



An integrated assessment of future food demand, supply, and international trade in a changing climate

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Increasing population and changing diets will pose increasing pressure on the Earth's planetary boundaries, with important challenges to preserve the natural ecosystems while producing more food. In this context, the international trade will play an essential role in overcoming the local limits to fill the domestic demand. In this study, we forecast the future trade network of 34 plant-based and 3 animal-based products, under four assorted scenarios, which explore a lowly-to-highly globalized market. Trade projections are coupled with demand and supply projections that we compiled at the country scale. Supply is projected as a function of yield variations, agricultural investments, and climate change. Demand is forecast under different scenarios pertaining population trends and diet choices.

Results show crucial changes in the next future. The demand of agricultural goods and the correspondent trade flow will increase by 10-50% and 20-90%, respectively, with respect to the current levels. The largest increase in the amount of traded goods is expected under the economic optimism scenarios that will see an average flow of 2830 kcal/cap/day (i.e. nearly the double of the current per capita flow). The trade networks architecture in 2050 and 2080 will be very different from the one we actually know, with a clear shift of the trade pole from the Western toward the Eastern economies. The Eastern Europe and Central Asian countries together with the Eastern Asian countries and Pacific Islands will lead the export flows of the future trade network thanks to the large production potentials achievable through yield boosting. The dramatic changes of global food-sources and trade patterns will hamper the natural capital and the ecosystem services of new regions while exacerbating the pressure in those areas that will continue serving food also in the future.

The overall study provides an integrated database of future demand, supply, and international trade, which can be used to prioritize the actions appointed in the SDGs agenda pertaining food security and environmental sustainability.