West African Agriculture and Climate Change:
A COMPREHENSIVE ANALYSIS — TOGO

ABIZIOU TCHINGUILOU[1], ABDULAI JALLOH[2], AND TIMOTHY S. THOMAS[3]

DECEMBER 2012

CURRENT CONDITIONS

The agricultural sector employs approximately 70 percent of Togo's workforce and accounts for 38 percent of the country's GDP. The sector is dominated by small-scale, rainfed farming of millet, sorghum, maize, and rice.

Life expectancy rose from 45 years in 1960 to 57 years in 1990, increasing to about 60 years by 2010. Infant mortality has been reduced by more than half, from more than 250 deaths per 1,000 births in 1960 to about 100 deaths per 1,000 births in 2008. Vaccination of children and urbanization, which increases access to medical and social services, may partly account for these improvements. However, malnutrition among children under 5 years remains high (23.2 percent in 1998).

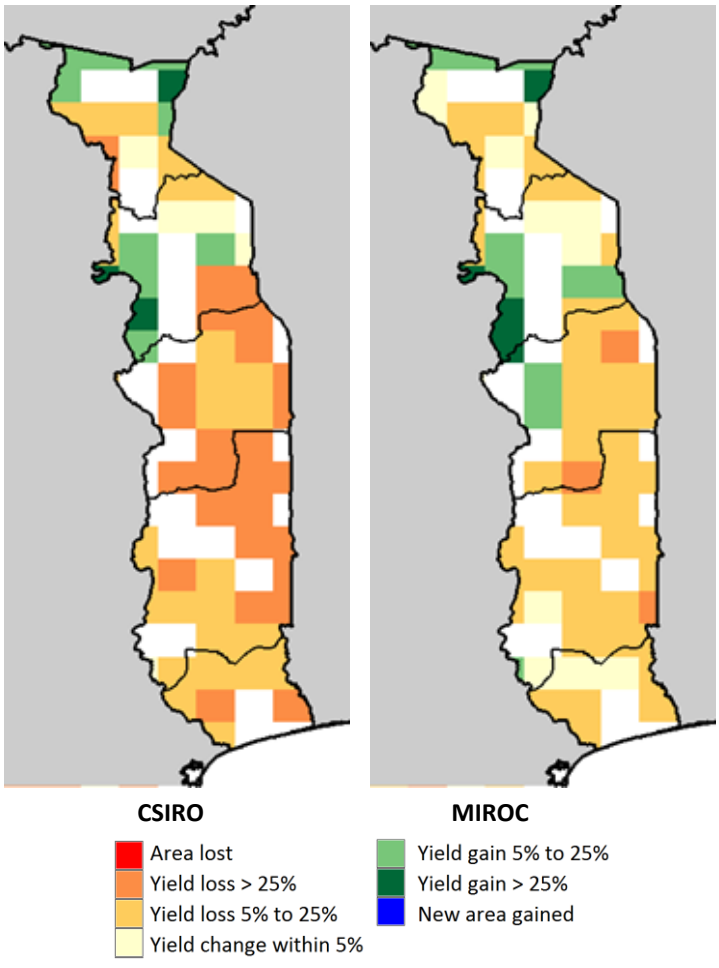
Only 21 percent of the national road network is paved; the feeder roads linking major agricultural areas to potential markets are often impassable, particularly during the rainy season, and some areas remain isolated. The proportion of the population living on less than US$2 a day is 60–70 percent. By 2050, the population is projected to reach 11–15 million people.

CLIMATE CHANGE SCENARIOS & THEIR POTENTIAL EFFECTS ON YIELDS

We used four downscaled global climate models (GCMs) from the IPCC AR4. These models predict diverse results for changes in annual rainfall by 2050. The CNRM model predicts that average rainfall will change very little. The CSIRO model, which yielded the most pessimistic results, predicts that precipitation will decrease by 50–100 mm in the Maritime and much of the Kara regions, and will decrease by 100–200 mm across the rest of the country. The MIROC model predicts that precipitation will increase by 100–200 mm in the north, diminishing progressively to the south, with a reduction of 100–200 mm in the southern third of the country.

All the models predict an increase in the average daily maximum temperature during the warmest month by 2050. The CNRM model predicts the largest temperature increase (2–2.5^{0}C across the country). In contrast, the MIROC model predicts the smallest increase (1–1.5^{0}C). The CSIRO and ECHAM models predict that temperatures will rise by 1.5–2^{0}C in most parts of the country.

CHANGES IN YIELD WITH CLIMATE CHANGE: RAINFED MAIZE



Any sustained increase in temperature, especially when combined with diminished rain, could pose serious challenges for farmers.

---

[1] Ingénieur Agronome , Direction de l'Environnement, Ministère de l'environnement et des ressources forestières; [2] Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles/West and Central African Council for Agricultural Research and Development (CORAF/WECARD); [3] International Food Policy Research Institute (IFPRI).

The maps depict the results of the Decision Support System for Agrotechnology Transfer (DSSAT) crop modeling software projections for rainfed maize, comparing crop yields for 2050 with climate change to yields with 2000 climate. Both models predict a widespread reduction in maize yield. Most of the losses in the MIROC model are 5–25 percent, while many of the losses in the CSIRO model are for more than 25 percent. There is some spatial differentiation, however, since both models predict an increase of 5–25 percent in some areas in the north.

CLIMATE CHANGE & FOOD SECURITY SCENARIOS

The research used the IMPACT global model for food and agriculture to estimate the impact of future GDP and population scenarios on crop production and staple consumption, which can be used to derive commodity prices, agricultural trade patterns, food prices, calorie consumption, and child malnutrition. Three GDP-per-capita scenarios were used – an optimistic scenario with high per capita income growth and low population growth, a pessimistic scenario with low per capita income growth and high population growth, and an intermediate scenario.

In the pessimistic scenario, per capita GDP will increase very slightly between 2010 and 2030, and then increases at a steeper rate through 2050, resulting in a 120 percent increase over the 2010 income. In the intermediate scenario, income rises 370 percent during that period, and it rises 680 percent in the optimistic scenario.

IMPACT projects maize yields to rise 80 percent from 2010 to 2050. At first, this seems to contradict the earlier crop model findings of yield loss due to climate change. But the crop model predicts the impact of climate change without allowing for adaptation or technological change, while IMPACT does allow for those things. There is very little difference in yields between scenarios, but for a given scenario, the difference in the lowest yield predicted by a climate model and the highest yield from a different climate model is around 10 percent.

IMPACT also tells us that the harvested area of maize will decline by 23 percent between 2010 and 2050. Together with the yield results, this implies that production will expand by just over 30 percent between 2010 and 2050. With demand from higher incomes and a larger population, net imports will increase, particularly after 2025. Maize price is projected to double over the 40-year period.

Sorghum productivity will increase even more than maize productivity, with yield more than doubling. Very little differences are observed for yield across scenarios or climate models. Unlike for maize, sorghum area is projected to expand by more than 40 percent. Production will triple. Net exports increase under the pessimistic scenario but decrease under the optimistic scenario.

Cassava is similar to maize in that it has a yield increase but an area decrease. The yield roughly doubles between 2010 and 2050, but in the intermediate scenario there is an especially large difference between climate models, with the high yield climate model being 27 percent greater than the low yield climate model.

In the pessimistic scenario, the number of malnourished children under five years rises until 2030 and then falls, and the level in 2050 is higher than in 2010. With rising population, the percent of children who are malnourished will undoubtedly be smaller, however. The optimistic scenario projects a reduction of more than 50 percent in the number of malnourished children by 2050.

In the pessimistic scenario, the fewer kilocalories per capita will be available by 2050. In the optimistic scenario, available kilocalories per capita will increase to about 3,000 by 2050. The results indicate a correlation between the availability of kilocalories and the reduction in the number of malnourished children under five years.

RECOMMENDATIONS

Policymakers should consider the following recommendations:

- support the development of small-scale irrigation in low-land areas;
- ensure effective outreach by agricultural extension services;
- support the National Agricultural Research System to develop crop varieties and management systems that will enhance productivity under adverse weather; and
- update national policy strategies to emphasize climate change (including the Agricultural Policy Note adopted in December 2006, the strategy and action plan to boost agricultural production adopted in July 2008, the poverty reduction strategy adopted in May 2009, and the national food security program adopted in December 2008).

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
2033 K Street, NW • Washington, DC 20006-1002 USA
T: +1.202.862.5600 • F: +1.202.467.4439
Skype: ifprihomeoffice • Email: ifpri@cgiar.org

This is an excerpt from the chapter on Togo that will appear in the forthcoming peer-reviewed IFPRI monograph, *West African Agriculture and Climate Change: A Comprehensive Analysis*. For more information, contact g.nelson@ifpri.org. The authors would like to acknowledge financial support from the European Union and the Canadian International Development Agency through their support of the CGIAR Research Program on Climate Change, Agriculture, and Food Security, the German Federal Ministry for Economic Cooperation and Development, and the Bill and Melinda Gates Foundation.