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What is the State of Resilience of Today's Global Food System? Looking back to 1816

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The eruption of the Indonesian volcano Tambora in 1815, in conjunction with other circumstances, caused a severe and global climate anomaly. The year following turned out to be extremely cold and brought heavy rain to some and draught to other parts of the world. "The year without summer", as it was nicknamed in Europe and North America, saw very poor plant growth and poor harvests which, in combination with other factors, led to hardship, extreme food crisis and starvation in various regions of the world, including China, Germany, India and the US.

Undoubtedly, advances in research and development in agriculture, transportation and other fields as well as globalization have changed the global food system tremendously since then. Nevertheless, regional specialisation and reliance on global availability of food supply and trade put into question whether today's global food system would also be resilient against such climate shocks which are of global nature: How resilient is today's global food system with respect to such extreme climate events? To what extent would it be capable of compensating the widespread harvest failures? How fragile is national food security with respect to protectionist trade policy reactions?

To shed light on these questions, we combine global crop yield and computable general equilibrium (CGE) models for simulating the impact of a climate anomaly comparable to 1816. The crop yield model translates climate shock data into regional yield shocks which are fed into the CGE model. Taking international price and trade reactions comprehensively into account, this shock is evaluated with respect to its impacts on various dimensions of food security, most importantly, the supply of nutritional energy. Additional simulations consider a more protectionist global trading system as well as potential trade policy responses of national governments to the occurring food shortages, like those experienced during the 2007/08 world food price crisis, to further investigate how this affects the resilience of the global food system.

The analysis of the food security consequences for examples of individual countries will reveal whether today's global food system is well-equipped to cope with a catastrophe as happened in 1816. The results will gauge the state of resilience of today's global food system, the dependency of the resilience on trade and trade policy and point to policy recommendations.