

Air pollution caused by corn production increases mortality rate in US

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A new study establishes that environmental damage caused by corn production results in 4,300 premature deaths annually in the United States, representing a monetized cost of \$39 billion.

The paper, published in the peer-reviewed journal *Nature Sustainability*, presents how researchers have estimated for the first time the health damages caused by [corn production](#) using detailed information on pollution emissions, pollution transport by wind, and human exposure to increased air pollution levels. Corn is a key agricultural crop used for animal feed, ethanol biofuel, and human consumption.

The study also shows how the damage to [human health](#) of producing a bushel of corn differs from region to region and how, in some areas, the health damages of corn production are greater than its market price.

"The deaths caused per bushel in western corn belt states such as Minnesota, Iowa, and Nebraska tend to be lower than in eastern corn belt states such as Illinois, Indiana, and Ohio," said lead researcher Jason Hill, associate professor at the University of Minnesota College of Food, Agricultural and Natural Resource Sciences.

Researchers, including UMN professors Stephen Polasky, applied economics; Timothy Smith, bioproducts and biosystems engineering; David Tilman, College of Biological Sciences; teaching assistant professor Natalie Hunt and doctoral graduate student Sumil Thakrar, bioproducts and biosystems engineering; and scientists at other institutions, used county-level data on agricultural practices and

productivity to develop a spatially explicit life-cycle-emissions inventory for corn. The data show that reduced air quality resulting from corn production is associated with the [premature deaths](#) annually in the United States, with estimated damages in monetary terms of \$39 billion. This uses a value from the U.S. EPA of \$9 million for each death avoided.

Increased concentrations of fine particulate matter (PM_{2.5}) are driven by emissions of ammonia—a PM_{2.5} precursor—that result from nitrogen fertilizer use. Average health damages from reduced air quality are \$3.07 per bushel (56.5 lbs.) of corn, which is 62 percent of the \$4.95 per bushel average corn [market price](#) of the last decade. This paper also estimates life-cycle greenhouse gas emissions of corn production, finding total climate change damages of \$4.9 billion, or \$0.38 per bushel of corn.

"It's important for farmers to have this information so that they can implement practices that reduce the environmental impact of the crops they grow," Hill said. "Farmers can greatly improve the environmental profile of their corn by using precision agriculture tools and switching to fertilizers that have lower ammonia emissions."

In addition to changing the fertilizer type and application method, the study's results suggest potential benefits from strategic interventions in corn production, including improved nitrogen use efficiency, switching to crops requiring less fertilizer, and changing the location where corn is grown.

Aware that changes in practices can take time and planning, Hill suggests farmers could be offered incentives to switch to crops that demand less applied nitrogen while still offering market and nutritional benefits.

"Not only are ammonia emissions from fertilizer damaging to human

health, they are also a waste of money for farmers because they are not getting the benefit of the nitrogen that they're paying for," Hill said. "The number of deaths related to [corn](#) production could be reduced through these key tactics."

More information: Jason Hill et al, Air-quality-related health damages of maize, *Nature Sustainability* (2019). [DOI: 10.1038/s41893-019-0261-y](#)

Provided by University of Minnesota

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