

Introducing “biophysical redundancy”: the global status and past evolution of unused water, land and productivity resources for food production

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Countries have different resilience to sudden and long-term changes in food demand and supply. An important part of this resilience is the degree of biophysical redundancy, defined as 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. The presentation will show the results of a recently published paper¹ on the evolution of biophysical redundancy for agricultural production at country level, from 1992 to 2012.

Results indicate that 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.

¹Fader, M.; Rulli, MC.; Carr, J.; Dell'Angelo, J.; D'Odorico, P.; Gephart, J.; Kummu, M.; Magliocca, N. et al. (2016): Past and present biophysical redundancy of countries as a buffer to changes in food supply. Environ. Res. Lett. 11 (2016)055008.