Met Office

UK National Climate Crop Modelling Capability (UKNCCC)

Climate Modelling and Datasets

Advanced Earth-system simulations and climate projections, alongside scenario datasets

Call to action:

Advance UK capability in Climate Monitoring and Datasets by integrating high-resolution observational data streams with predictive crop models. Prioritize automation of data and visualization tools to enable real-time monitoring of food security indicators under climate stress scenarios.

Why we need climate modelling and datasets in UKNCCC:

- They provide climate models are essential for anticipating future risks and opportunities in UK agriculture
- They provide the evidence base for long-term food security planning and resilience building
- They provide smart investment: Platforms like OurSmartFarm were developed to harness this potential and support data-driven farm management
- UKNCCC aims to harmonise outputs across modelling groups to reduce uncertainty and improve comparability.

Benefits:

Enables scenario-based planning for crop adaptation	Facilitates participation in international modelling efforts (e.g. The Agricultural Model intercomparison - AgMIP and Improvement Project, The Inter-Sectoral Impact Model Intercomparison Project - ISI-MIP)	Supports policy development through robust projections

Alignment with policy:

- This capability supports the UK Government's adaptation priorities outlined in the 2025 response to the Climate Change Committee, including Farming 2050 and Defra's food strategy. Our modelling provides evidence on future climate impacts for agriculture and land use, enabling informed decisions on resilience and adaptation planning and supporting the UK Climate Change Risk Assessment (CCRA) and UK Food Security Report
- Outputs from UKNCCC modelling can inform Environmental Land Management schemes and the Farming Innovation Programme by identifying projected risks to crop yields and soil health

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Priority Actions and Recommendations for UKNCCC:

- Incorporate future Coupled Model Intercomparison Project (CMIP7) and Coordinated Downscaling Experiment - European Domain (EuroCORDEX) projections as they become available
- Ensuring that crop models can take account of the latest high resolution climate data for the UK in a consistent, comparable manner
- Enhance model intercomparison and validation frameworks

What are climate modelling and datasets?:

Weather and Climate Prediction Capabilities (Met Office)

This capability includes the use of climate models to simulate future climate scenarios and assess impacts on agriculture. Key datasets and tools:

- **UK Climate Projections (UKCP18):** Probabilistic, regional, local projections at 2,12,25,60km
- **Global models:** CMIP6 (60km -250km)
- **Regional models:** Coordinated Regional Climate Downscaling Experiment (CORDEX) - Better incorporates small scale factors, such as local topography, leading to improved projections (0.44°, 0.22° or 0.11° resolution)
- **IPCC WGI Interactive atlas:** Regional information

The Met Office provides cutting-edge weather and climate capabilities, including:

- Seasonal-to-decadal prediction systems, integrated with crop-climate models which could provide early warning systems and support climate-resilient crop breeding and selection
- High-resolution climate projections at both local and global scales, and at shorter timescales (7-day).
- Large ensemble techniques use to get better at understanding risks of extreme events and their impacts on agriculture and food security on climate timescales

These capabilities underpin scenario analysis and risk assessment for UK and European food systems, supporting both near-term tactical decisions and long-term strategic planning.

Earth System models and Land use change:

- Hadley Centre Global Environment Model version 3 (HadGEM3) included in CMIP6
- **Earth System models and Land use change:** (ESMValTool) for model evaluation (Global) - Very powerful tool for the evaluation and analysis of Earth System Models (ESMs)

The UKNCCC leverages earth system models that incorporate simplified representations of agriculture and land use change, including carbon, water, and energy fluxes, such as JULES - Joint UK Land Environment Simulator. These models are developed and maintained by the Met Office (MO), enabling integrated assessments of how agricultural practices and land use transitions affect and are affected by climate dynamics.

Seasonal to Decadal Prediction: (Predictability and Impacts)

Already in operation – UK monthly and seasonal outlooks and global seasonal and decadal forecasts

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Current research:

- Sub-seasonal flood risk forecasts in collaboration with the Flood Forecasting Centre (FFC) and UK Centre for Ecology & Hydrology (UKCEH)
- Seasonal predictability of temperature extremes

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