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Future climate risk to UK agriculture from heat and humidity changes

Freya Garry, Dan Bernie, Jemma Davie, and Edward Pope

Met Office, Science, United Kingdom of Great Britain – England, Scotland, Wales (freya.garry@metoffice.gov.uk)

Assessments of current and future climate risk are required for adaptation planning to increase resilience and enable society to cope with future climate hazards. Here we identify case studies of compound hazard (involving heat and humidity) events of interest to the UK agricultural sector and present a framework for comparing the frequency and duration of compound events now to those projected in 50 years' time. We use high resolution (12 km) simulations from the UK Climate Projections to explore how the frequency and duration of instances of potato blight and thermal heat stress to dairy cattle may change locally under RCP 8.5 emissions forcing. We combine hazard (temperature and humidity data) with vulnerability (specific threshold exceedance) and exposure (regional dairy cattle numbers/potato growing area) to estimate risk. Regions where most potatoes are grown, and where the potato blight risk is greatest in both the current and future climate, include the East of England, Yorkshire and the Humber and Eastern Scotland. By 2070, potato blight occurrences may increase by 70 % in East Scotland and between 20 - 30 % across the East of England, the Midlands and Yorkshire and the Humber. Assuming dairy cattle spatial distributions remain the same, the area of greatest risk now and in the future is South West England, with notable increases in risk across Northern Ireland, Wales, the Midlands, North West England and North West Scotland. Dairy cattle heat stress (using a temperature-humidity index) is projected to increase by over 1000 % in South West England, the region with the most dairy cattle. Finally, we consider projected changes to UK seasons, using 2018 as a template, where a cold spring followed by a warm/dry summer resulted in hay/silage shortages. In addition to reduced crop yields in 2018, cattle were kept inside for longer in the cold spring and in the warm/dry summer, due to heat stress and poor grass quality. UK Climate Projections indicate that the annual probability of cold spring/warm summer conditions will decrease in future, but the annual probability of longer dry/warm summers will increase. We conclude that the agricultural sector should consider suitable climate adaptation measures to minimise the risk of dairy cattle thermal heat stress, increased potato blight, and longer dry/warm summer conditions.