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Transforming the Global Agri-food System's Monotony: Collaborative Solutions for Health, Inequalities, and Sustainability

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Solidarity for the
Achievement
of the SDGs



Abstract

The global agri-food system is far from contributing to SDG 2 – eliminating hunger while promoting health and sustainability. A critical paradox persists, demanding urgent attention from the G20. On the one hand, 28.9% of the global population faced moderate to severe food insecurity in 2023. On the other hand, approximately 40% of adults and 20% of children worldwide are overweight or obese, with obesity-related conditions causing increasing preventable deaths and diseases. Under Green Revolution techniques, agricultural production has historically expanded since the 1960s. However, their continued dominance poses threats to global food and nutrition security. The global agri-food system faces a "threefold monotony" that must be addressed. First, agricultural production is excessively concentrated, with 75% of global caloric intake relying on just six crops, often cultivated in regions increasingly vulnerable to extreme climate events. Second, the rise of antimicrobial resistance – one of the WHO's most urgent concerns – exposes the risks of homogeneous livestock populations maintained by large-scale factory farming. Third, excessive meat consumption and the growing contribution of ultra-processed foods in diets worldwide are key drivers of the global obesity pandemic, indicating that current food systems fail to improve human health. These challenges contribute to the "hidden costs" of the global agri-food system (Appendix II), which total nearly \$12 trillion annually. Transforming the system requires addressing interconnected crises in food and nutrition security, climate change, and biodiversity loss. This policy brief examines these challenges from a Global South–North perspective, providing updated data and analysing pathways, policies, and behavioural changes necessary for systemic transformation that balances immediate food security needs with long-term sustainability goals. Drawing on collaborative research conducted by institutions across the Americas, Africa, and Europe, this proposal highlights the pivotal role of the G20 in advancing the SDGs. The solutions presented seek to improve global governance mechanisms and initiatives, while promoting a new generation of public policies, regulatory frameworks, and financial incentives at the national level.

Keywords: Agri-Food System, Triple Monotony, Hidden Costs, Climate Change, Sustainable Transition

Diagnosis

Among the four essential "systems of provision"^{1,2} – food, mobility, construction, and energy – the agri-food system holds the most immediate potential for sustainability transformation. The COP28 Declaration in Dubai underscored this potential, with 134 nations recognising agriculture's role in cutting carbon emissions and fostering prosperity for all. The issue was deepened in the G20 Leaders' Final Declaration in 2024,³ according to which agriculture offers decisive opportunities to "fight poverty, end hunger, improve nutrition and, at the same time, tackle climate change, biodiversity loss, pollution and desertification".

There is a clear gap between the current situation and the potential shown in these declarations. The central idea of this policy brief is that the actors involved – farmers (in family and community economies, but also large farms), consumers (who find an increasing abundance of harmful products on supermarket shelves), public health professionals (alarmed by the extent of the global pandemic of obesity and other noncommunicable diseases), researchers (who highlight the threat of current production patterns), as well as government officials and policymakers (ministries of agriculture, environment, and trade) – can converge on the urgency of the ecological transformation of the agri-food system. This convergence translates into technologies that are already available, as well as institutional and governance changes that make it possible to guarantee a quality food supply for all, based on production models supported by a nature-based knowledge economy.

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1. United Nations Environment Programme and International Resource Panel. 2024. *Global Resources Outlook 2024 - Bend the trend: Pathways to a Liveable Planet as Resource Use Spikes*.
 2. Andrew L. Fanning, Daniel W. O'Neill, Milena Büchs, "Provisioning Systems for a Good Life within Planetary Boundaries", *Global Environmental Change* 64 (2020): 102135, <https://doi.org/10.1016/j.gloenvcha.2020.102135>.
 3. "G20 Rio de Janeiro Leaders' Declaration", G20 Brasil 2024, Effective November 18, 2024, <https://www.gov.br/planalto/pt-br/media/18-11-2024-declaracao-de-lideres-g20.pdf>

Monotony and concentration

Global hunger has decreased dramatically since 1960.⁴ This undeniable achievement, however, was based on production methods, forms of industrialisation, public policies and scientific research programmes that no longer correspond to current needs, go beyond planetary limits, and whose fundamental expression is the triple monotony of the global agri-food system:

- **Agricultural monotony:** The Green Revolution's emphasis on seed efficiency⁵ has relied heavily on chemical fertilisers and pesticides, fostering a system vulnerable to extreme weather events. Since the 1960s, nitrogen fertiliser use has increased 9.2 times, phosphorus five times, potassium 4.8 times, and pesticides 5.2 times. The market is dominated by a handful of pesticide and seed corporations, locking farmers into costly, closed technologies.⁶ When harvests suffer from climatic events, deforestation emerges as an expansion solution, exacerbating biodiversity loss, particularly in the pan-Amazonian region. Environments with the richest biodiversity and high carbon stocks are being destroyed in favour of a monotony of low resilience and declining productive efficiency.
- **Monotony in animal farming:** About 40% of global grain production is allocated to animal feed, and grazing areas account for over 70% of the world's agricultural land.⁷ The industry relies on genetic monotony⁸ controlled by a few corporate giants, with factory farms facilitating the

4. FAO, IFAD, UNICEF, WFP and WHO. "The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms." (Rome, Italy: Food and Agriculture Organization of the United Nations, 2024).

5. Rattan Lal, "Regenerative management of agroecosystem soils to minimise extinction risks and for climate and food security", in *Regenerative Farming and Sustainable Diets*, ed. Joyce D'Silva, Carol McKenna (Routledge, 2024), 50.

6. ETC Group. *Food Barons 2022 - Crisis Profiteering, Digitalization and Shifting Power* (ETC Group, 2022), https://www.etcgroup.org/files/files/food-barons-2022-full_sectors-final_16_sept.pdf.

7. Rattan Lal, "Regenerative management of agroecosystem soils to minimise extinction risks and for climate and food security", 50.

8. Rita Albernaz-Gonçalves, Fernanda H. M. Leite, Maria J. Hötzel, Rafael Silva, Gabriela O. Antillón, Estela C. Sanseverino et al., 2024, "Animal welfare for a healthy and sustainable agri-food system.", T20 Policy Brief.

spread of microorganisms. Widespread antibiotic use – both for disease prevention and growth acceleration – has fuelled antimicrobial resistance, now a pressing concern for the World Health Organization.

- **Dietary monotony:** Agricultural and animal farming monotony is leading to a growing monotony in what people eat: globally, 75% of global calorie consumption relies on just six crops.⁹ Ultra-processed foods stand out as industrial formulations offering artificial diversity in colour and flavour but relying on a narrow base of maize, wheat, soy, and sugarcane.¹⁰ The decline in dietary variety, increased ultra-processed consumption and the erosion of culinary culture¹¹ are decisive vectors of the global obesity pandemic and a wide range of noncommunicable diseases.¹²

Hidden costs

The indirect economic costs of the current form of organisation of the agri-food system are estimated at \$12 trillion annually (FAO, 2023), exceeding the market prices of what contemporary societies pay for what they eat. These costs, which represent around 10% of the world's GDP, include environmental degradation, depletion of water resources, impacts on public health, and loss of biodiversity – and are largely externalised, falling on society through spending on environmental restoration, health treatments, and climate change mitigation.

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9. Roshan K. Singh, Nese Sreenivasulu, Manoj Prasad, "Potential of underutilized crops to introduce the nutritional diversity and achieve zero hunger", *Functional & integrative genomics* 22, no. 6 (2022):1459-1465, [https://doi: 10.1007/s10142-022-00898-w](https://doi.org/10.1007/s10142-022-00898-w).
 10. Carlos A. Monteiro, Geoffrey Cannon, Renata B. Levy, Jean-Claude Moubarac, Maria L.C. Louzada, Fernanda Rauber et al., "Ultra-processed foods: what they are and how to identify them", *Public Health Nutrition* 22, no. 5 (2019): 936–941, <https://doi.org/10.1017/S1368980018003762>.
 11. Ministry of Health of Brazil, "Dietary Guidelines for the Brazilian Population." (Brasilia: Ministry of Health of Brazil, 2014): 156.
 12. Melissa M. Lane, Elizabeth Gamage, Shutong Du, Deborah N. Ashtree, Amelia J. McGuinness, Sarah Gauci et al., "Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses", *The British Medical Journal* 384 (2024):e077310, [https://doi:10.1136/bmj-2023-077310](https://doi.org/10.1136/bmj-2023-077310).

This economic irrationality demonstrates that the unsustainability of the global agri-food system goes beyond environmental and human health problems.¹³

Recommendations

Despite the immense diversity of foodstuffs, production techniques, and food cultures around the world, contemporary diets are dominated by a system that compromises fundamental ecosystem resources, harms human and animal health, and has huge social and financial costs. Precisely because of the global nature of this system, the G20 is in a strategic position to lead a process of transformation so that diets valorise the territories from which products come, contribute to improving health, and regenerate the ecosystem services that have so far been systematically destroyed. This transformation must address the global crises of food and nutrition security, climate change, and biodiversity loss,

We recognise the incremental work of the G20 in drawing up these recommendations. In 2024, the G20's Agriculture Working Group emphasised the promotion of sustainable practices such as agroecology, regenerative intensification, and agriculture based on scientific evidence as a strategy for tackling climate change and global food insecurity. Little progress has been made, however, on reducing the use of pesticides and chemical fertilisers¹⁴ and the regulation of patented seeds.¹⁵

It is therefore essential that transition strategies address these problems in an integrated manner, the centre of which must be replacing the monotony that marks the global agri-food system in its current form with fairer and more

13. Lord, S, "Hidden costs of agrifood systems and recent trends from 2016 to 2023 – Background paper for The State of Food and Agriculture 2023." *FAO Agricultural Development Economics Technical Study, no.31*. (Rome, Food and Agriculture Organization of the United Nations, 2023).

14. Chris Baldock, Filippo Grassi, John Willis, *Fixing Nitrogen: Planet Tracker* (2023), 48.

15. Cary Fowler and Pat Mooney, *Food politics, and the loss of genetic diversity* (University of Arizona Press, 1996), 174.

sustainable practices. The following topics summarise the elements that can structure such a transition.

1. Strengthening ecosystem services and infrastructure

The G20 countries must encourage governments and financial agents to make the provision of ecosystem services a decisive component of the supply of agricultural products.^{16,17} Investments in public goods that strengthen infrastructure and adaptation to climate change are essential to guarantee the resilience and sustainability of the agricultural sector. Organisations such as the World Bank¹⁸ have advocated a broader approach, prioritising investments in water systems, transport, agricultural research, and technologies for climate monitoring and adaptation actions. This approach makes it possible to mitigate environmental risks and improve the competitiveness of the sector, reducing systemic vulnerabilities and ensuring long-term benefits for producers and consumers.

2. Regenerating degraded soils and enhancing agricultural autonomy

The G20 countries, which produce most of the world's agricultural supply, must set clear targets so that the regeneration of today's degraded soils contributes to food and nutrition security. To this end, it is essential to introduce changes in the forms of regulation and in the incentive and financing systems capable of supporting the development of business models that reduce the current dependence of the agricultural sector on the corporate giants that supply inputs,

16. World Economic Forum, *Transforming the Global Food System for Human Health and Resilience*, (World Economic Forum in collaboration with Accenture, Insight Report, 2023).

17. Ismahane Elouafi, "Why biodiversity matters in agriculture and food systems", *Science* 386, eads8197(2024), <https://doi:10.1126/science.ads8197>.

18. Todd Sandler, "On Financing Global and International Public Goods", Policy Research Working Paper; No. 2638 (The World Bank Economic Policy and Prospects Group, July 2001).

and whose closed and proprietary technologies erode ecosystem services that are fundamental to agriculture itself. This aspiration is already being realised through the expansion of bio-inputs, some of which are produced on the farms themselves.¹⁹ Also noteworthy is the strengthening of regenerative agriculture and the spread of moderate intensification technologies in cattle farming.²⁰ Increasing the technological autonomy of the agricultural sector contributes to the resilience of the agri-food sector as a whole and should guide both research and rural extension.

3. Regulating antibiotics in livestock production

The G20 countries are home to most of the factory farms dedicated to animal production. It is essential that the G20 sets quantitative targets and transparent monitoring systems to reduce the current use of antibiotics, either by discontinuing their use as an animal growth factor or via hygiene measures that contribute to the elimination of microorganisms. Since the current intake of animal products, with the exception of sub-Saharan Africa, exceeds the metabolic needs of human beings,²¹ this paves the way for production methods based on the One Health approach, with lower animal concentration, lower opportunity cost of animal feed, and lower risk of disease.

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19. Frédéric Goulet, "On-farm agricultural inputs and changing boundaries: Innovations around production of microorganisms in Brazil, *Journal of Rural Studies* 101, (2023): 103070, <https://doi.org/10.1016/j.jrurstud.2023.103070> .
 20. Rachael D. Garrett, Julie Ryschawy, Lindsay W. Bell, Owen Cortner, Joice Ferreira, Anna V.N. Garik et al., "Drivers of decoupling and recoupling of crop and livestock systems at farm and territorial scales", *Ecology and Society* 25, no. 1 (2020), <https://doi.org/10.5751/ES-11412-250124> .
 21. Mike Berners-Lee, C. Kennelly, Reg Watson, C. N. Hewitt, "Current global food production is sufficient to meet human nutritional needs in 2050 provided there is radical societal adaptation", *Elementa: Science of the Anthropocene* 6 (2018): 52, <https://doi.org/10.1525/elementa.310> .

4. Promoting whole foods and reducing ultra-processed food consumption

There is an urgent need for international mobilisation to drastically reduce the consumption of ultra-processed products and increase the consumption of a variety of fresh and minimally processed foods, which will improve human health, with a consequent reduction in spending by the health systems. Ultra-processed foods should be taxed and the risks of their consumption clearly advertised on their packaging. On the other hand, unprocessed foods must be subsidised to guarantee food and nutritional security through their processing by human culinary skills, as recommended by the WHO and dietary guidelines around the world.

5. Equitable global governance for food system transition

If the forms of transition are not accompanied by instruments of global governance that reduce asymmetries between countries and between different classes of producers, there is a risk of deepening socio-economic inequalities.²² Small farmers and countries with less investment capacity may face difficulties in adapting to the new requirements, while large producers and developed economies benefit from the resources mobilised for this purpose. It is essential to adapt the forms of financing, credit, and international funds to support the transition, in a way that is consistent with the specific needs of these groups of farmers and countries. In addition, global governance must balance environmental demands with social justice, ensuring that sustainability does not become a new factor of exclusion.

22. Mariana Mazzucato, Vera Songwe, Amir Lebdioui, Barbara Buchner, Carlos Lopes, Daniela Gabor et al., "Um planeta verde e justo. A agenda de 1,5° para a governança global das políticas industrial e financeira do G20" (G20 Brasil e CEBRAP, Relatório Independente do Grupo de Especialistas da TF-CLIMA, Outubro 2024).

Appendix

Box 1. Agri-food system

The term **food system** is used by various authors and international organisations to refer to a set of networks and relationships involved in the production, processing, distribution, and consumption of foods. More recently, the incorporation of the prefix **agri-** has become increasingly common, highlighting the role of agricultural activities in linking the different stages that make up this system.

Within the global **agri-food system**, there are different forms of organisation. The most conventional models are based on growing integration among the various stages of the system through **global value chains**, intensive and large-scale use of chemical inputs, genetic standardisation of crops and livestock, corporate control over the different activities, and the widespread consumption of **ultra-processed foods**. However, there are also alternative models that challenge this approach, relying on practices that value biodiversity, foster closer relationships between producers and consumers, and adopt technologies that avoid environmental degradation. Despite this diversity, the use of the singular form – **agri-food system** – emphasises the fact that there is a predominant logic that governs how the system is organised globally.

This organisational model of the **global agri-food system** emerged in the second half of the 20th century as a response to the need to increase food supply for a rapidly growing population. This goal was achieved, but at a significant cost to both human health and the environment: while hunger rates declined, problems related to obesity and malnutrition – tied to the types of foods consumed – rose sharply. The environmental impact has also been immense.

This does not mean that hunger is no longer an issue. Where it persists, it is largely explained by **problems of access to food rather than its scarcity**.

More than half a century after the so-called **Green Revolution**, which spread the dominant logic behind the current agri-food system, the ethical and normative goals that should now guide governance, financing, regulation, and incentives are different: improving the quality of food consumed, expanding access to nutritious food for all people, and transforming production practices to regenerate the ecosystems upon which human life depends.

Source: Authors, based on Friedland (1984)²³; McMichel (2009)²⁴; Marsden (2022)²⁵; Marsden (2024)²⁶

²³ William H Friedland, "Commodity Systems Analysis", *Agriculture and Human Values* 1, no.1 (1984): 29–39.

²⁴ McMichael, P, "A food regime analysis of the 'world food crisis'", *Agriculture And Human Values* 26, n. 4 (2009): 281-295, <http://dx.doi.org/10.1007/s10460-009-9218-5>.

²⁵ Terry Marsden, "Sustainable Agri-Food Transformations and the Rise of Disruptive Governance", in *Food and Agriculture in Urbanized Societies*, ed. Sergio Schneider, Potira V, Terry Marsden (Emerald Publishing Limited, 2022), <https://doi.org/10.1108/S1057-192220220000026005>

²⁶ Terry Marsden, "Contested ecological transitions in agri-food: emerging territorial systems in times of crisis and insecurity". *Rivista di Economia Agraria* 79, n. 3 (2024): 69-81 (2024), <http://dx.doi.org/10.36253/rea-15421>.

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