Can we have both human and planetary health?

Food systems transformation in the midst of climate (and pandemic) disruption

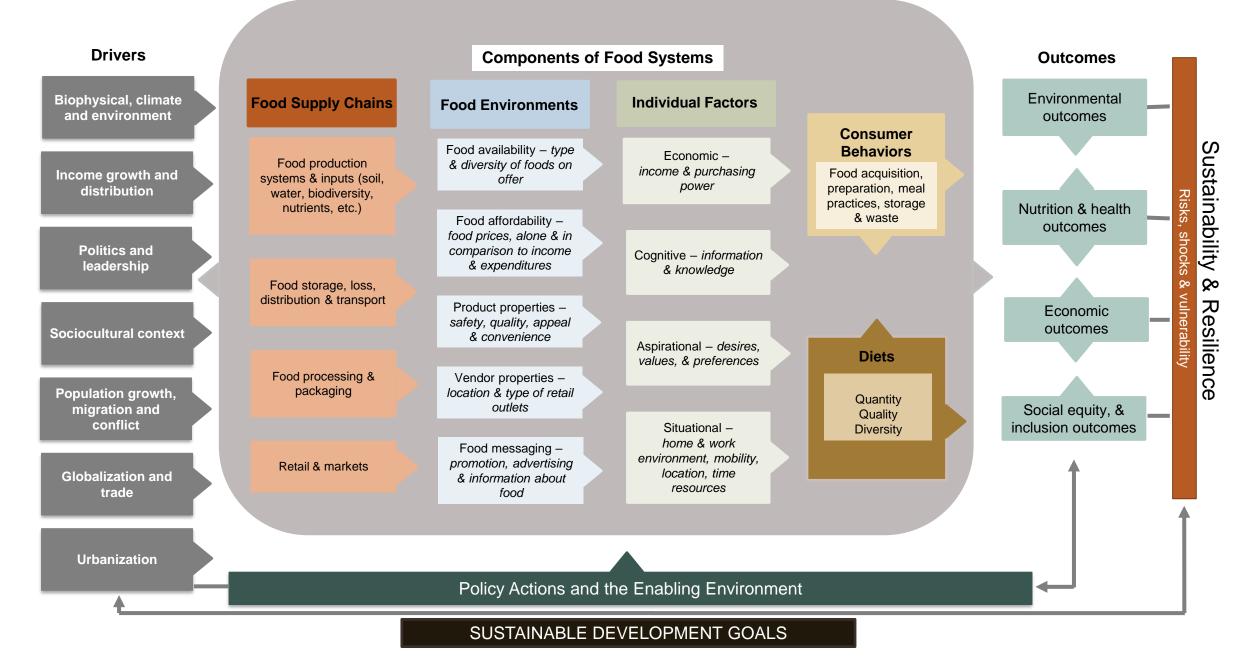
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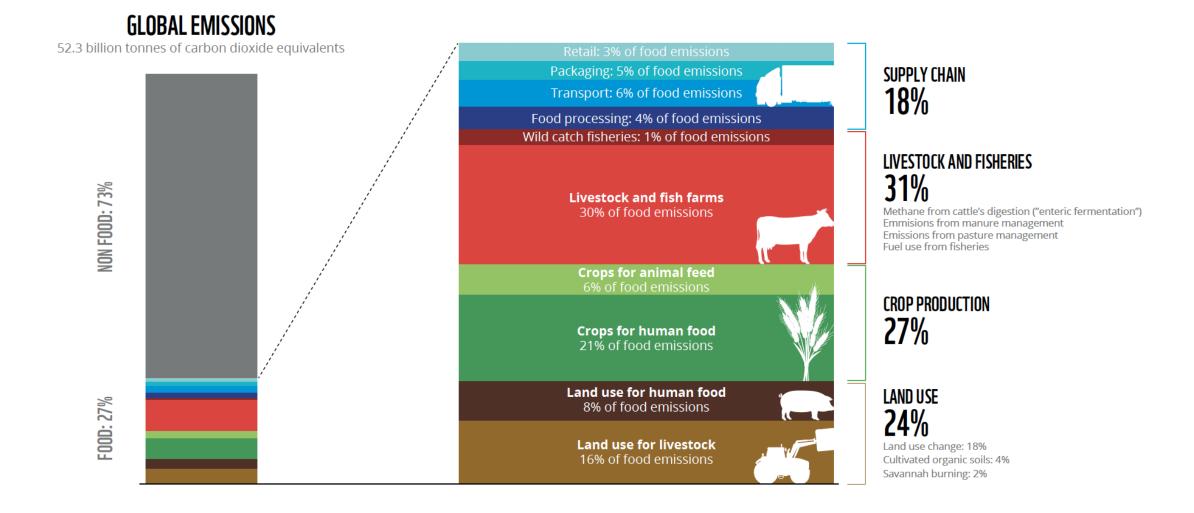


Food systems: victims and instigators

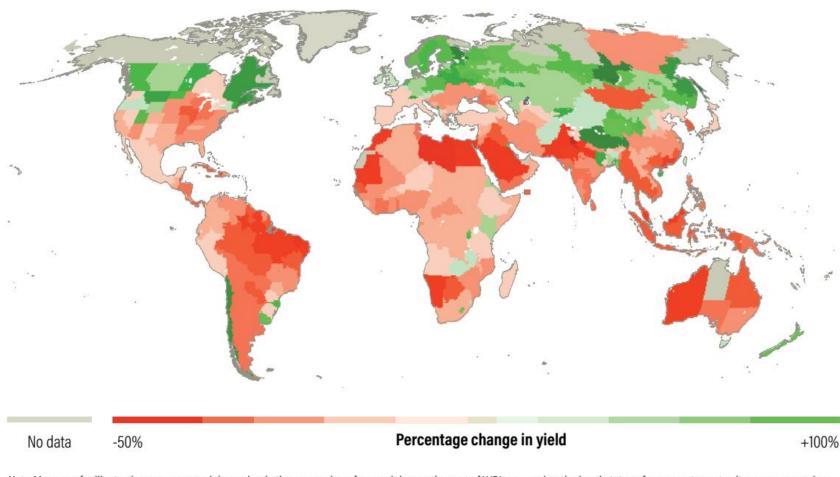


Fanzo, J., et al, 2020. The Food Systems Dashboard is a new tool to inform better food policy. Nature Food, 1(5), pp.243-246.

Food systems are contributing to global greenhouse emissions



Quantity of crops & climate change

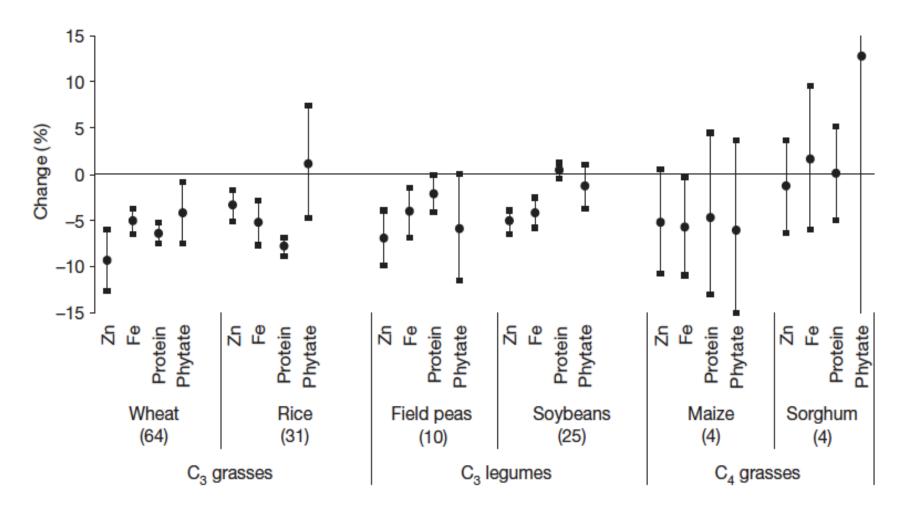


Climate change is projected to have a net adverse impact on crop yields (3C warmer world scenario)

Note: Maps are for illustrative purposes and do not imply the expression of any opinion on the part of WRI concerning the legal status of any country or territory, or concerning the delimitation of frontiers or boundaries. *Source:* World Bank (2010).

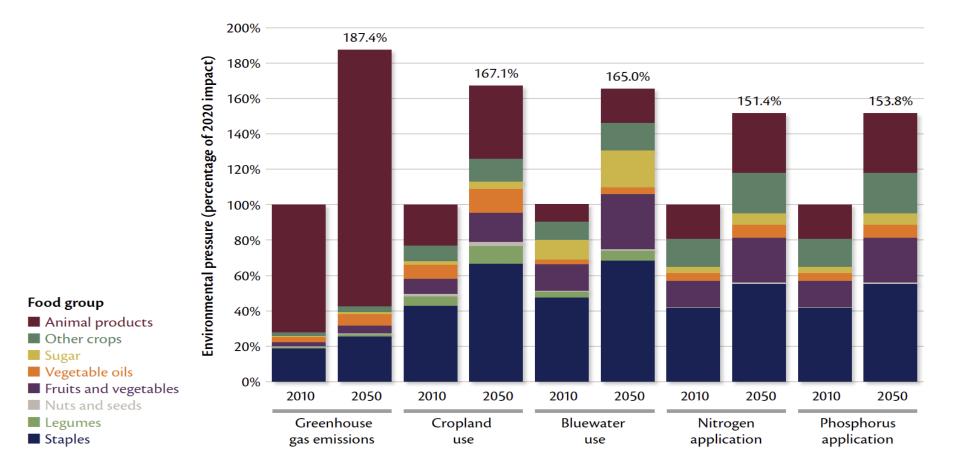
World Resources Institute (2019) Creating a Sustainable Food Future. https://wrr-food.wri.org/sites/default/files/2019-07/WRR_Food_Full_Report_0.pdf

Nutritional quality of crops and elevated CO2 effects



Myers, S.S., Zanobetti, A., Kloog, I., Huybers, P., Leakey, A.D., Bloom, A.J., Carlisle, E., Dietterich, L.H., Fitzgerald, G., Hasegawa, T. and Holbrook, N.M., 2014. Increasing CO 2 threatens human nutrition. *Nature*, *510*(7503), p.139.

Environmental stress of food production will continue in order to meet dietary demands



Note: Bluewater is fresh water in streams, rivers, lakes and aquifers.

Source: Global Nutrition Report (2020)⁵

Springmann, M., Clark, M., I ., Zurayk, R., Scarborough, P., Rayner, M., Loken, B., Fanzo, J., Godfray, H.C.J., Tilman, D., Rockström, J., Willett, W., n.d. Options for keeping the food system within environmental limits. Nature. doi:10.1038/s41586-018-0594-0; Global Panel on Agriculture and Food Systems for Nutrition. 2020. Future Food Systems: For people, our planet, and prosperity. London, UK.

Why do we need a food transformation?



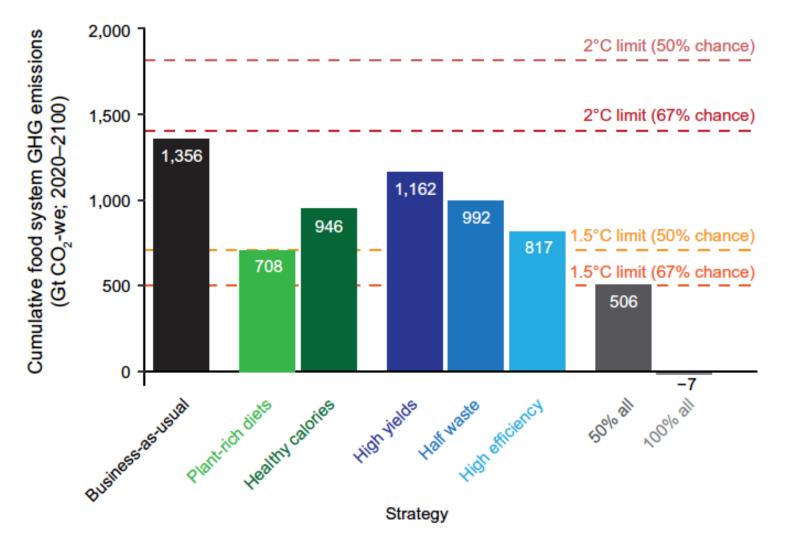
1. Because we are in the middle of catastrophic climate breakdown.

The **Anthropocene** defines Earth's most recent geologic time period as being human-influenced, or anthropogenic, based on overwhelming global evidence that atmospheric, geologic, hydrologic, biospheric and other earth system processes are now altered by humans.

Population Foreign direct Real GDP 60 investment 50 in US dolla 40 30 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 Urban Primary Fertilizer 500 160 population energy use consumption <u></u> 400 120 릑 300 80 200 X 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 2010 Large dams Water use 400 Paper production e 300 F 200 15 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 2010 2010 Transportation International *ଘ* 1200 Telecommunications 800 tourism 1000 ·È 600 800 600 ₽ 400 400 200 1750 1750 1800 1850 1900 1950 2000 1750 1800 1850 1900 1950 2000 1800 1850 1900 1950 2000 2010

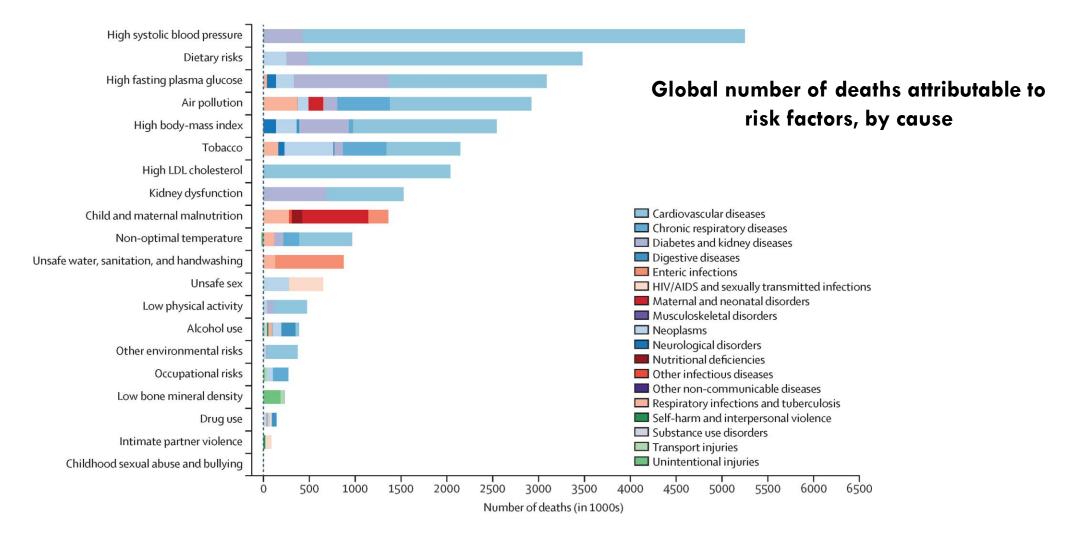
Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O. and Ludwig, C., 2015. The trajectory of the Anthropocene: the great acceleration. The Anthropocene Review, 2(1), pp.81-98.

2. Because a business as usual for food systems is not sufficient for the Paris climate change targets.



Clark, M.A., Domingo, N.G., Colgan, K., Thakrar, S.K., Tilman, D., Lynch, J., Azevedo, I.L. and Hill, J.D., 2020. Global food system emissions could preclude achieving the 1.5° and 2° C climate change targets. Science, 370(6517), pp.705-708.

3. Because sub-optimal diets are a top risk factor of disease and death.



Murray, C.J., Aravkin, A.Y., Zheng, P., Abbafati, C., Abbas, K.M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I. and Abegaz, K.H., 2020. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10258), pp.1223-1249.

4. Because zoonotic pandemics are not going anywhere.

- COVID-19 is a zoonotic disease due to a spillover event that jumped from animals to humans.
- 60% of emerging infectious diseases are zoonotic, and of that 60%, 72% originate in wildlife.
- Food and agriculture have a big part to in the rise of zoonotic spillover events - animals are in close proximity to humans, either because their natural habitat has shrunk or been destroyed, or they are moved from their habitats.



Cutler, S.J., Fooks, A.R. and Van der Poel, W.H., 2010. Public health threat of new, reemerging, and neglected zoonoses in the industrialized world. *Emerging infectious diseases*, 16(1), p.1; New York Times 2020. How Humanity Unleashed a Flood of New Diseases: https://www.nytimes.com/2020/06/17/magazine/animal-disease-covid.html

Can we have both human and planetary health?

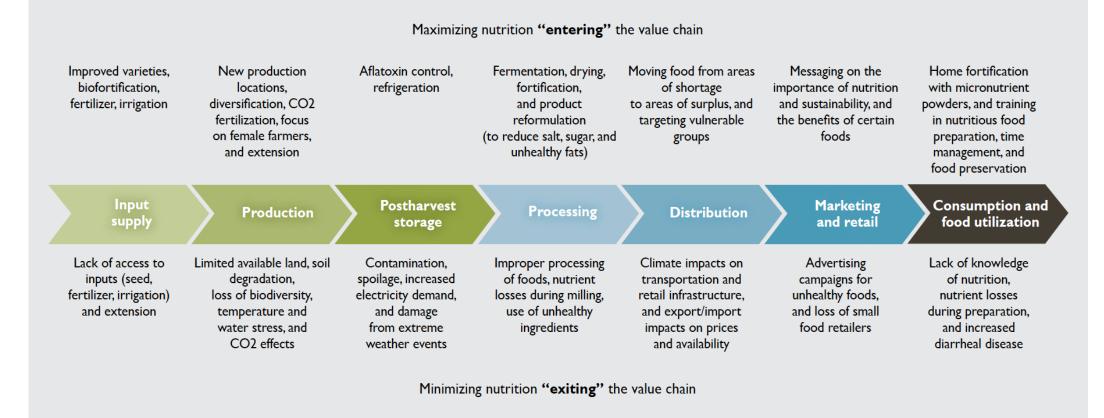


Can we have it all? It DEPENDS!

- <u>Decision-making</u>: prioritizing, cooperating, systems thinking
- Evidence: generating it, sharing it, using it
- Political will and action: being cautiously bold, learning from the past
- Empowerment: of who, for who, and with balance
- <u>Negotiation</u>: providing room to move and incentives
- Data: to inform and predict future scenarios of decisions
- <u>Sharing the planet</u>: global citizenry and sustainability

1. Focus on the entire system

FIGURE 1. Entry and exit points for increasing net nutrition along the food value chain under climate change

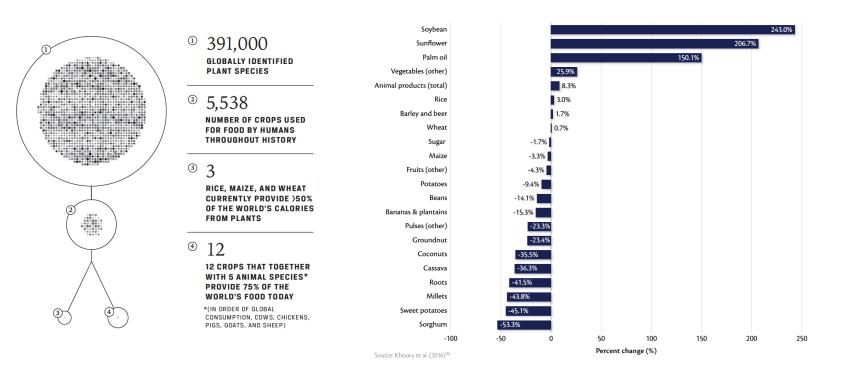


Source: Fanzo et al. (2017b).

Fanzo, J., Davis, C., McLaren, R. and Choufani, J., 2018. The effect of climate change across food systems: Implications for nutrition outcomes. Global food security, 18, pp.12-19.

2. Get over our staple fetish

Changes in relative abundance of crops (1960– 2009 in terms of calories)

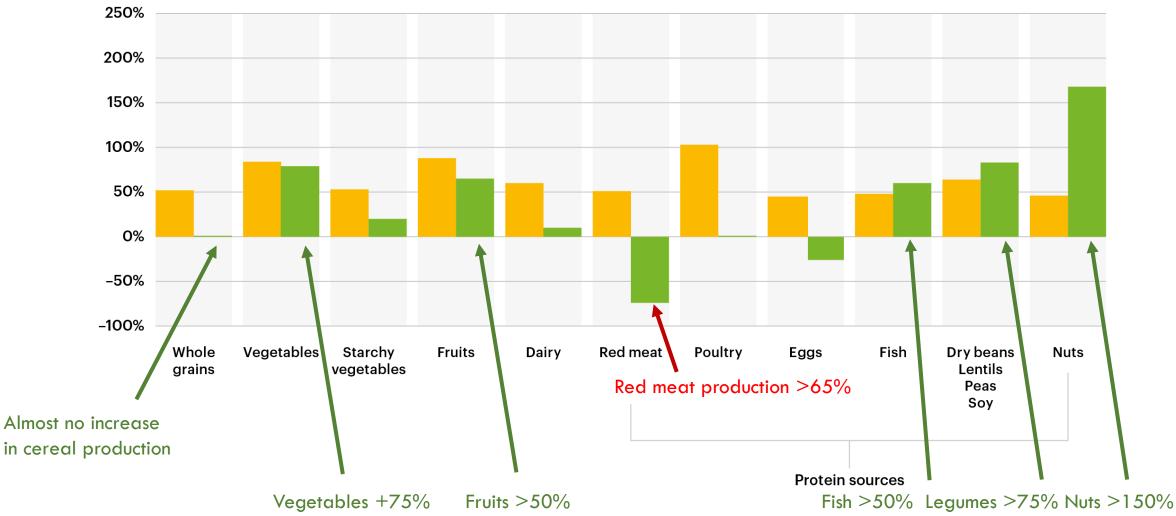


Most research on the impact of climate change on the nutrient content of crops has focused on staple crops; to date, very few studies have examined how climate change may influence changes in production and consumption of nonstaple food groups. More research is needed on how different kinds of crops – particularly those that are nutrient-dense such as fruits, vegetables, and legumes – will fare in a +2 C degree world.

Khoury, C.K., Bjorkman, A.D., Dempewolf, H., Ramirez-Villegas, J., Guarino, L., Jarvis, A., Rieseberg, L.H. and Struik, P.C., 2014. Increasing homogeneity in global food supplies and the implications for food security. Proceedings of the National Academy of Sciences, 111(11), pp.4001-4006; Global Panel on Agriculture and Food Systems for Nutrition. 2020. Future Food Systems: For people, our planet, and prosperity. London, UK.

Do we have what it takes to totally change food production systems?

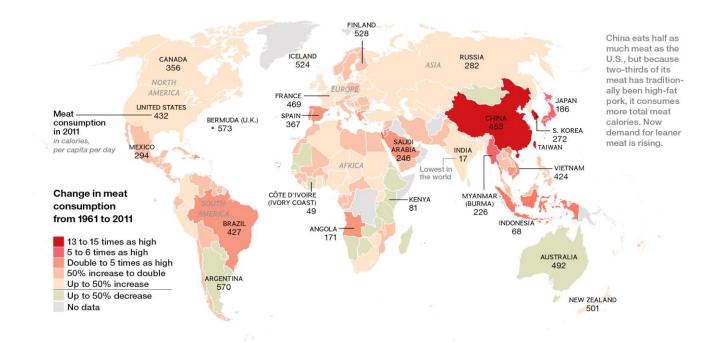
2050 BAU + full waste 🛛 📕 2050 planetary health diet + halve waste



Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A. and Jonell, M., 2019. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. The Lancet, 393(10170), pp.447-492.

3. Consider environmental motivations for dietary change

The environmental motivation for dietary change is related to a question of resource use: even if the food system can produce adequate calories for a growing global population, can food production systems keep up with the demand for more resourceintensive foods?



_	Food system responses	Mitigation	Adaptation	Co-benefits
Improved crop management	Increased soil organic matter content			Livelihoods, biodiversity
	Change in crop variety			Livelihoods, biodiversity
	Improved water management			Livelihoods, water
	Adjustment of planting dates			Livelihoods
	Precision fertilizer management			Livelihoods, pollution
	Integrated pest management			Livelihoods, biodiversity
	Counter-season crop production			Livelihoods, biodiversity
	Biochar application			Livelihoods
	Agroforestry			Livelihoods, biodiversity
	Changing monoculture to crop diversification			Livelihoods, biodiversity
	Changes in cropping area, land rehabilitation (enclosures, afforestation), perennial farming			Livelihoods, biodiversity
	Tillage and crop establishment			Livelihoods, biodiversity
	Residue management			Biodiversity
	Crop–livestock systems			Livelihoods, biodiversity
Improved livestock managment	Silvopastoral systems			Livelihoods, biodiversity
	New livestock breeds			Livelihoods
	Livestock fattening			Livelihoods
	Shifting to small ruminants or drought-resistant livestock or fish farming			Livelihoods
	Feed and fodder banks			Livelihoods, biodiversity
	Methane inhibitors			
	Thermal stress control			Livelihoods, energy
	Seasonal feed supplementation			Livelihoods, biodiversity
	Improved animal health and parasite control			Livelihoods
Climate services	Early warning systems			Livelihoods
	Planning and prediction for seasonal-to-intraseasonal climate risk			Livelihoods
	Crop and livestock insurance			Livelihoods
Improved supply chain	Food storage infrastructure			Livelihoods
	Shortening supply chains			Livelihoods, energy
	Improved food transport and distribution			Livelihoods
	Improved efficieffincy and sustainability of food processing, retail and agrifood industries			Livelihoods
	Improved energy efficiencies of agriculture			Energy
	Reduced food loss			Livelihoods
	Urban and peri-urban agriculture			Livelihoods, biodiversity
	Bioenergy (for example, energy from waste)			Livelihoods, energy
	Dietary changes			Health
nen	Reduced food waste			Water, energy
Demand management	Packaging reductions			Pollution
mar	New ways of marketing (for example, direct sales)			Livelihoods, energy
	Transparency of food chains and external costs			Health, energy, water
	Mitigation and None	Limited	High	N Very high

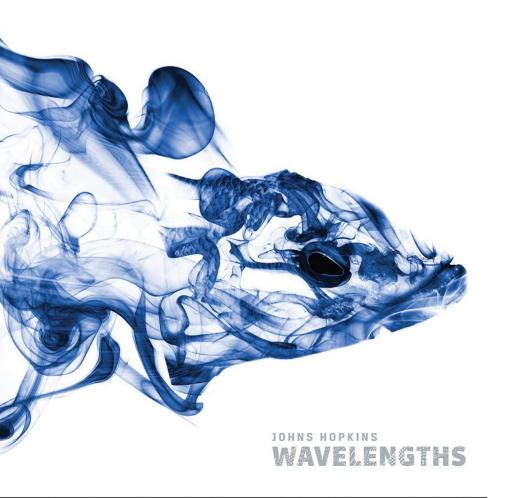
adaptation potential

Mitigate, and adapt through food system responses

Rosenzweig, C., Mbow, C., Barioni, L.G., Benton, T.G., Herrero, M., Krishnapillai, M., Liwenga, E.T., Pradhan, P., Rivera-Ferre, M.G., Sapkota, T. and Tubiello, F.N., 2020. Climate change responses benefit from a global food system approach. *Nature* Food, 1(2), pp.94-97.

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Can Fixing Dinner Fix the Planet?



Thank you!

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