Impacts, trade-offs and co-benefits of mitigation

Why this is important: Climate change is anticipated to have a negative impact on food security, particularly in the least developed countries, where meeting food needs is already a challenge. At the UNFCC climate change negotiations in Paris in 2015 (known as COP21) an agreement was reached to set a goal of limiting the rise in global temperature to 2°C, pursuing efforts to limit the increase to 1.5°C. Without concerted and sustained international efforts to tackle the causes of climate change, much higher levels of global average temperature rise, including rises up to 4°C, could occur. It is vital to understand the trade-offs and co-benefits as society moves from a pathway that could lead to more than 3°C of warming to lower levels.

What the UKCR programme is doing: The Hunger and Climate Vulnerability Index (HCVI) has previously been developed by the World Food Programme and the Met Office as a measure of how climate Exposure, Sensitivity and Adaptive Capacity combine in a country's vulnerability to food insecurity as a result of climate factors. The 'High-End cLimate Impacts and eXtremes' (HELIX) project has applied the HCVI to climate change under three scenarios of global average temperature rise (referred to here as Global Warming Levels (GWLs)) of 1.5°C, 2°C and 4°C, to provide indications of vulnerability to food insecurity in developing countries. Continued research under the UKCR programme has now focussed on how the individual flood and drought metrics that comprise the HCVI influence one of the three components of the HCVI impacted by climate – exposure - across the different model simulations from the HELIX project at the different GWLs.

Results so far: Findings are consistent with previous studies, indicating that climate change will increase vulnerability to food insecurity in developing countries, with the vulnerability increase being much smaller at GWLs of 1.5°C or 2°C than for 4°C. However, there is little to distinguish the food security outcomes between 1.5°C and 2°C. Limiting climate change to no more than 2°C will mean that although meeting food security needs in the future will be more challenging than today, it will be much more achievable than at higher levels of climate change. Additional efforts to reduce warming to 1.5°C may have benefits for a range of impacts, but for food security the difference in outcomes is not substantial. However, it should be noted that overall higher levels of warming result in greater vulnerability to food insecurity, and it might therefore be concluded that the lower the temperature rise the better for food security, however small the differences may be.

What is next? A key recommendation from this work is that further development of climate indices most appropriate for food security impacts is undertaken, and that building on the success of the HCVI, a more sophisticated methodology for translating climate change into food security outcomes is developed. Continued research will aim to achieve these recommendations.

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Reference: Betts, R. A., Alfieri, L., Bradshaw, C., Caesar, J., Feyen, L., Friedlingstein, P., Gohar, L., Koutroulis, A., Lewis, K., Morfopoulos, C., Papadimitriou, L., Richardson, K. J., Tsanis, I., Wyser, K., (2018), Changes in climate extremes, fresh water availability and vulnerability to food insecurity projected at 1.5°C and 2°C global warming with a higher-resolution global climate model, *Philosophical Transactions of the Royal Society A – Mathematical, Physical and Engineering Sciences*, Vol. 36, Issue 2119. https://royalsocietypublishing.org/doi/10.1098/rsta.2016.0452