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Resource conservation and pollution reduction in the context of global food trade and agricultural intensification

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Global food trade redistributes spatial patterns of resources use and pollution. Trade conserves resources and reduces pollution globally if exporters have higher resource use efficiencies than importers. In this study, we combine a crop model Python-based Environmental Policy Integrated Climate (PEPIC) and the Global Trade Analysis Project (GTAP) model to investigate this hypothesis for the cases of international trade in maize, rice and wheat in 2000 and an intensification scenario. This is the first study showing that global food trade not only conserves a large amount of resources, i.e. blue water use, total water use and nitrogen inputs, but also substantially reduces nitrogen losses in 2000. However, these gains come at the expense of water resources and environment in major exporting countries. Agricultural intensification, in which low-input countries increase nitrogen and irrigation inputs to a greater extent than high-input countries, results in a more level playing field and reduces trade-related resource conservation and pollution reduction. The results are of significance to inform sound policies aimed at improving overall benefits of global food trade.