

NEWS RELEASE 6-APR-2022

An uncertain future for livestock production in the tropics

future heat stress may make cattle production unviable in large swathes of Africa

Peer-Reviewed Publication
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

Cattle, whether grazing in small herds along the roadside or lowing singly from a nearby field, are an emblematic sight for much of Africa, as characteristic of the continent as the yoked oxen of southeast Asia or the gray squirrels of American suburbs. Yet large swathes of the continent may be stripped of the creatures as early as 2045 due to climate change-induced heat stress, according to a pair of recent studies by a team of scientists led by Philip Thornton, a principal scientist at the International Livestock Research Institute (ILRI).

The two studies investigated the impact of low and high climate change scenarios on livestock worldwide. The first, published in *Global Change Biology*, investigated the number of extreme heat stress days that can be expected for cattle, sheep, goats, poultry and pigs. It found that by 2050 as many as 370 million cattle could suffer from one or more days of extreme heat, as could some six billion chickens.

Cows are especially prone to heat stress, which occurs when they take in more heat than they can easily get rid of by respiration, sweating or wind blowing on them. It can negatively affect liveweight gain, milk yield, fertility and behaviour

The second study, published in *Lancet Planetary Health*, examined the potential economic costs of heat stress in the future. It found that by the end of this century livestock farmers may face financial losses between \$15 and \$40 billion annually, with most of that loss happening in poor, tropical countries of South America, Asia and Africa.

"Economic losses will mostly occur in low- and middle-income countries," said Mario Herrero, professor in the Department of Global Development at Cornell University and a co-author of the study. "Relative to the total value of dairy and meat production, it's a significant and a higher proportion than in high-income countries."

'The bottom line is that open-air livestock production in much of the tropics (especially West Africa) is basically going to be impossible, even by mid-century, without massive adaptation', said Thornton. 'Unfortunately, these countries are resource-poor to begin with, so achieving the necessary measures will be especially challenging.'

Challenging, says Thornton, but not impossible. A number of adaptive measures can be undertaken. Cattle can be bred or cross bred for heat stress tolerance; farmers can switch from cattle to more heat-resilient species such as goats or camels; certain feed additives may help; and low-cost shading, fanning and bathing devices can be installed in some places to provide cattle with relief. But ultimately many of the animals may have to be relocated to more climatically suitable regions, a daunting prospect and one not necessarily feasible to farmers in the tropics.

Adding to these challenges is the growing population and demand for animal-source food in developing countries. In these countries, rapid urbanization, market growth, changing diets and increasing incomes are all contributing to rising demand for meat, milk and eggs.

The authors conclude: 'Our results highlight the potential magnitude and extent of the adaptation efforts that will be necessary to combat the effects of increasing heat stress on cattle production during this century if food security challenges are to be minimized.'

JOURNAL

The Lancet Planetary Health

DOI

10.1016/S2542-5196(22)00002-X [↗](#)

METHOD OF RESEARCH

Computational simulation/modeling

SUBJECT OF RESEARCH

Animals

ARTICLE TITLE

Impacts of heat stress on global cattle production during the 21st century: a modelling study

ARTICLE PUBLICATION DATE

3-Mar-2022

COI STATEMENT

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Media Contact

David Aronson
International Livestock Research Institute
d.aronson@cgiar.org

