Why is an agroecological transformation of food systems necessary?

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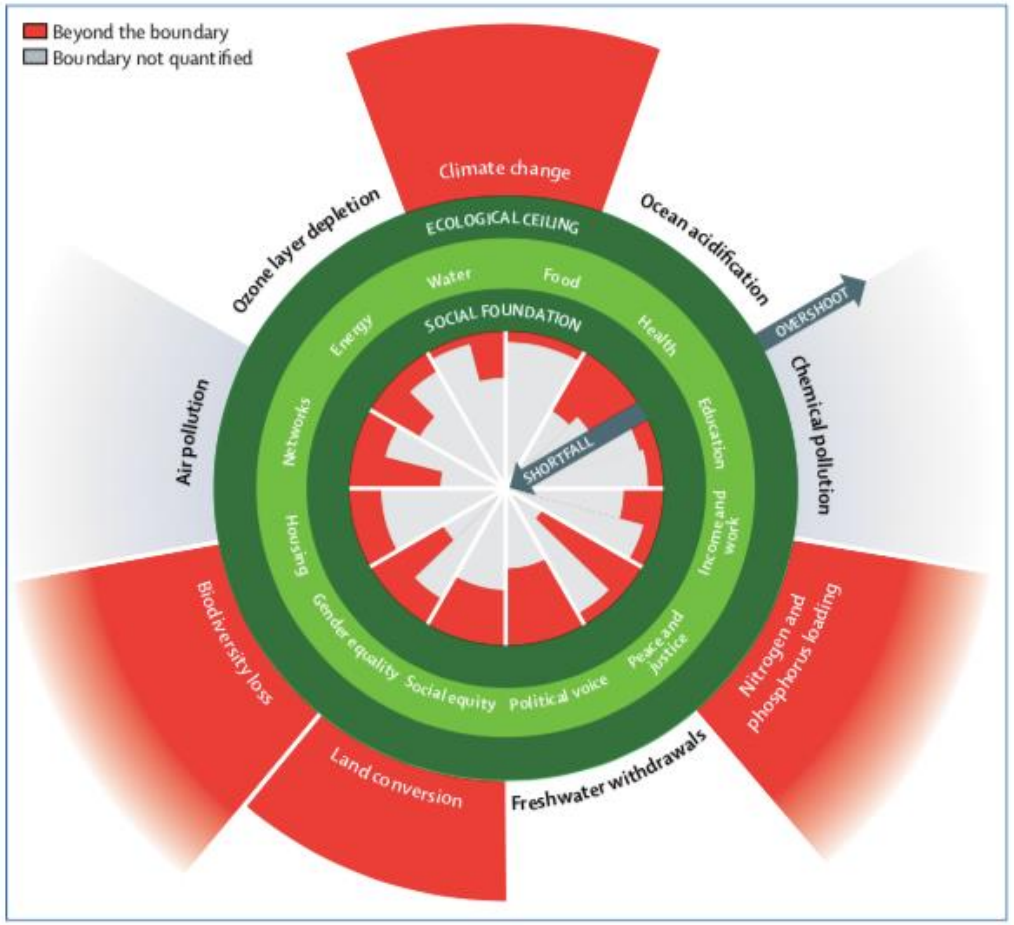
Global food systems are broken

- Many people hungry or with nutrient deficiency, amidst a rising tide of obesity
- Agriculture a key driver of climate change, degradation of land and water resources and biodiversity loss at the same time as being hugely affected by them
- Business as usual agriculture and food systems are unsustainable, inequitable and a major cause of humanity exceeding planetary boundaries



Raworth, K. *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist* (Random House, London, 2017)

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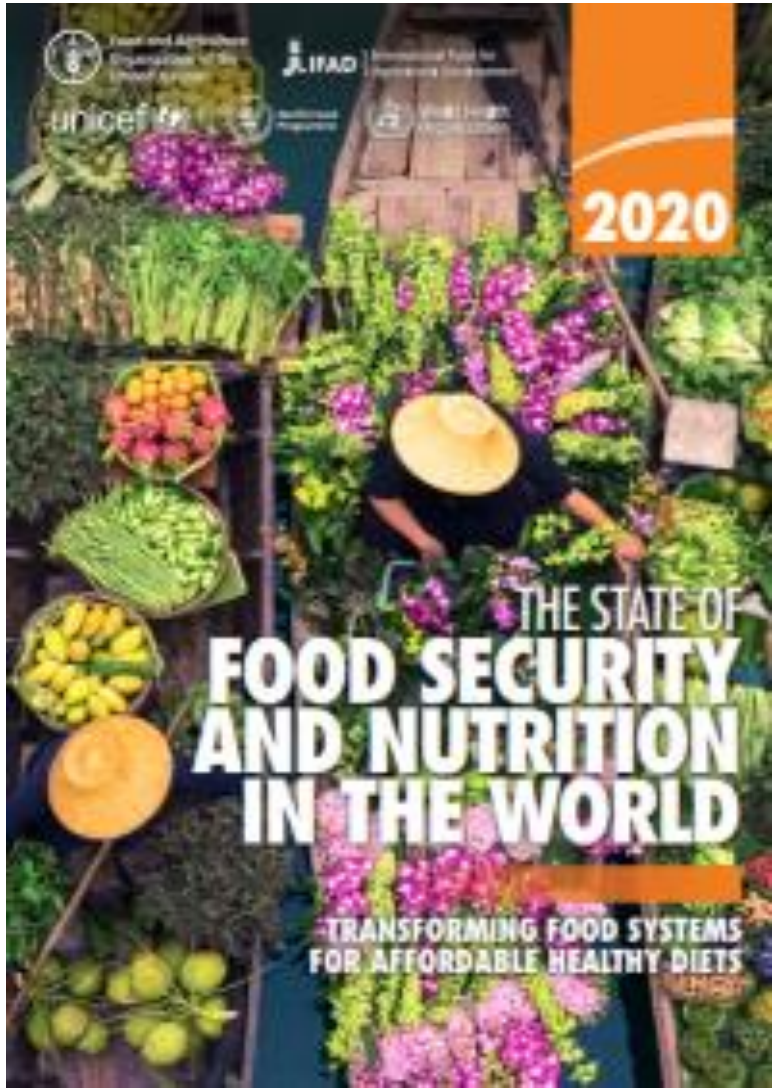
Food security and nutrition

- After decades of improvement, the prevalence of undernourishment has steadily risen since 2014 to 8.9% globally
- Unequal distribution with hunger much more prevalent in Africa at 19.1%
- 690 million people hungry across the world before COVID-19
- Pandemic estimated to cause this to rise sharply, especially in Africa



FAO, IFAD, UNICEF, WFP and WHO, 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. https://doi.org/10.4060/ca9692en
FAO, 2020. COVID-19 and malnutrition: situation analysis and options in Africa. http://www.fao.org/3/ca9896en/CA9896EN.pdf

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Climate crisis

Food systems responsible for 21-37% of total greenhouse gas emissions

- farm production (9-14%),
- land use change (5-14%)
- storage, transport, packaging, processing, retail and consumption, including loss and waste (5-10%)

Increase in food supply has come at a cost. Since 1961:

- 800% increase in Nitrogen fertilisers
- 100% increase in water resources for irrigation

Photo: NASA (climate.nasa.gov)

Food security threatened by:

- increasing frequency and severity of both droughts and floods
- change in the distribution of pests and diseases and in where some crops can be grown

Mbow, C., C. Rosenzweig, L.G. Barioni, T.G. Benton, M. Herrero, M. Krishnapillai, E. Liwenga, P. Pradhan, M.G. Rivera-Ferre, T. Sapkota, F.N. Tubiello, Y. Xu, 2019: Food Security. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. https://ntrs.nasa.gov/api/citations/20200001724/downloads/20200001724.pdf

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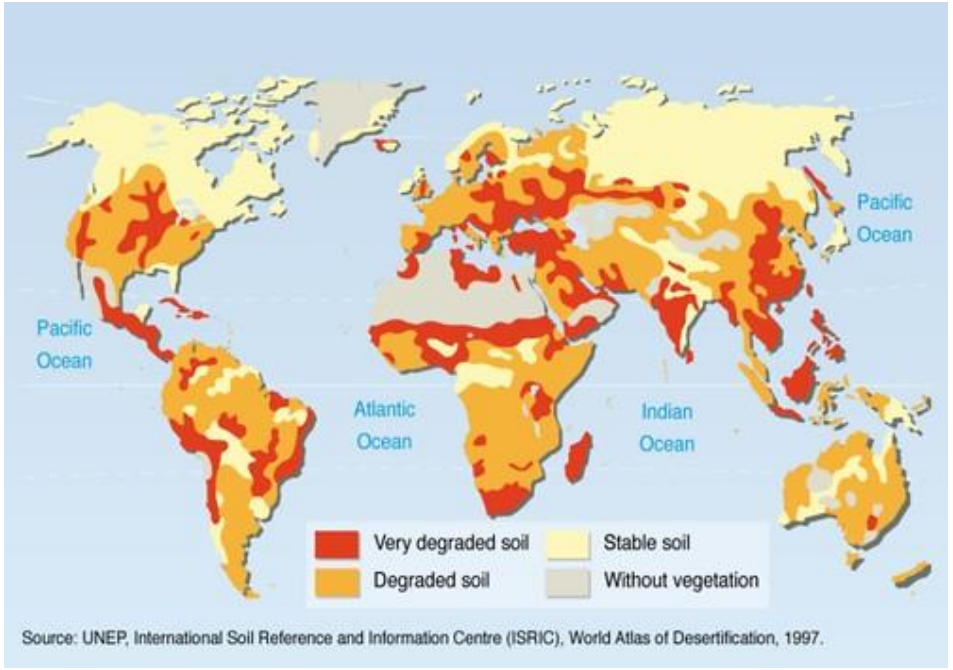
Land and water degradation

- 25% of the earth's land area disproportionately affecting people in developing countries
- Soil erosion and reducing SOC impacting structure, water holding capacity and biota are quick to happen but take a long time to reverse
- Climate change exacerbates degradation



- Water tables lowering because of of ground water extraction and surface water abstraction for irrigation
- Many water courses contaminated with pollutants ranging from excess nutrients to toxic substances

Olsson, L., H. Barbosa, S. Bhadwal, A. Cowie, K. Delusca, D. Flores-Renteria, K. Hermans, E. Jobbagy, W. Kurz, D. Li, D.J. Sonwa, L. Stringer, 2019: Land Degradation. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.
https://www.ipcc.ch/site/assets/uploads/sites/4/2019/11/07_Chapter-4.pdf

Biodivdersity loss

- 64% of agricultural land globally (approximately 24.5 million km^2) is at risk of pesticide pollution causing adverse effects on water quality, biodiversity and human health
- Agriculture major driver of unprecedented loss of biodiversity
- a million species at risk of extinction
- rate of extinction increasing
- average abundance of native species fallen in most major land-based habitats by 20% or more over the last century

Tang, F.H.M., Lenzen, M., McBratney, A. *et al.* Risk of pesticide pollution at the global scale. *Nat. Geosci.* **14,** 206–210 (2021). https://doi.org/10.1038/s41561-021-00712-5

- US$577 billion in annual global crops are at risk from pollinator loss.

Photo by Flickr user Lucas Zallio

IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany

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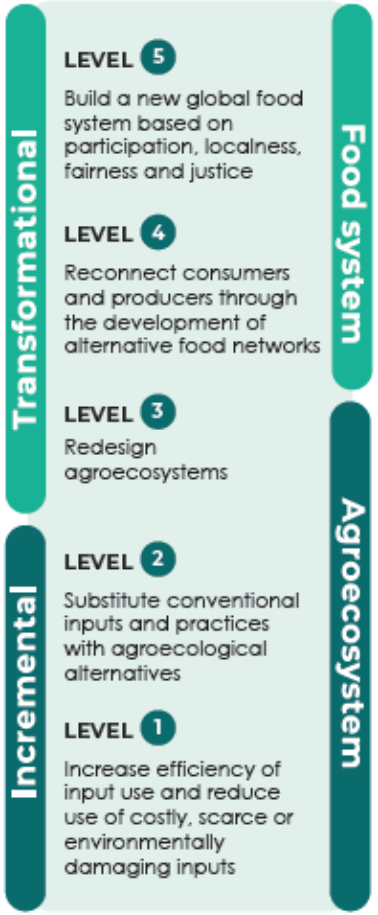
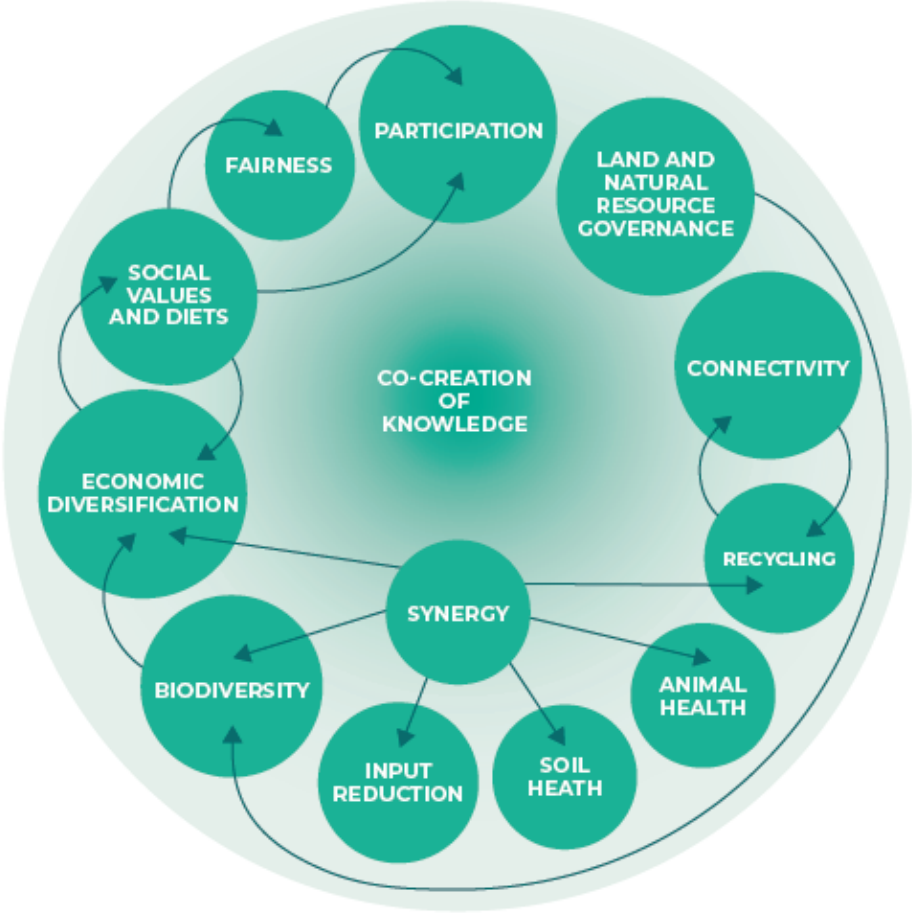
Transformation

- severity of the interlinked crises associated with food systems mean that incremental change is not enough
- fundamental system wide reorganisation is required involving technology, economic, social and governance aspects – challenging norms and the *status quo*
- agroecological approaches involve an alternative paradigm to business as usual agricultural and foods systems with different goals, values and mindset





HLPE 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome http://www.fao.org/3/ca5602en/ca5602en.pdf

Wezel A, Gemmill Herren B, Bezner Kerr R, Barrios E, Gonçalves ALR and Sinclair F (2020). Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agronomy for Sustainable Development* **40:** 40 13pp**.** https://doi.org/10.1007/s13593-020-00646-z

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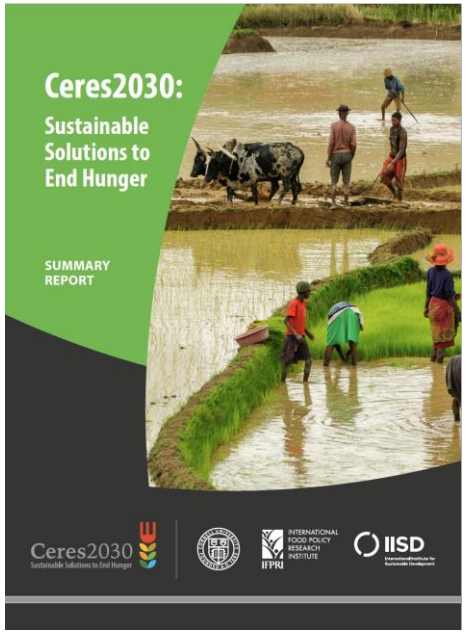
Reconfiguration of science, policy and practice

- Transdisciplinary science
  - focussed on real world problems
  - involves stakeholders and their knowledge,
  - solution-orientated,
  - employs reflexive methodology that can evolve to suit the context
- Policy reform
  - maladapted policies that lock in BAU
  - conducive policies
- Supporting local innovation
  - options x context



Global assessment of agricultural research found that over 95% of research was not relevant to smallholder farmers, despite 83% of farms globally being less than two hectares

Ending hunger: science must stop neglecting smallholder farmers. Editorial *Nature*(2020) 586, 336. https://www.nature.com/articles/d41586-020-02849-6

Sinclair, F and Coe R (2019). The options by context approach: a paradigm shift in agronomy. *Experimental Agriculture* 55 (S1): 1–13. https://doi.org/10.1017/S0014479719000139

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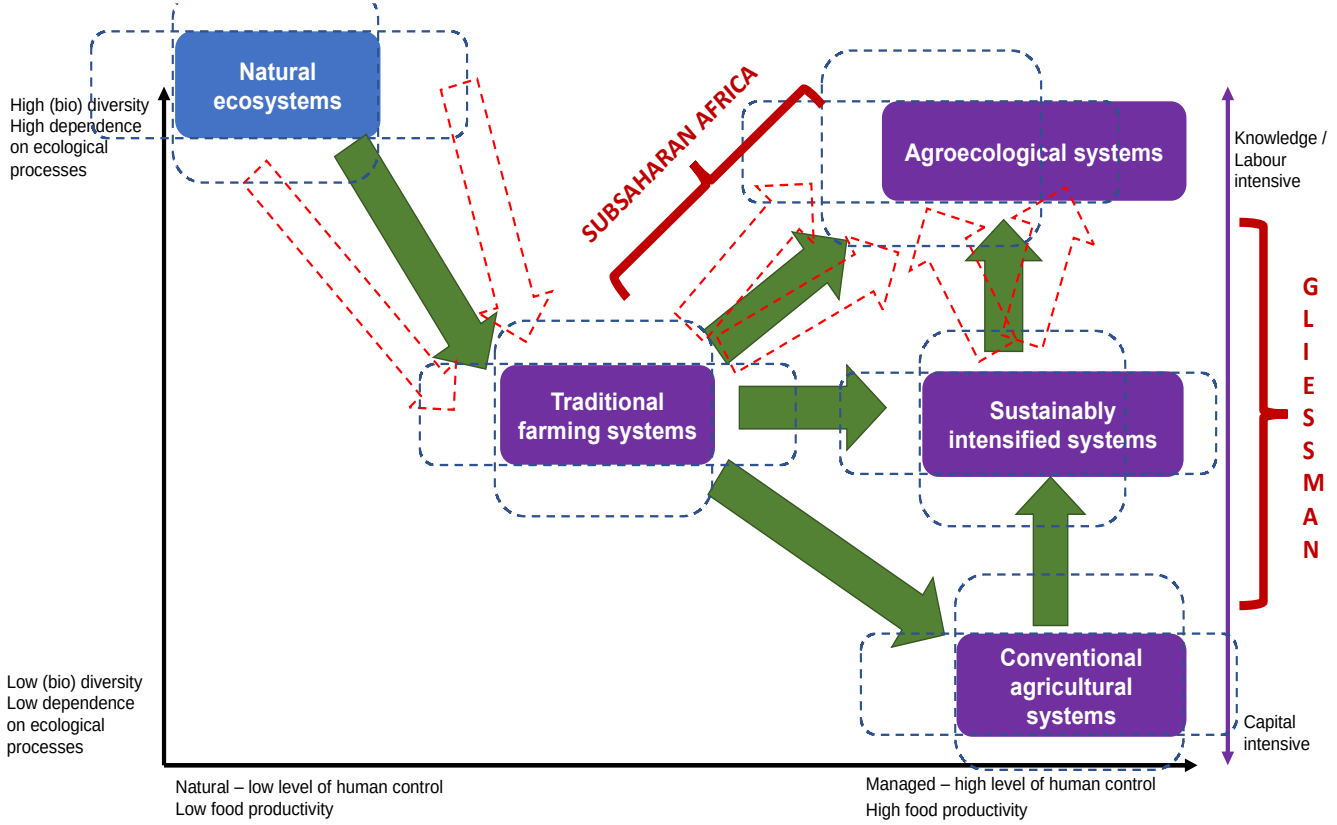
Food security through agroecology

- Despite very little resource expended on agroecology research or practice for cases where there are comparisons agroecological systems are as or more productive than conventional agriculture
- Need for agroecological intensification in much of sub-Saharan Africa but redesign in much of Asia, the Americas and Europe



Rachel Bezner Kerr, Sidney Madsen, Moritz Stüber, Jeffrey Liebert, Stephanie Enloe, Noélie Borghino, Phoebe Parros, Daniel Munyao Mutyambai, Marie Prudhon, Alexander Wezel (2021). Can agroecology improve food security and nutrition? A review, Global Food Security 29, 100540. https://www.sciencedirect.com/science/article/abs/pii/S221191242100050X

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https://glfx.globallandscapesforum.org/networks/events/62489

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