

Past and present biophysical redundancy of countries as a buffer to changes in food supply

May 17, 2016

Author:

Marianela Fader, Maria Cristina Rulli, Jampel Dell'Angelo, Paolo D'Odorico, Jessica A. Gephart, Matti Kummu, Nicholas Magliocca, Miina Porkka, Christina Prell, Michael J. Puma, Zak Ratajczak, David A. Seekell, Samir Suweis, and Alessandro Tavoni

Abstract

Spatially diverse trends in population growth, climate change, industrialization, urbanization and economic development are expected to change future food supply and demand. These changes may affect the suitability of land for food production, implying elevated risks especially for resource-constrained, food-importing countries. We present the evolution of biophysical redundancy for agricultural production at country level, from 1992 to 2012. Biophysical redundancy, defined as unused biotic and abiotic environmental resources, is represented by the potential food production of 'spare land', available water resources (i.e., not already used for human activities), as well as production increases through yield gap closure on cultivated areas and potential agricultural areas. In 2012, the biophysical redundancy of 75 (48) countries, mainly in North Africa, Western Europe, the Middle East and Asia, was insufficient to produce the caloric nutritional needs for at least 50% (25%) of their population during a year. Biophysical redundancy has decreased in the last two decades in 102 out of 155 countries, 11 of these went from high to limited redundancy, and nine of these from limited to very low redundancy. Although the variability of the drivers of change across different countries is high, improvements in yield and population growth have a clear impact on the decreases of redundancy towards the very low redundancy category. We took a more detailed look at countries classified as 'Low Income Economies (LIEs)' since they are particularly vulnerable to domestic or external food supply changes, due to their limited capacity to offset for food supply decreases with higher purchasing power on the international market. Currently, nine LIEs have limited or very low biophysical redundancy. Many of these showed a decrease in redundancy over the last two decades, which is not always linked with improvements in per capita food availability.

<http://iopscience.iop.org/article/10.1088/1748-9326/11/5/055008?fromSearchPage=true>

Associated Project:

[Trade & Food Security](#) [1]

Associated SESYNC Researcher(s):

[dseekell](#) [2]

[jdellangelo](#) [3]

[jgephart](#) [4]

[nmagliocca](#) [5]

[pdodorico](#) [6]

Source URL:

<https://www.sesync.org/past-and-present-biophysical-redundancy-of-countries-as-a-buffer-to-changes-in-food-supply>

Links

[1] <https://www.sesync.org/project/ventures/trade-food-security>

[2] <https://www.sesync.org/users/dseekell>

- [3] <https://www.sesync.org/users/jdellangelo>
- [4] <https://www.sesync.org/users/jgephart>
- [5] <https://www.sesync.org/users/nmagliocca>
- [6] <https://www.sesync.org/users/pdodorico>