

What do we know about THE IMPACTS OF THE NEXT EL NIÑO ON AGRIFOOD SYSTEMS?

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This chapter was originally published as an online brief in June 2023; it has been lightly edited and a brief postscript has been added, but otherwise it appears in its original form.



Key messages

- As of June 2023, the U.S. National Oceanic and Atmospheric Administration (NOAA) declared that El Niño conditions were present and consensus existed among climate prediction centers that El Niño would likely persist from November 2023 to February 2024.
- El Niño is typically associated with seasonal climate anomalies and extreme weather events throughout the developing world, especially across sub-Saharan Africa, but the economic impacts caused by these events are difficult to disentangle from those of other climate shocks, natural disasters, and economic cycles. Additionally, the strength and consistency of El Niño's agroclimatic impacts vary by region.
- El Niño's unique slow onset, periodic pattern, and lead times of prediction (from a few months to a year) make it possible to design anticipatory policies and prepare emergency responses in advance.
- Policymakers should closely monitor the evolution of El Niño-Southern Oscillation (ENSO) phases and the potential impacts of El Niño and be prepared to coordinate policy responses quickly as the situation unfolds.
- As global warming continues and climate extremes occur more frequently, actions to foster climate-resilient agrifood systems should be broadly prioritized.

RECENT TRENDS AND CHALLENGES

As of June 2023, consensus existed among the climate science community and prediction centers that the El Niño-Southern Oscillation (ENSO) of the boreal winter season (November 2023–February 2024) would transition to an El Niño event, ending the recent three-year La Niña (FAO 2023). El Niño naturally reoccurs every 2 to 7 years, and its cycle typically lasts 9 to 12 months, starting with a slow onset during the boreal (Northern Hemisphere) spring season (March–June), peak intensity during the late fall or winter (November–February), followed by weakening during the spring or early summer (March–June). Its unique slow onset, periodic pattern, and lead times of prediction (from a few months to a year) make it possible to design anticipatory policies and prepare emergency responses a few months in advance.

Evidence shows El Niño is associated with seasonal climate anomalies and a higher occurrence of extreme weather events throughout the developing world, especially across sub-Saharan Africa, but the economic impacts caused by these events are difficult to disentangle from those of other climate shocks, natural disasters, and economic cycles.

Although an expanding literature examines how natural disasters are managed in the global South, quantitative evaluation of the policies and investments that could help avoid at least some of the damage caused by El Niño events is limited. Many technical and scientific challenges still arise to predicting ENSO with the desired level of confidence due to the complexity of the oceanic and atmospheric processes involved. For example, ENSO forecasts are notoriously difficult to make during the months of February, March, and April – a time often referred to as the “spring predictability barrier” – but become progressively more feasible over the course of May, June, and July for lead times up to the next boreal spring (Barnston et al. 2019). These factors complicate the design of policies and timely response mechanisms that could help mitigate economic damage and welfare losses. Thus, it is important for countries to closely monitor the development of El Niño/La Niña events and be prepared to make nimble adjustments to their risk management measures.

The strength and consistency of El Niño’s agroclimatic impacts vary by region. Even when an El Niño develops,

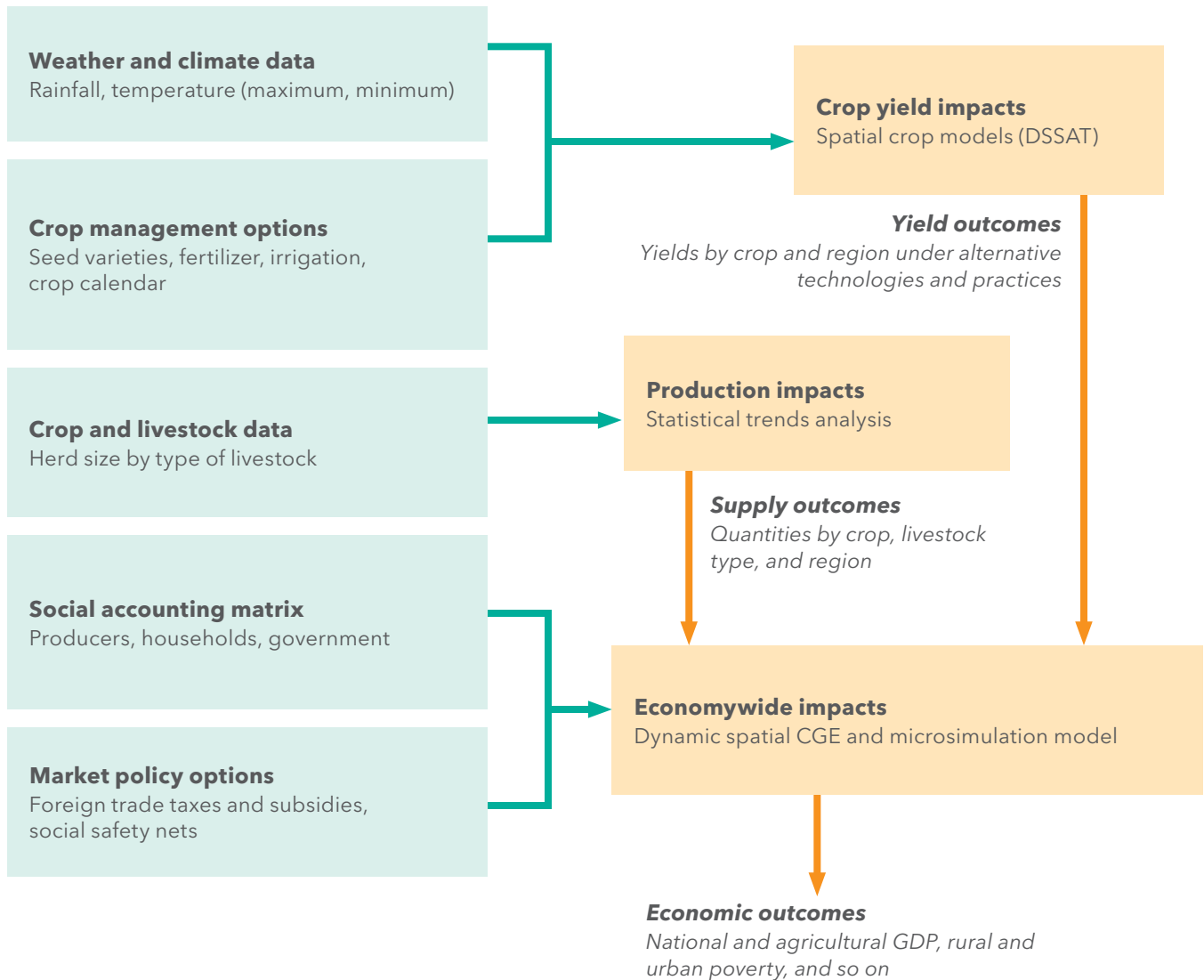
the expected impacts are robust and consistent in some regions but difficult to predict in others. This is partly due to the complexity of the El Niño phenomenon and its interaction with other modes of climate variability that influence the agroclimate in any given location, such as the Indian Ocean Dipole (IOD) and its impacts in Asia and Africa. While El Niño events are all associated with substantial warming of the central and eastern part of the tropical Pacific Ocean, which in turn affects climate extremes globally, no two El Niño events are quite the same. For example, the 2015/16 El Niño developed strength similar to the 1997/98 El Niño, but their localized climate impacts were very different (Xue and Kumar 2017). Nevertheless, some regions demonstrate a stronger link to El Niño than others. El Niño consistently brings drought and poor maize yields to South Africa, Zimbabwe, and southern Mozambique, while impacts farther north in Malawi, Zambia, and northern Mozambique are possible but less consistent. Therefore, maintaining high alerts on early warning systems is critical during El Niño events.

LATEST FORESIGHT RESEARCH

At the time of writing, all international climate science agencies – including the World Meteorological Organization (WMO), the International Research Institute for Climate and Society (IRI), and the U.S. National Oceanic and Atmospheric Administration (NOAA) – predicted a very high probability of a moderate-to-strong El Niño event in 2023/24 (WMO 2023; Johnson 2023; IRI 2023). The Agricultural Market Information System (AMIS) estimated that drier than average conditions would be likely in Central America, the Caribbean, northern South America, parts of western and northern East Africa, southern Africa, India, and northern China, while positive IOD conditions during June to October could ease the drying conditions in East Africa during the short rain season in November–December (FAO 2023).

The El Niño forecast did not warrant implementation of domestic market-protective policy measures. Even with the hypothetical worst-case scenario, where a historically strong El Niño affects maize and wheat yields in many regions simultaneously (Anderson et al. 2019, 2023), the total number of catastrophic and simultaneous breadbasket shocks globally in a given year is unlikely

FIGURE 1 Integrated analytical framework used in the foresight analysis of economywide impacts of ENSO events



Source: Koo et al. 2019.

to increase because an ENSO event increases the probability of yield shocks in some regions but decreases in others (Anderson et al. 2023). Additionally, preemptively implemented policies with uncertain forecasts can cause unintended economic impacts. For example, an integrated modeling analysis using subnational household data and crop models suggested that the Zambian government's maize export ban during the early-season drought in the 2015/16 El Niño event blocked producers' access to regional food markets, reduced income, and exacerbated rural households' poverty (Koo, Mamun, and Martin 2021).

A series of foresight analyses of economywide impacts of ENSO using an integrated analytical framework (Figure 1) identified a range of effective climate shock-mitigating interventions, including on-farm investments in technology and irrigation infrastructure, investments in roads and grain storage facilities to stabilize food markets, and social transfers to provide households with a cushion against immediate income and asset losses (Sutton et al. 2019a, 2019b, 2019c, 2019d, 2019e; Koo et al. 2019). For Ethiopia specifically, IFPRI used the Rural Investment and Policy Analysis (RIAPA) model to analyze El Niño's impacts and the country's policy responses and estimated that the

combined interventions of food import subsidies, distribution of stored grains, and cash transfers could effectively reduce El Niño's adverse impacts on the national poverty rate and the number of poor people (Koo et al. 2019).

It is worth noting that great uncertainty remains about how climate change will affect sea surface temperatures, ENSO, and teleconnections between regions. Analysis of historical ENSO events for the past 11,700 years indicates that any recorded changes in El Niño patterns are well within the range of natural variability. Similarly, climate model simulations without greenhouse gas emissions still produce large variations in ENSO due to the nature of the climate system (Di Liberto 2021).

KEY GAPS AND OPPORTUNITIES FOR FORESIGHT RESEARCH

Enhanced weather and climate forecasting skills will allow early detection and timely warning of floods and droughts. A well-maintained network of automated weather stations can improve the accuracy of El Niño impacts at the local level. Between 2000 and 2017, for example, advances in flood early-warning systems were estimated to have helped to reduce global flood-related human casualties by 45 percent and the number of people affected by floods by 24 percent (Perera et al. 2019). Conservative estimates based on a meta-analysis of global studies suggest that the benefit-cost ratio for reliable climate information services is about 10 to 1, with potential global benefits as high as US\$30 billion per year in increased agricultural productivity and US\$2 billion per year in reduced asset losses (WMO 2019). With timely and reliable early warning information, policymakers can prepare for disasters and reduce damage by declaring emergencies early and getting resources where they are likely to be needed in advance.

Recognizing both the strengths and the uncertainties in current ENSO forecasts, policymakers should closely monitor the development of El Niño impacts and be prepared to coordinate policy responses in an agile way as the situation unfolds. In the Philippines, for example, in preparation for the 2015/16 El Niño, the Roadmap to Address the Impact of El Niño (RAIN) initiative was

launched as a pan-government strategic action plan. The RAIN initiative enabled multiple government agencies to coordinate and respond to the challenges associated with climate variability on food security, energy security, health, and safety. In 2016, the government of the Philippines found that RAIN was successful in mitigating the impact of El Niño, particularly in ensuring sufficiency in supply of food and keeping food prices stable, but that coordination with local government units should be strengthened to ensure that the distribution of food and other resources is timely (Philippines, NEDA 2016).

It is essential for governments, particularly in drought- and flood-prone regions, to proactively implement a range of risk-mitigating measures as the probability of future El Niño events increases. Promoting climate-resilient agrifood systems, strengthening climate forecast and early warning capacities, and implementing agile risk management policies are critical to mitigating the adverse effects of climate variability. By fostering collaboration among various institutions and actors, policymakers can plan to develop “no-regret” interventions – including climate information services, climate-smart agriculture practices, access to finance, and social safety nets – and implement country-specific comprehensive strategies that safeguard communities from the likely impacts of El Niño. Recognizing the inherent uncertainties in ENSO forecasts, governments should closely monitor the development of El Niño impacts and be prepared to adapt their policies and response mechanisms as the situation evolves. Investing in these anticipatory policies and emergency responses will not only help minimize the economic damage and welfare losses during El Niño events but also contribute to building more climate-resilient agrifood systems in the long run.

POSTSCRIPT

As a result of the strong El Niño event that did indeed develop, southern Africa experienced a record-breaking drought in January and February 2024 that caused widespread crop failures, including reductions in maize production exceeding 50 percent in Zimbabwe, 30 percent in Zambia and Malawi, and 10 percent in South Africa (FEWS NET 2024).

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Related chapters on the future of food system drivers and impacts, regional and national perspectives, food commodities, and foresight tools are available in our [Table of Contents](#).

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