1	-1.4	4.0	-2.9	-17.2	-31.4	-20.9	-13.1	-7.4	-5.5	-9.1	-5.0	-20.2	-32.2	-37.1	-30.5	-18.8
Guinea	-11.5	-8.5	-1.8	3.6	-4.6	-18.3	-32.0	-14.0	-10.9	-1.4	1.6	-0.7	0.0	-18.6	-27.5	-28.5	-91.4	-3.9
Guinea-Bissau	-12.0	-11.9	-4.3	2.5	-7.0	-15.1	-24.7	-18.3	-13.9	-6.0	-4.3	-6.5	-8.4	-34.1	-39.4	-54.1	-64.5	-67.8
Liberia	-14.0	-9.1	-2.9	1.7	-12.5	-27.7	-36.6	-17.4	-18.4	0.2	3.1	1.3	-0.5	-44.8	-26.4	-27.8	-95.8	-3.3
Mali	-0.3	-0.9	2.1	7.4	19.3	7.9	-12.7	-3.5	1.4	4.4	-18.4	-9.8	-4.8	-1.1	-19.9	-26.1	1.6	0.9
Niger	2.7	5.7	5.4	9.0	24.6	16.3	2.0	4.4	9.6	33.9	-8.0	-7.8	-3.6	6.9	-13.4	-18.2	54.1	27.5
Nigeria	-7.4	-9.2	-1.3	4.9	0.9	-18.2	-50.9	-26.4	-15.3	-4.6	-9.6	-9.5	-3.3	-4.4	-22.6	-30.1	-17.0	-9.4
Senegal	2.6	0.7	1.5	4.5	17.4	6.8	-7.6	-2.0	2.7	11.1	-32.1	-9.0	-4.5	18.7	-16.7	-8.6	40.1	72.8
Sierra Leone	-14.4	-10.9	-3.6	1.4	-15.9	-36.6	-47.5	-42.5	-32.2	-1.6	0.4	-0.8	-3.0	-82.1	-42.7	-33.5	-78.6	-4.8
Togo	-5.6	-7.2	-0.8	5.8	9.0	-4.9	-30.7	-10.0	-7.0	-8.2	-5.9	-10.0	-4.5	-9.7	-33.8	-49.0	-53.0	-48.1
	<i>Vegetables and fruit</i>									<i>Oil seeds</i>								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.5	8.5	7.9	3.0	9.1	27.8	52.4	30.1	20.9	-1.4	-7.2	-6.5	-15.7	-17.8	-9.6	18.9	55.8	70.1
Burkina Faso	5.5	8.2	7.3	1.8	5.5	24.8	51.7	32.5	23.7	-5.2	-11.4	-8.8	-18.3	-28.7	-23.8	-17.7	-2.9	-13.3
Côte d'Ivoire	8.8	11.3	11.9	12.1	25.1	43.0	63.8	37.9	29.7	-0.5	-2.3	-5.1	-13.9	-21.3	-39.2	-28.0	31.2	6.2
Gambia	-2.9	-0.8	-2.9	-6.4	-12.0	9.1	35.3	27.6	25.8	-6.2	-12.2	-8.4	-19.4	-25.5	-21.1	-9.1	-3.4	-13.7
Ghana	9.2	11.1	11.8	12.9	27.9	45.2	64.0	37.1	28.0	-2.0	-0.9	-3.6	-7.8	7.3	15.3	15.1	18.7	1.4
Guinea	11.1	16.4	16.5	20.1	30.6	48.5	71.3	46.2	40.9	-2.0	-1.7	-3.7	-8.9	-3.0	10.9	45.7	82.3	24.1
Guinea-Bissau	8.8	10.6	10.5	10.5	23.0	39.7	58.1	32.4	24.1	-2.9	-4.8	-5.0	-5.3	3.2	13.3	19.8	23.4	17.8
Liberia	13.3	18.5	23.4	31.9	46.4	56.2	75.2	48.4	45.6	-5.9	-3.1	-3.7	-3.7	204.9	614.2	952.4	1597.1	1164.5
Mali	4.0	7.0	6.3	2.0	2.4	22.4	47.9	31.4	23.7	-8.0	-12.9	-8.4	-17.4	-45.6	-59.4	-74.4	-60.7	-54.6
Niger	-2.6	-6.0	0.2	-6.2	-21.6	-12.4	7.3	10.4	7.5	-9.2	-13.5	-9.0	-16.9	-70.6	-89.8	-91.0	-92.6	-89.9
Nigeria	2.0	6.1	5.0	3.5	5.0	25.7	51.3	34.0	28.4	-6.1	-10.7	-8.1	-18.1	-24.3	-23.3	-18.0	15.6	-5.3
Senegal	-1.9	-1.2	0.4	-3.8	-8.8	5.5	23.1	-7.5	24.0	-8.7	-13.4	-8.0	-17.6	-36.9	-29.5	-80.0	-23.3	-23.7
Sierra Leone	14.5	19.0	20.9	31.0	47.3	59.0	74.6	45.6	42.8	-5.8	-3.6	-3.9	-2.9	148.4	299.5	390.4	520.6	261.1
Togo	6.9	10.4	10.4	7.4	15.1	34.8	61.6	38.8	31.7	-1.5	-5.9	-4.8	-16	-16.6	-7.9	14.0	35.3	30.7

The figures presented in table 1 suggest that food production will decline under harsh climatic conditions and that crop production will become less profitable as the climate changes. It should be noted that cocoa, coffee and sesame production is expected to decrease as a result of climate change, whereas sugarcane and cotton production is expected to increase. Crop production in ECOWAS countries is therefore highly sensitive to climate change, and a structural transformation of the agricultural sector is of paramount importance if countries are to mitigate the negative impact of climate change and improve the living standards of their populations. The impact of climate change will not be uniform across countries, however, and disparities are likely to be seen across landscapes.

4. Policy recommendations

Appropriate adaptation strategies to offset the negative impact of climate change are urgently needed, including the adoption of high-yield crop varieties in all ECOWAS countries. It is also critically important to adopt improved irrigation and other technologies, facilitate access to extension services to complement the adoption of high-yield crop varieties and act to minimize inefficiencies in agricultural production systems. Furthermore, Governments must advocate for international action to reduce greenhouse gas emissions so as to ensure that their populations enjoy a high quality of life in the years ahead.

5. Bibliography

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