



The European Commission's Knowledge Centre for Global Food and Nutrition Security



Weather and climate extremes impact on food security

Headlines

- Weather and climate extremes such as droughts, storms, floods and heat waves are among the key drivers of food insecurity and malnutrition worldwide and have contributed to the recent rise in global hunger.
- Their frequency and severity is generally expected to further increase with climate change.
- All dimensions of food security can be negatively impacted by weather and climate extremes which often lead to livelihoods erosion for the poorest and in particular in countries with high dependence on agriculture.
- Reducing risks due to weather and climate extremes on food security is one of the major challenges of the 21st century and requires inter-sectoral approaches and action, international collaboration and increased levels of policy coherence and synergy.

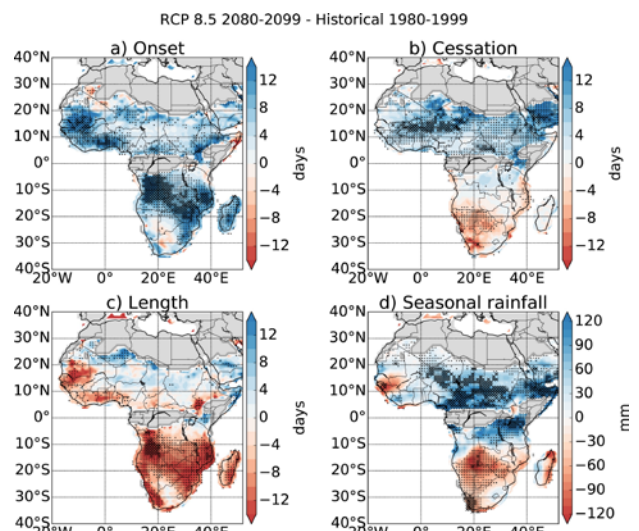
Climate change and extremes

In its Summary Report for Policy Makers on *Climate Change and Land*, the Intergovernmental Panel on Climate Change (IPCC) concluded in 2019 that "Climate change has already affected food security due to warming, changing precipitation patterns, and greater frequency of some extreme events" [1]. Climate change is already hampering crop production across different agro-climatic zones of the world. Changes in the precipitation regime, increasing temperatures and extremes have been projected for the coming decades all around the world [2] [3] [4]. In Africa for example, significant negative impacts on crop growth season timing and length have been estimated [5] (Figure 1). Future climate projections show that

on average, temperatures on the continent will increase by 3-4 °C by the end of the 21st century (as compared to the end of the 20th century), and that it will potentially be the most negatively impacted by climate change [6] [7].

Recent climate model outputs also show that the frequency of both high intensity rainfall events and of dry spells is expected to increase markedly across different climatic zones of the African continent [3] [4]. With the uncertainty still inherent to climate change predictions it remains difficult to attribute single extreme weather events to climate change. However, while the frequency of such events is increasing, exposure to multiple types of events progressively becomes more challenging (eg. droughts followed by floods) [8].

Figure 1 Median change in (a) onset, (b) cessation, (c) season length, and (d) wet season rainfall in 29 CMIP5 simulations from 1980-99 (historical simulation) to 2080-99 (RCP8.5 scenario). Blue colors indicate the onset/cessation getting later while red colors indicate onset/cessation getting earlier [5].



In most African countries, precipitations will be concentrated in a shorter period

Why focus on the impact of weather and climate extremes on food security?

Extreme weather and climate events are among the leading causes of global hunger and malnutrition. This effect is particularly evident in low and middle income countries, where the economy is often highly dependent on agriculture [8]. Also, according to the Global Network against food crises, weather extremes are one of the main factors leading to food crises, together with conflict and socio-economic aspects. Countries facing the double impact of both conflict and climate shocks in 2017 have suffered significant increases in the severity of acute food insecurity [9]. Climate-related disasters are progressively dominating disaster risk to a point that they account for 80 % of all major internationally reported disasters. Floods, droughts and tropical storms alone affect food production more than any other factor [10].

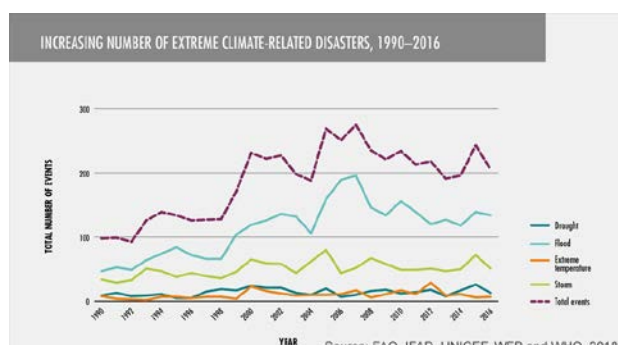


Figure 2 depicts the increasing number of extreme climate-related disasters in the time period 1990 – 2016 for low and middle-income countries, as reported in the State of Food Security and Nutrition of the World 2018 [8] and based upon the Emergency Events Database (EM-DAT) of the Centre for Research on the Epidemiology of Disasters [11].

Climate extremes have an impact on all four dimensions of food security, namely on food availability, food accessibility, food utilisation and food stability.

Impact of Weather Extremes and Climate Change on Food Availability

Food availability is defined as the availability of sufficient quantities of food having an adequate quality supplied via domestic production or import. The foremost impact of extreme weather on food availability is due to crop failure and reductions in crop yield. For instance, in Sub-Saharan Africa, food availability has been reported as being affected by change in precipitation amount and variability patterns, increase in temperature, sea water level rises and increase in atmospheric CO₂ concentrations [12] [13]. In semi-arid climate regions it is not unusual to have 80% or more of the interannual crop production variability explained by climate [8]. Weather extremes may not always affect aggregate national food production but can significantly affect subnational areas with devastating impacts on the food security and nutrition of their populations [14]. This is particularly the case of areas dominated by small scale farmers and pastoralists, whose livelihoods largely depend on their own crop and livestock production. Food availability is also impacted by the availability of water which in turn is extremely responsive to climate change [15].

Fisheries are expected to be significantly affected by climate change, as a result of changes in abiotic (sea temperature, oxygen levels, salinity and acidity) and biotic conditions

(primary production, and food webs) of the sea affecting aquatic species in terms of their distributional patterns, growth and size, catch potential, etc. (Barange et al., 2018) [16].

Several global and regional quantitative studies project that fisheries productivity will increase in high latitudes and decrease in mid- and low latitudes (Porter et al., 2014), primarily due to species shift. This has important implications for developing countries, which are generally located in the tropics [16].

Inland fisheries and aquaculture may face higher mortality due to heat waves, water scarcity and competition for water. Impacts of extreme events are increasing, with more risks of damage or loss of infrastructure and housing. Sea level rise might lead to the relocation of communities [17].

Impact of Weather Extremes and Climate Change on Food Accessibility

Food access is ensured when individuals, communities and countries are able to obtain food in appropriate quantity and quality. Food price spikes and volatility, often combined with losses of agricultural income, follow weather extremes, reducing food access and negatively affecting the quantity, quality and dietary diversity of food consumed [18]. Where weather extremes damage occurs with an increased frequency, it can also lead to long term negative effects on food access including increased poverty, negative coping strategies and erosion of livelihoods. Additionally, weather extremes can directly impact physical access to food by the disruption of food supply to markets and access to markets by people due to dysfunctional or blocked transport routes and physical wellbeing issues due to the climate extremes themselves [19].

Impact of Weather Extremes and Climate Change on Food Utilisation

Food utilisation refers to the capacity to consume and benefit from food. It depends on what manner food is exploited, and whether a balanced and nutritious diet can be maintained. Food utilisation is affected by climate change and extremes if the micronutrient and nutritional content of the crops is altered, or possibly if other crops of a different nutritional value are substituted due to negative climate effects. Also, coping strategies used to face climate shock impacts may lead to a reduction of the quantity, diversity and quality of the food consumed. Studies have shown for example, that the nutritional status of children is especially vulnerable to climate related disasters both in the aftermath of the event and in the long run [20] [21].

Also, food safety issues are involved via the supply chain [19]. Food safety is commonly decreased by climate change and extremes owing to higher rates of microbial growth at increased temperatures [8][13].

Impact of Weather Extremes and Climate Change on Food Stability

The stability of food security is impacted in the short and medium term by the potential strong fluctuations of food supply, access and utilisation induced by extreme climate events. In the longer run, climate change, through pressure on agriculture, ecosystems, water and soil, possible environmental

degradation and decrease in productivity, is threatening the resilience of food systems and livelihoods [13] [19]. In agriculture-dependent communities in low income contexts, droughts have been found to increase the likelihood of violence and prolonged conflict at the local level, which can eventually pose a threat to societal stability and peace [8].

The importance of increasing climate resilience

Determining and implementing measures to reduce risk and impact of increased climate variability and extreme weather events implies major challenges for policy development and implementation [8] [13]. Scaled up actions across sectors are needed to strengthen the resilience of livelihoods and food systems to climate variability and extremes. Those actions include integrated disaster risk reduction and management as well as climate change adaptation policies and programmes. Implementation of climate resilience policies and programmes means strengthening and adopting tools and interventions including: risk monitoring and early warning systems, emergency preparedness and response, vulnerability reduction measures among others. Efforts in the agricultural sector to adapt to and mitigate climate change are crucial. Examples are agroecological practices and climate-smart agricultural practices, which can increase resilience to climate change and contribute to mitigation efforts [22].

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