



Background

Agriculture and the whole food system is vulnerable to climate change but there are both risks and opportunities. Cutting-edge science and thought leadership in building climate-resilient food systems can support the goal of Net Zero. Research is already having on-the-ground impacts on decision making, providing vital information for policymakers. To secure global food supply for the future, consideration needs to be given from farm to fork, across all space and timescales and from field to globe, hours to decades ahead, taking into account perspectives from the global north and global south.

As we approached COP27, the Met Office hosted a webinar to consider the impacts of climate change on the resilience of the food system and how this is factored into decision making. We were joined by speakers from the University of the West of England, Defra and the Food and Agriculture Organization (FAO).

Key webinar talking points

Climate change



 Met Office

“Extreme weather events in the future could have impacts right throughout the food chain, not just on production but all the way from farm to fork, through processing and packaging, transporting, storing food, selling it, eating it and nutrition, and through to disposal and re-use.”

Dr Pete Falloon
Met Office

Climate change is increasingly recognised as the major threat for humanity, and extreme weather events, many of which can be attributed to a changing climate, are already decimating crop yields. The latest UK Climate Projections (UKCP18) indicate that we can expect warmer, wetter winters and hotter, drier summers, accompanied by an increase in the frequency and intensity of extreme events such as heatwaves, heavy rainfall and droughts. We also need to be mindful, however, of the natural variability of the

UK climate. Climate change is likely to exacerbate disruptive climate events such as droughts, storms, pests and diseases. There's also an increased risk of disruptions across multiple production areas, leading to a high risk of cascading effects and unpredictable and complicated outcomes.

The Climate Change Committee has identified extreme weather events as one of the biggest future risk shocks to the UK food system. Rainfall and evaporation data already shows an increase in the severity of

droughts, indicating a strong increase in summer droughts over wheat growing areas - wheat being the most important crop in the UK.

Extreme weather events in the future could have impacts right throughout the food chain, not just on production but all the way from farm to fork through processing and packaging, transporting, storing food, selling it, eating it and nutrition, through to disposal and re-use. Extreme events have the potential to cause flooding which disrupts transport and causes issues with access to land. Storm surges can also disrupt the ability of ports to operate and affect our ability to import food.



Risks and opportunities

The risks and opportunities of climate change to the UK agri-food system are broad, from changing soil moisture patterns, and impacts on the productivity of crops and livestock systems, to sea level rise and its impact on saltwater intrusion and inundation of agricultural land, the changing ability of plant pests and pathogens and non-native species to proliferate, and opportunities for growing different plant species and different crops and doing things in different ways. As the climate changes, this will also affect the relative advantage of growing or producing different foodstuffs at home or overseas, providing different opportunities for imports or exports.

There are opportunities right across time and space scales, such as using short-term weather information to support tactical decisions in production systems and agriculture, and in the long-term thinking about risk assessments for where we might see synchronised major breadbasket failures across the world.

Adaptation

We need to think in terms of both near-term variability and longer-term patterns when making adaptation decisions. The UK imports around half the food that we consume, in particular fruit and vegetables, and most of these come from just five areas of the world which are already prone to drought risk. We therefore also need to think about how the changing climate around the world and in key producing regions that supply our food will be impacted by a changing climate.

We also need to consider breeding resilient crops, which are more heat resilient and able to cope with rainfall extreme. Genetic improvement networks on some key crops in the UK are seeking to identify genetic traits to improve productivity, sustainability, resilience and nutritional quality. They also consider longer-term issues around resource efficiency and sustainability, aiming to complement and augment commercial breeding programmes.

Weather and climate information can also be used to support other aspects of the food chain, such as bio-logistics, transport and stock planning.

Net zero

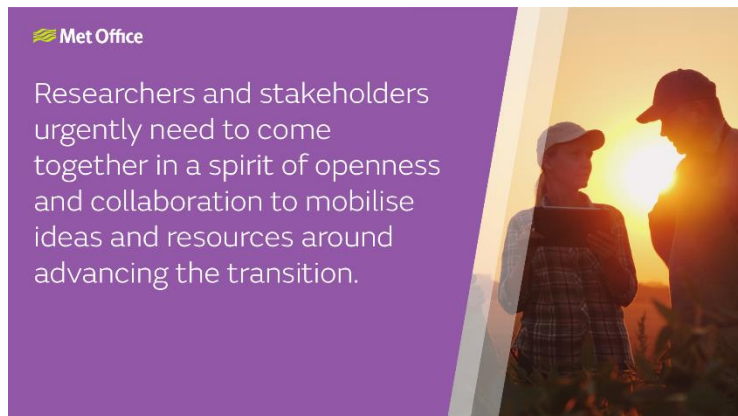
Agri-food and rural land sectors are in urgent need of a clear plan for emissions reductions with the food system responsible for almost a quarter of UK greenhouse gas emissions. Agriculture systems play a unique and significant role in the global climate change process, contributing about a third of the global emission totals.

There are many ways in which agri-food in the UK can contribute to net zero by 2050 that go beyond low-carbon farming practises or energy crops. There are many options involving forestry, but also dietary change and reducing food waste. There also needs to be a systems approach and multi-functional uses of land, for example for quite significant areas of agricultural land to be released and used for storing carbon. Building up soil carbon in organic matter is a good climate mitigation and net zero contributor, and higher organic matter in soils also stores more water which could be helpful in drought conditions and in terms of flood mitigation.

A systems approach needs to be taken which thinks about adaptation and mitigation actions together and how they interact. We also need to consider the trade-offs and consequences of taking those actions, as well as make sure there is effective dialogue and discussion with the wider industry and that solutions are co-designed.

Final summary

We need to take action to secure healthy and sustainably produced food for all in order to achieve net zero emission targets. It is vital that researchers and stakeholders come together in a spirit of openness and collaboration and with real urgency to mobilise ideas and resources around advancing the transition.



UK policymakers are working towards risk pathways to try and reduce our exposure to risks. There is a desire to encourage the uptake of best practise in farming, which will support both reduction of emissions as well as climate resilience in terms of more resilient crops. Precision breeding technologies also have longer-term potential to support food security and help the UK meet Government goals around adapting to climate change and enhancing sustainability.

Every mitigation and adaptation decision has to be context specific because of the significant impact on vulnerable populations and ecosystems. Countries need to think about no-regrets scenarios, including different criteria and elements in the decision-making process. Numerous policy and technology-based options have been already tested and, in many cases, have been proven to be economically viable and commercially possible. However, there is still an implementation gap in the sector. The Intergovernmental Panel on Climate Change (IPCC) has suggested many innovative solutions that would contribute to the transformation from the business as usual to more sustainable agri-food systems.

