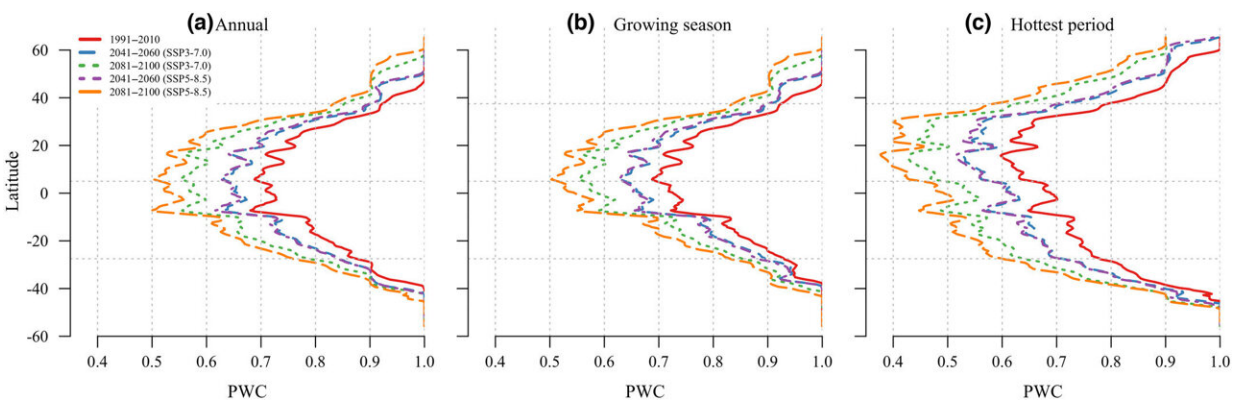


Global food production at risk as rising temperatures threaten farmers' physical ability to work, new study finds

January 19 2024, by Meg Cox



Physical work capacity (PWC) by latitude for global cropland for historical (1991–2010) and potential future thermal conditions (2041–2060 and 2081–2100 with SSP3-7.0 and SSP5-8.5). The daily PWC values were averaged temporally for (a) the entire year (annual), (b) growing season (weighted by the cropping intensity throughout the year) and (c) the hottest 90 continuous days of the year. Credit: *Global Change Biology* (2024). DOI: 10.1111/gcb.17142

The future of global food production is under threat as temperature rises will impact farmers' physical capacity to work, a new study has revealed.

The research—which brings together Loughborough University, Australian and U.S. universities—predicts that by the end of the century

labor productivity could fall as low as 40% in key food production regions like Pakistan and India.

While other important crop-growing regions in Southeast and South Asia, West and Central Africa, and northern South America are expected to see physical work capacity reduced to 70%.

"Assessments consistently conclude that [climate change](#) will reduce [crop yields](#) making [food security](#) challenges worse," says study lead Professor Gerald Nelson, of the University of Illinois.

"But it's not only crops and livestock that are affected. The [agricultural workers](#) who plant, till, and harvest much of the food we need will also suffer due to heat exposure, reducing their ability to undertake work in the field."

Published in the journal *Global Change Biology*, [the study](#), titled "Global reductions in manual agricultural work capacity due to climate change," involved using computational models to predict the physical work capacity (PWC)—defined as "an individual's work capacity relative to an environment without any [heat stress](#)"—under different predicted climate change scenarios.

The models, developed by Loughborough University, are based on data from more than 700 heat stress trials—which involved observing people working in a wide range of temperatures and humidities, and differing weather conditions, including sunshine and wind.

The maximum work capacity achievable by individuals in a cool climate was used as the benchmark for the study—representing 100% physical work capacity.

Reductions in capacity mean people are limited in what they can

physically do, even if they are motivated to work. This may translate as farmers needing extra workers to do the same job, or if these are not available, then reducing their crop sizes.

Agricultural workers are already feeling the heat, the study reveals, with half the world's cropland farmers estimated to be working below 86% capacity in "recent past" (1991–2010) climate conditions.

As a next step, the study considered potential adaptations to mitigate the [impact of climate change](#) on agricultural workers.

Switching to nighttime or shade work to reduce direct solar radiation, was shown to lead to a 5%–10% improvement in worker productivity.

A second investigated option is to increase the global use of mechanical machinery and equipment, particularly in Sub-Saharan Africa, where agricultural practices largely involve hard physical labor.

Of the importance of the study, Loughborough University's Professor George Havenith said, "This research demonstrates once again the large impact climate change will have on life in various regions around the world, and quantifies the effects on agricultural productivity.

"Understanding the full impact of climate change on worker productivity enables us to predict the economic impact of climate change and guide mitigation efforts that ensure we keep workers safe while limiting productivity losses.

"We hope the suggested adaptations can help guide investments to support agricultural workers and food security as climate change makes the outdoor working environment increasingly inhospitable."

More information: Gerald C. Nelson et al, Global reductions in

manual agricultural work capacity due to climate change, *Global Change Biology* (2024). [DOI: 10.1111/gcb.17142](https://doi.org/10.1111/gcb.17142)

Provided by Loughborough University

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