

Climate change: Trade liberalization could buffer economic losses in agriculture

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Global warming could create substantial economic damage in agriculture, a new study conducted by a team of scientists of the Potsdam Institute for Climate Impact Research finds. Around the globe, climate change threatens agricultural productivity, forcing up food prices. While financial gains and losses differ between consumers and producers across the regions, bottom line is that consumers in general will likely have to pay more for the same basket of food. As the additional expenditure for consumers outweighs producers' gains, increasing net economic losses will occur in the agriculture and food sector towards the end of the century. However, economic losses could be limited to 0.3 percent of global GDP - depending on agricultural trade policies.

"Agriculture is very sensitive to [climate change](#) - even a small increase of global mean temperatures can have significant effects on regional crop yields, affecting both the profitability of agricultural production and the share of income spent on [food](#)", lead author Miodrag Stevanović says. "Our study quantifies economic impacts and analyses the role of international trade as an adaptation measure. We find that [economic losses](#) in agriculture could add up to the annual amount of roughly 0.8 percent of global GDP at the end of the century with a very restricted trade regime. As small as this percentage sounds, it actually translates to losses of 2.5 trillion US Dollars and is comparably higher for regions with limited agricultural resources with respect to growing agricultural demand, for example the Middle East, Africa and India. In contrast, further trade liberalization in agricultural commodities could reduce

financial damage globally by 65 percent, to 0.3 percent of global GDP."

Trade can balance economic impacts on agriculture due to climate change

"Both [global warming](#) and free trade favor northern regions like Europe and the US, since producers' gains increase as trade patterns shift northwards. At the same time, southern regions like Africa or India could theoretically reduce climate-change-related damages by half through more liberalized food markets," co-author Alexander Popp explains. "Irrespective of our assumptions on global trade, climate change will result in reduced crop yields in many areas. At the same time, intensifying production or expanding cultivated land into previously untouched areas may come at a risk: it could lead to additional greenhouse gas emissions through tropical deforestation or increased fertilizer use". This could then further enhance climate change pressure on agriculture.

The researchers combined 19 different climate projections with simulations of crop growth to assess [economic impacts](#) of climate change in the agricultural sector. While the magnitude of damage varies with different assumptions on crop productivity response to climate change, CO₂ plant fertilization effect or socio-economic projection, the study still highlights the important role of trade as a key measure to partly reduce [climate change impacts](#). Modelling challenges such as adverse effects of extreme weather events still remain.

Risks of food shortages also call for poverty reduction measures

If food prices increase due to climate change impacts, households will not only have to spend more on their food consumption, but could also

face risks of insufficient access to food and malnutrition. "The best way to avoid these risks is to limit climate change. However, for impacts that cannot be avoided, an open and diversified trade system can be an important adaptation option. It can account for changes in global patterns of agricultural productivity and thus allow for reducing production costs and enhancing food security," says Hermann Lotze-Campen, chair of PIK's research domain Climate Impacts and Vulnerabilities. "As climate change will have an amplifying effect on the gap between developed and developing countries, reductions in [trade](#) barriers will have to be accompanied by measures for poverty reduction and social safety nets".

More information: Stevanović, M.; Popp, A.; Lotze-Campen, H.; Dietrich, J.P.; Müller, C.; Bonsch, M.; Schmitz, C.; Bodirsky, B.; Humpenöder, F.; Weindl, I.: The impact of high-end climate change on agricultural welfare. *Science Advances*. [DOI: 10.1126/sciadv.1501452](https://doi.org/10.1126/sciadv.1501452)

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