Food System Strategic Assessment: Trends and issues impacted by climate change/environmental factors

Figure 11: Issues and trends impacted by climate change/environmental factors and estimated timeline to impact as highlighted by experts consulted for this study. Most relevant issues and trends with regard to the FSA remit are discussed in this section.

Much of the scientific evidence and reporting concurs that climate change will be the biggest factor impacting the global food system from the present into the long-term future. However, besides the scientific complexity of issues involved, it is the task of aligning a plethora of political, social and economic factors that makes effective policy design to mitigate climate change very difficult. Given the long time horizon and often indirect impacts of climate change on the FSA remit, only a very limited view of climate change impacts on the food system can be presented in this section.

6.1 Driver: climate change, status March 2023

Climate change: climate change impacts will steadily increase over at least the next ten years.

Climate change due to global warming is seen across the world as the main cause for altered weather patterns leading to less predictable harvests and longer-term change of land use and agricultural practices. Climate change is accepted by most governments worldwide as needing to be dealt with in the short- medium- and long-term future and substantial international efforts by the United Nation’s Intergovernmental Panel on Climate Change (IPCC) have been underway since 1988 to globally coordinate on its scientific understanding and mitigation measures (IPCC, 2023).

Awareness of the impact of climate change on the food system, and its own impact on climate change has substantially increased and globally governments are attempting to achieve net-zero carbon and GHG emission goals over the coming decades and support more sustainable food production/farming practices as well as general mitigation measures with regards to energy use and process efficiencies across industries.

Climate change impacts the food system at two levels. First, through the direct consequences of currently occurring changes of weather events (e.g. more extremes, greater variability) and longer-term, large geographical shifts in weather patterns to which humans have to respond, and second, through the necessary demands on human behaviour, actions and practices to mitigate or prevent anticipated further climate change (propagated by regulation nationally and internationally). As recent evidence has shown, and most experts consulted for this study agreed, it is almost certain that climate change will remain a major driver of change in the UK and global food systems for the foreseeable future (IPCC, 2023).

6.2 Trends and issues impacted by climate change

While most experts consulted for this study agreed that climate change will remain a major driver of change in the food system for the foreseeable future, it was also acknowledged that its impact with regards to the FSA remit may not pose substantially novel threats over the next decade and may be often indirect (for example, the FSA supporting general sustainability goals by working on assessment frameworks for sustainability labelling of foods). Hence only a small selection of issues is presented in this section.

Key insights

A recent assessment of climate change risks and opportunities published by Defra in January 2022 highlights risks, such as loss of diversity and viability of terrestrial and aquatic habitats, loss of biodiversity, soil health, risks to food and feed crops, supply chain disruption, risks to essential infrastructure, and human health among others (HM Government, 2022b). However, it is expected that many more risk factors will emerge, as the scientific understanding of causative mechanisms for climate change evolves and priorities will shift accordingly over time to mitigate the better understood contributing risk factors.

For example, surface Ozone (O3) poses significant threats to crops. Current losses are estimated to be around 3.6% for maize, 2.6% for rice, 6.7% for soybean, and 7.2% for wheat. It is predicted that this is likely to increase further in the future due to global warming and more anthropogenic emissions of O3 precursors including nitrogen oxides (NOx), methane (CH4) and carbon monoxide (CO) (Tai et al., 2021). Ozone also affects other plants, reducing flower numbers in perennial grassland by 10%, annual total biomass increment in perennial grassland in the UK by 2.7%, and annual biomass increment in managed broadleaf woodland by 7.3%. While increasing ozone levels are just one of many consequences of GHG emissions it is clear that it is the combination of factors that will reduce the overall biodiversity, and livestock and biomass yields, with ultimate consequences for land use (Defra, 2021f).

Other issues of immediate importance for the food system impacted by climate change, highlighted by experts consulted for this study, are soil health and lack of appropriate water management, which are currently paid much less attention in the UK than other issues (for example, GHG emissions). Long-term planning for adapting to climate change often requires long-term infrastructure planning as for example in the case of much needed improvements of water management infrastructure in the UK in light of more frequent droughts and flooding (Harvey, 2023). While some of the complexities of the causes of climate change are understood to some degree, current strategies to moderate and mitigate the effects of climate change are focusing on a very limited number of parameters via relatively broad regulatory measures. This is

also the case for climate change mitigation measures aimed specifically at the food system.

As agricultural food production has globally a large negative impact on climate change the UK has introduced several measures to support change in agricultural practices, such as the Environmental Land Management Scheme (ELMS), or the Sustainable Farming Initiative (SFI) with the aim to contribute to a reduction of man-made climate change drivers. Some experts consulted for this study perceived a lack of attention being paid to the “missing middle” of the food supply chain including processors, distributors, and wholesalers (among others) with regards to a lack of regulatory measures demanding more sustainable practices, energy use, and implementation of new technologies supporting sustainability.

As climate change affects all parts of global food supply chains it is anticipated that already emerging trends regarding increasing pest burden in animals and crops, such as fungal contamination, will continue to increase in the short- to mid-term future. Animal pests such as ticks or liver fluke are already reported to be increasing in the UK and continental Europe, with many species of insects native to southern parts of Europe now being detected due to warmer winters in northern parts of the continent.

More persistent and frequent livestock infestations not only put pressure on farmers to use veterinary services and treatments more frequently, adding costs to production, but more frequent use of antibiotics and other medication will increase the emergence of treatment resistant forms of pests, as is already the case for many crop pests (Schneider et al., 2022). Moreover, the connection between increasing Anti-Microbial Resistance (AMR) in livestock and climate change is well established and the increase of multi- and pan-resistant forms of bacteria and microorganisms due to antibiotics overuse for many decades on a global scale affecting human and animal health is well documented (Magnano San Lio et al., 2023). This requires heightened alertness and international efforts to monitor and respond to outbreaks globally.

Experts consulted for this study also anticipated that foodborne and zoonotic diseases will increase in the UK over the next decade. It is therefore anticipated that more comprehensive and regular global monitoring and data sharing will be required to detect emerging pest incidence and other biogenic food safety issues early. In addition, longer term developments, such as a documented increase in aflatoxins and other mycotoxin contamination (due to fungal contamination of crops) will become more frequent in Europe, needing to be mitigated by food safety enforcement further along supply chains, as incidents may first arise outside of the UK (Leggieri et al., 2021). This would also be the case for aquaculture and certain seafood products due to the occurrence of natural toxins from harmful algal blooms, which are likely to increase due to changing climate conditions.