

## **Climate Change and Food Security in the Sahel**

Ahmadou Aly Mbaye  
WASCAL Climate Change Economics, University Cheikh Anta Diop, Senegal

PERN Cyberseminar on Population, Climate Change and Food Security  
18 – 25 May 2020

Sahelian countries, while sharing many features of other Sub-Saharan African economies, face some unique economic challenges, which merit particular scrutiny. Per-capita income levels are low, exports are concentrated on few commodities, climates are mostly dry and four of the six countries are landlocked. With fertility rates and population growth in Sahel hitting world record, youth –defined as people aged 15-24— make up more than 65% of the total labor force and are mostly either unemployed or underemployed. These exceptional demographic trends are putting downward pressure on living standards, as well as on access to infrastructural services and decent jobs. Poverty incidence is higher in the Sahel than in other African countries, with up to 80% of the population living on under \$2 per day. The picture is further darkened by critical governance weaknesses, political turmoil and radical Islamist threats, which, have caused serious security challenges within, and across, national borders. Issues of the economy of the Sahel have sprung forward in the course of growing instability in the region, where widespread conflicts and huge losses in livelihoods result in important population displacements.

Climate change is found to be drying out sources of livelihoods and fueling conflicts. In the Sahel, regional climatic trends show an overall rise in temperature, frequent and severe droughts, more frequent and intense floods with a quite erratic trend in rainfall. The Sahel is found to be one of the most vulnerable regions to the adverse effects of climate change. It faces a growing number of natural disasters, the frequency and intensity of which is expected to further in the near future. In a context where natural resources are the main sources of livelihoods, environmental degradation significantly impacts people's resilience and makes them highly vulnerable (Diop, 2007, Lam et al., 2012).

According to the Economist Intelligence Unit's Global Food Security Index (GFSI) Sahelian countries are poorly ranked. Out of 113 countries, Mali is 86, Senegal 87, Burkina 97, Niger 104, and Chad 108. Chronic poverty, high population growth and conflict are major drivers of food insecurity while climatic hazards exacerbates the already existing problem both directly and indirectly.

Below, we highlight some areas where the impact of Climate change on food security is more discernible

### **Sea-level rise**

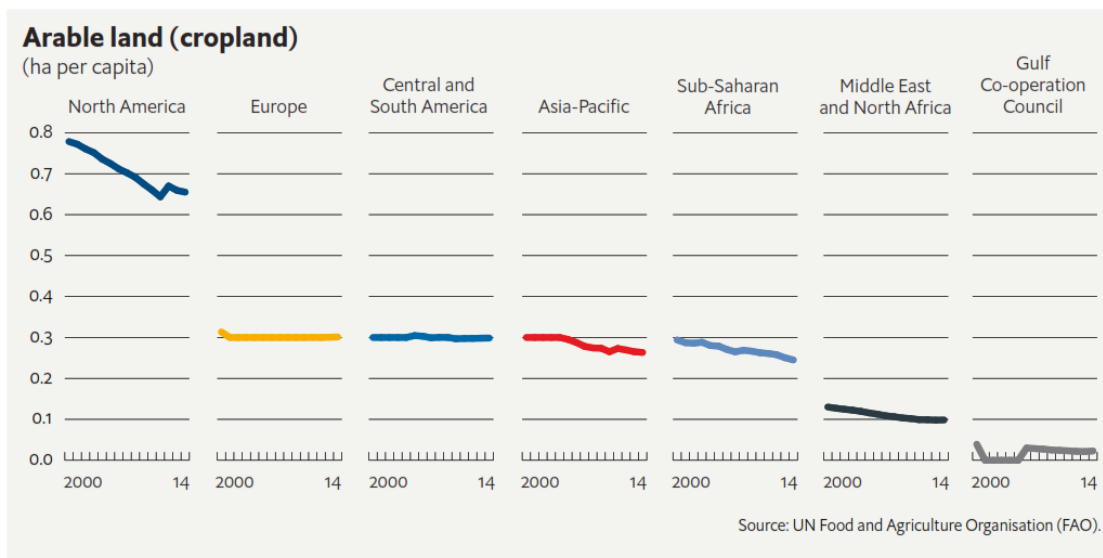
On coastal areas, climate change undoubtedly presents one of the most significant risks to food security in Africa. Indeed, recent estimates show that sea levels could rise [100 cm by 2100](#), further compounding the many hazards threatening the region. Coastal areas in Africa, like elsewhere in the world, tend to be more densely populated due to the economic opportunities

there. By some estimates, Africa’s populations in Low Elevation Coastal Zone (LECZs) will rise at an annual rate of 3.3 percent between 2000-2030, which is more than double the world’s average (Mirzabaev, 2019). About 30 million Africans live within the flood hazard zone around the Atlantic and Indian Oceans, out of which 2 million are likely to be flooded *each year*. Saltwater intrusion into inland coastal areas negatively impacts river salinity, hence available drinking and irrigation water, making both off-season agriculture and freshwater fishing more challenging.

### Availability of arable land

In terms of the size of arable land, Figure 1 displays the small endowment Africa has by comparison to other regions of the world, except desertic regions. It further shows this endowment shrinking as the result of climate change. According to some estimates, observed recent trends on greening of the Sahel, do not alter this conclusion. Instead, it is found that, desertification has increased in intensity in many localities of the Sahel, in recent years, further decreasing the yield of many staple and fruit crops, and therefore exacerbating food insecurity.

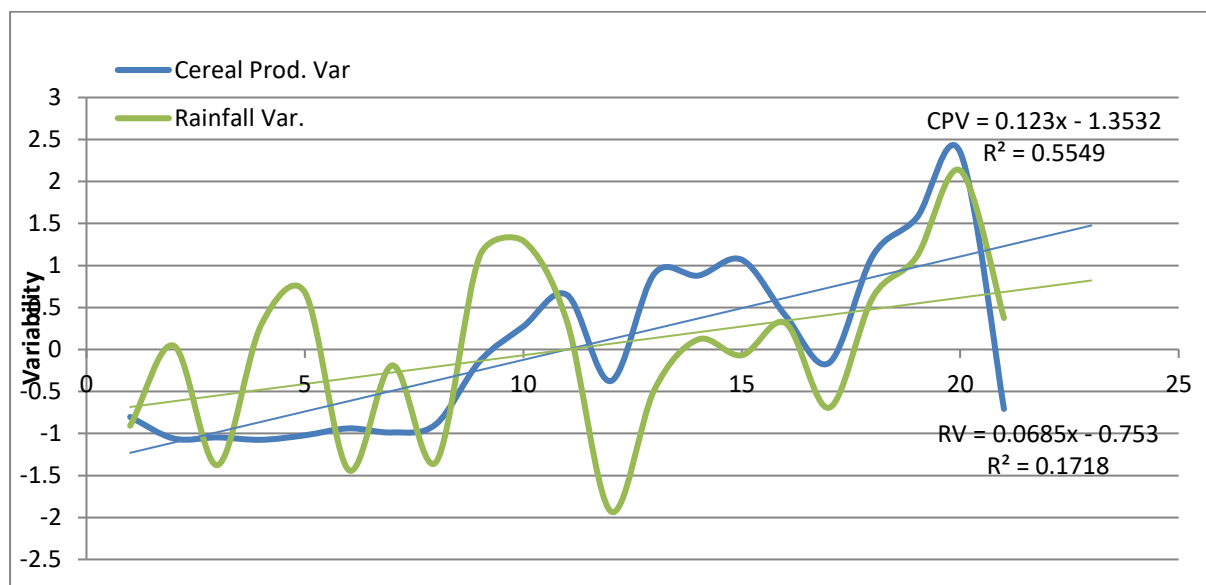
**Figure1. Endowment of arable land.**



### High volatility of cereal production

Figure 2 shows the correlation between rainfall and cereal production in the Gambia. A clear pattern where both variables being highly correlated emerges, further testifying to the adverse effect of climate change on food security. Due to these agricultural production variations, brought about by climate change and other factors, food prices are soaring in the Sahel, further jeopardizing food security as figure 2 shows.

**Figure 2. Correlation between rainfall and cereal production in the Gambia**



### Rising food prices are exacerbating food insecurity

Food prices are soaring as shown in Figure 3. Climate change is not the only reason. Cartelization, trade policy, and rent-seeking also come into play.

**Figure 3. Food Price Index**

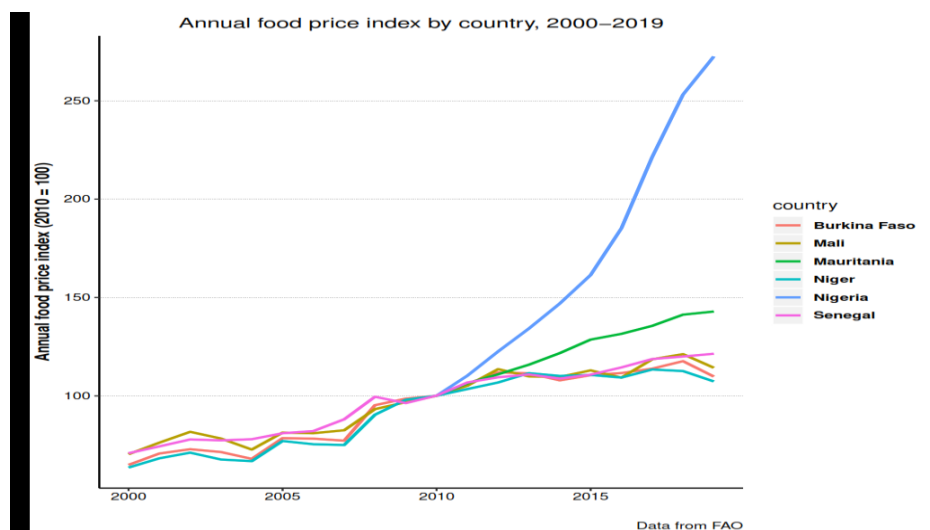
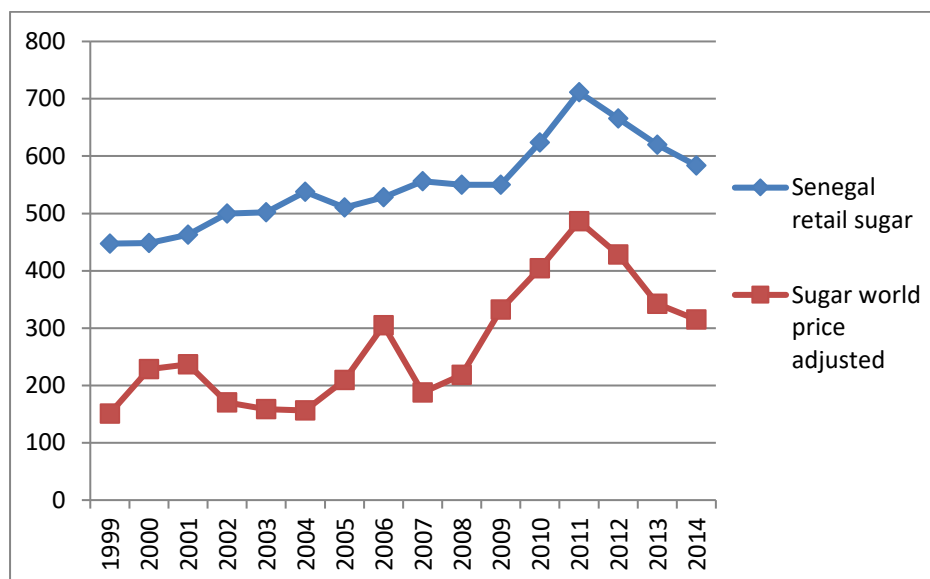


Figure 4 shows example of sugar in Senegal. As a finished product, sugar imports are subject to the highest applicable common external tariff (TEC) rate of 20 percent, a value-added tax (VAT) rate of 18 percent and other small taxes and fees, cumulating to 44.68 percent (see Appendix 1). In addition, sugar benefits from a special variable levy or “péréquation”, with a reference price (“prix de déclenchement”) used to establish duties assessed rather than import price. If the import price is below the reference price, all duties levied, including VAT, are assessed on the reference price. Moreover, additional duties are levied equal to the difference

between the import price and the reference price, so that the TCI acts as “valeur mercuriale” or variable levy.

For sugar as for other staples, difference between international and domestic prices is a good indication of distortion, and this difference happens to be too high for most items. Climate change is therefore compounding distortionary policy factors.

**Figure 4. Sugar Prices: Comparison of Domestic Senegalese Retail Price and World Price<sup>a</sup> CFA francs per kilogram**

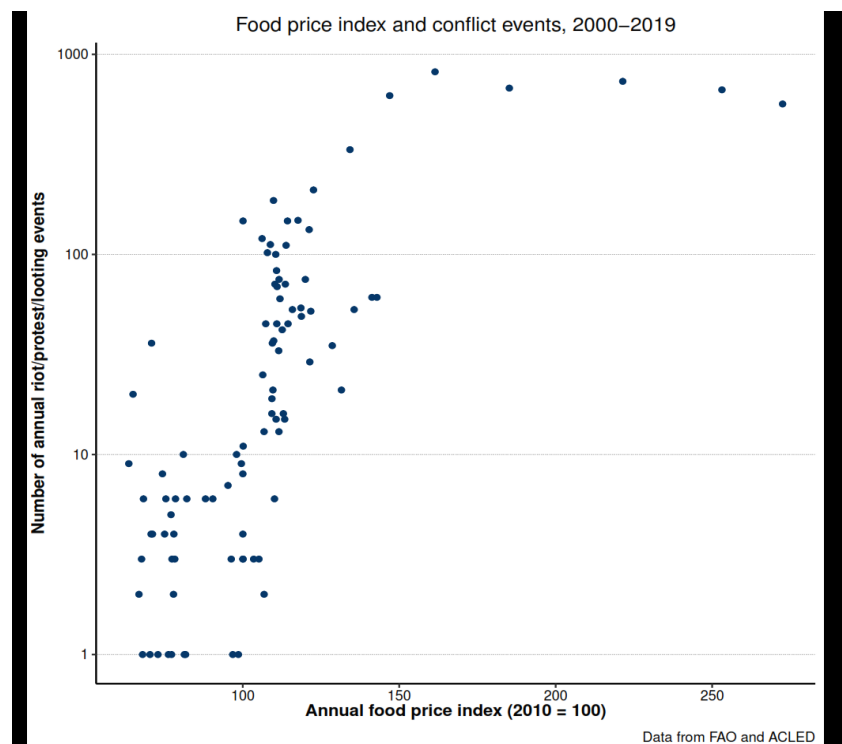


Source: Golub, Mbaye, English 2015

### Food prices and conflicts are correlated in the Sahel

While there are a lot of controversies around the relationship between climate change and communal violence, there seems to be a more direct link between riots and climate-induced increase in food prices. Figure 5 plots annual food price index and riots in the Sahel, showing a clear positive trend between the two variables.

**Figure 5. Food price and conflict events**



## Conclusion

The Sahel is the area of the world where population growth hits world records, reaching 4%, in Niger, while urban and coastal areas population growth range from 3 to 6% per annum. These demographic trends exert negative pressure on food security, through several channels, among which overfishing (depleting halieutic resources), soaring food demand (exerting an upward pressure on food prices), are significant. By increasing sea-surface temperature and bringing about more frequent and prolonged droughts, climate change is further compounding these trends, and contributes in decreasing yield both for agriculture, livestock, and fishing.

As livelihoods dry out, migration is incentivized and fighting over increasingly scarce resources becomes more frequent. Adaptation to climate change in this context is made even more challenging by critical governance issue and ramping Jihadist threats. Mitigating climate change and conflict, will require scaling up resources and addressing institutional and policy failures.

## References:

Diop, A. T. (2007) *Dynamique écologique et évolution des pratiques dans la zone sylvo-pastorale du Sénégal: perspectives pour un développement durable*. Th. Doctorat d'État. Dakar. Université Cheikh Anta Diop de Dakar, 387 p.

*Population-Environment Research Network (PERN) Cyberseminars*  
<https://www.populationenvironmentresearch.org/cyberseminars>

Economist Intelligence Unit. Global Food Security Index (GFSI).  
<https://foodsecurityindex.eiu.com/>

Lam, V. W., Cheung, W., Swartz, W. and Sumaila, U. R. (2012) Climate change impacts on fisheries in West Africa: implications for economic, food and nutritional security. *African Journal of Marine Science*, 34:103-117

Mirzabaev, A. (2019) *IPCC Special Report on Climate Change and Land: Implications for Western Africa*. Proceedings of the UCAD-ZEF conference on climate change and food security. [http://wascal.ucad.sn/images/wascal/Wascal\\_conf/dakar\\_alisher%20mirzabaev.pdf](http://wascal.ucad.sn/images/wascal/Wascal_conf/dakar_alisher%20mirzabaev.pdf)

### **Appendix 1:**

Mbaye, A. A., Golub, S., English, E. P. (2015) *Policies, prices, and poverty: the sugar, vegetable oil, and flour industries in Senegal (English)*. Policy Research working paper; no. WPS 7286. Washington, D.C.: World Bank Group.  
<http://documents.worldbank.org/curated/en/474811468183562115/Policies-prices-and-poverty-the-sugar-vegetable-oil-and-flour-industries-in-Senegal>