CASE STUDY 8

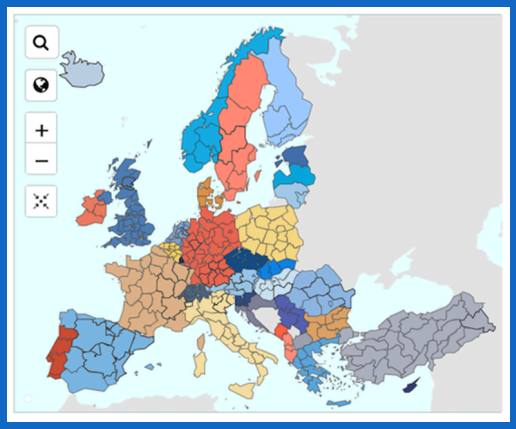
Spillover effects

CrossEU

Europe

Context

Climate change poses a growing threat to the resilience, productivity, and stability of agricultural systems. Rising temperatures and intensified heat stress reduce crop yields and labour capacity, particularly in outdoor, manual-intensive settings, leading to declines in agricultural output and broader economic performance. These impacts are unevenly distributed, with vulnerable regions facing disproportionate shocks. In the EU27 and UK, where agriculture and trade are deeply integrated, localised climate-induced disruptions can cascade through supply chains, shifting production patterns, and deepening market volatility. This assessment considers both regional disparities within Europe and climate-induced shocks in key trading partners, recognising the interconnected nature of global markets. These cascading effects present systemic risks to food security, trade stability, and socio-economic welfare, highlighting the need for coordinated, cross-border strategies that address both domestic vulnerabilities and external dependencies.



Source: Eurostat website

NUTS2 regions across Europe

Climate Change Hotspots (CCH)

EU27 and the UK

Regions across the EU27 and the UK, particularly in southern and eastern Europe, are projected to experience reductions in crop yields and labour productivity due to rising temperatures and heat stress. These regions are characterised by high climate exposure and vulnerability, with systemic risks to local economies and food systems.

Major Trade Partners

Major agricultural exporters such as India, Other Developing Asia, and Sub-Saharan Africa are identified as high-risk zones, with substantial yield losses across all major crop types. These regions face declining output, competitiveness and export capacity, with serious implications for global food prices and stability of international supply chains.

High-Latitude Producers

Northern regions including Canada, the Former Soviet Union, and parts of Western Europe and the UK are projected to benefit from moderate warming, leading to improved yields, increased agricultural output, and stronger trade positioning. These regions may experience enhanced comparative advantage in global food markets, potentially reshaping international agricultural dynamics.

Objectives

This study aims to assess the economy-wide implications of climate change impacts on global agriculture, with a focus on the EU27 and UK and their trade interdependencies. Specifically, it:

- Quantifies the effects of rising temperatures on crop yields and agricultural labour productivity across regions, using region-specific damage functions and climate change scenarios.
- Evaluates how these biophysical shocks propagate through regional and global markets via production and trade linkages, affecting output, prices, consumption, and welfare.
- Identifies subnational regions within the EU27 and UK that are most vulnerable to climate change, based on their exposure to localised warming, trade disruptions, and critical supply chain dependencies.
- Explores shifts in comparative advantage and competitiveness in agricultural production under alternative climate scenarios, highlighting winners and losers across the global food system.
- Supports policy design by generating spatially explicit indicators of economic risk and resilience, enabling targeted adaptation strategies and investment planning.

Methods

This case study employs the UCL Environmental Global Applied General Equilibrium (ENGAGE) model, which is a multi-region, multi-sector Computable General Equilibrium (CGE) model developed to assess the economy-wide impacts of climate-induced shocks to agriculture. Climate-driven agricultural yields are taken from the GAEZ v5 dataset, which incorporates the most recent climate data and modelling techniques. Changes in labour productivity due to climate impacts are derived from region-specific damage functions, parameterised by projected temperature increases under SSP2-4.5 and SSP5-8.5 scenarios.
The analysis focuses on the EU27 and UK at the subnational NUTS2 level, enabling a spatially detailed assessment of climate-induced shocks on five main crop categories . Model outputs include changes in production, consumption, trade flows, price indices, regional GDP, and household welfare, among others. This comprehensive approach supports the identification of economically vulnerable regions and highlights shifts in comparative advantage under alternative climate scenarios.

Funded by the European Union