How could global food production break down?

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Industrialized farming relies heavily on outside inputs, like synthetic

fertilizers and pesticides, machinery, seeds, and animal feed. A study published in *Nature Food* predicts how much yield would be lost from "input shocks" that disrupt these supplies.

"Very little is known about how shocks in agricultural inputs would impact crop yields and food availability on a large scale. We used machine learning and spatially gridded datasets to model, for the first time, the impacts globally in high resolution," says the study's lead author, Aino Ahvo.

Researchers at Aalto University examined the effect of different input shocks on the yield of various crops throughout the world at a resolution of ~10km. The predicted yield loss differs between regions and crops. Areas with the highest current yield would see the greatest reduction. The analysis predicts large decreases in many important agricultural regions, such as the United States, Argentina, Western Europe and Southern Africa, as well as parts of China and Thailand.

A 50% shock in all inputs would reduce global maize production by 26% and wheat production by 21%. The most disruptive individual shock would be a reduction in fertilizer supply, which would drastically reduce yield. In fact, a shock in fertilizer supply would reduce the yield of most crops about as much as a shock in all inputs.

This analysis can help us prepare not only for unexpected disruptions (eg, COVID, sanctions from the Ukraine war, or the blocking of the Suez Canal) but also for the transition to a green future, which will require reductions in inputs such as fertilizers and pesticides.

Two of the authors, Vilma Sandstrom and Mika Jalava, will be presenting their work on sustainable food solutions on December 10 at the UN Climate Change Conference in Dubai (COP28). They will discuss how food production can be sustainably scaled to meet the needs

of a growing population and what risks need to be avoided.

"Identifying high-risk areas for the greatest yield losses is crucial for global food security in these times of global turmoil. Areas facing the most risk should look for ways to reduce their dependency on imported inputs to mitigate the effects of potential trade shocks on food production. For example, they could replace synthetic fertilizers with more sustainable and local organic fertilizers," says Mika Jalava.

More information: Aino Ahvo et al, Agricultural input shocks affect crop yields more in the high-yielding areas of the world, *Nature Food* (2023). DOI: 10.1038/s43016-023-00873-z

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