Workshop Summary

Workshop on Progress Indicators
in the context Biodiversity, Climate, Agriculture and Food, on July 16th, 2025

Contributors & Attendees *In alphabetical order of Institutes*
German Institute for Economic Research (DIW Berlin):
Karsten Neuhoff, Antonia Kurz, Fernanda Ballesteros, Arvid Ehlert
Leibniz Centre for Tropical Marine Research (ZMT):
Raimund Bleischwitz, Lara Stuthmann, Sarah Zwicker
Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB):
John Mulwa Ndisya, Syeda Hira Benish
Leibniz Institute of Ecological Urban and Regional Development (IOER):
Jochen Schanze, William Ying
Leibniz Institute of Vegetable and Ornamental Crops (IGZ):
Monika Schreiner
Wuppertal Institute for Climate, Environment and Energy (WI):
Christa Liedtke

Context and motivation

Nutrition alone accounts for around 30% of global natural resource use, making it a crucial lever of the transformation of the agri-food sector (Engelmann et al., 2018). This transformation can be characterised by a diverse set of innovations (Mukherjee et al., 2025), ranging from new protein sources to circular biomass systems. However, translating this innovation landscape into actionable and politically viable strategies remains a major governance challenge (Béné, 2022; Even et al., 2024; Hale et al., 2021; Höhne & Roy, 2021; Schneider et al., 2023).

Ongoing research on transition management in the agri-food sector identifies a variety of challenges for the transition and highlights the distributed production side – different to e.g. energy or mobility – in the form of millions of farmers who all make their own choices on how to produce food, feed or fuel products (Elzen & Barbier, 2024). Marine food with all their small-scale artisanal fishery people adds to it (Becke et al., 2025; Crona et al., 2023). From a political perspective however, high-level commitments for the transformation of the agri-food sector and monitoring will require a certain degree of aggregation which is challenging to achieve across heterogeneous suppliers, a large variety of food consumption patterns, and diverse innovation types. Could progress indicators help aggregate and track progress towards sustainability, health, resilience and distributional effects across this heterogeneity?

Numerous indicator frameworks have emerged to define in practical terms what a healthy and environmentally sustainable diet should look like (da Silva Vieira et al., 2025). Well-known examples include the EAT-Lancet Planetary Health Diet (Rockström et al., 2025) and the FAO Core Indicators, as well as national approaches like Sweden's "Food System Sustainability House" (FAO, 2018; Hansson et al., 2024; Willett et al., 2019). However, like the original SDG indicator framework, these frameworks usually contain a large number of Key Performance Indicators (KPIs), making them complicated and difficult for policy makers, firms and investors to use them for guiding and tracking policy implementation, corporate strategy and investment portfolios.

A similar challenge was successfully addressed in the energy transition. Crucially, the EU's first Renewable Energy Directive linked its binding 20% target for 2020 to a single, easily monitored metric (the share of renewables in final energy consumption) which policy evaluations describe as a key driver of its successful over-achievement (EU Comission, 2022). Despite early controversies (cost concerns, targeted resistance from opponents), this target succeeded in creating a common understanding of progress within the energy sector (Franco et al., 2023).

Contrasting these experiences in the renewable and agri-food sector lead to the central question guiding our workshop: **Can a suitable progress indicator be developed for the agri-food sector?**

We explored whether a progress indicator could make key aspects of complex system transitions accessible in a single, tangible metric. Such an **indicator could communicate co-benefits (such as improved health, climate mitigation, biodiversity conservation and restoration, and overall resilience)**, facilitate communication across stakeholders, make commitments more tangible and thus facilitate effective implementation of policies, corporate strategies and investment objectives.

To be effective, the indicator should:

- Track meaningful progress towards agreed transformational objective
- Be simple enough to engage policymakers, suppliers, producers and consumers
- Reflect multiple benefits like sustainability, health, resilience and global justice without becoming overly complex
- Enable coordination across policy areas and unlock financing for scaling innovations

Innovations identified within the context of the the Leibniz Lab

A range of innovations in the agri-food sector is currently being explored by the institutes participating in the Lab. These include for example the following:

- **Local and regional food systems (Leibniz Centre for Tropical Marine Research, ZMT; Leibniz Institute of Vegetable and Ornamental Crops, IGZ):**

ZMT investigates local and regional food systems for coastal communities in the tropical Global South, in particular through marine food and small and artisanal fishery. While often fragile, ZMT identifies social-ecological systems that work through participation and local rules, the advancements of Integrated Multitrophic Aquaculture systems (IMTA), all added by smart data (e.g. Marine Atlas of Peru). Innovations are considered systemic by addressing both a socio-cultural and a technical perspective. A more circular aquaculture (e.g. using coffee waste as input for shrimps production) is done too.
IGZ research emphasises the importance of strengthening local and regional agri-food systems through horticultural innovations that ensure resilient and sustainable production close to consumers. By focusing on crop diversity, urban farming concepts, and regional adaptation, IGZ contributes to reducing dependency on global supply chains.

- **Use of algae and alternative proteins such as insects (Leibniz Centre for Tropical Marine Research, ZMT; Leibniz Institute of Vegetable and Ornamental Crops, IGZ):**

ZMT investigates, inter alia, into changing preferences for using algae among school kids and does a range of analyses related to jellyfish as a resilient yet protein-rich future food. This work is lab-based and, partly, supported by field work – e.g. on harvesting sea grapes or coastal social-ecological systems.
IGZ investigates novel food sources such as algae, halophytes, and underutilised indigenous vegetable crops to broaden the food base for future nutrition. These studies aim to create sustainable cultivation systems that require fewer resources while providing healthy alternatives to conventional protein.

- **Circularity bioeconomy (The Leibniz Institute for Agricultural Engineering and Bioeconomy, ATB)**

A circular, diverse, innovative and sustainable bioeconomy can produce healthy food from renewable raw materials. ATB is currently developing and testing climate-smart food production, residue valorisation and energy-efficient post-harvest systems among others. In particular, ATB has ongoing projects with local and international partners on alternative foods and feeds based on insects and algae, value chain technologies for processing and preservation of fruits and vegetables, food safety and certification and digital agriculture and precision livestock systems.

- **Community-supported agriculture (CSA) (Leibniz Institute of Ecological Urban and Regional Development, IOER):**

Community-supported agriculture (CSA) is a social innovation that builds a direct partnership between producers and consumers, strengthening local food systems and promoting sustainability. The IOER focuses on the scaling dynamics of the CSA movement in Germany. They investigate how network formation, strategic collaborations, and the role of key intermediaries can foster collective growth and resilience. By analysing these relational structures, our work aims to identify effective strategies to help these vital community-based initiatives scale while maintaining their transformative potential.

- **Food waste reduction strategies (Leibniz Institute of Vegetable and Ornamental Crops, IGZ):**

IGZ does not work directly to reduce food waste, but indirectly through the recycling of nutrients. The recovery of nutrients from human sanitary waste and its conversion into safe recycling fertilisers for horticultural production reduces the waste of limited natural resources, especially for the critical elements nitrogen and phosphorus. These innovations are linked to multiple policy objectives: they promote health through improved nutrition and food safety, support climate goals by reducing greenhouse gas emissions directly or reducing the energy use, and enhance resilience by strengthening regional value chains and enabling circular resource flows.

- **Sustainable consumption and production (Wuppertal Institute for Climate, Environment and Energy, WI):** Following the vision of the International Resource Panel to decouple well-being from resource consumption, the WI applies a sustainable consumption and production perspective on agrifood systems. It develops tools to support competencies and sustainable consumption decisions at the point of sale. It further uses the disciplines design and social science to develop innovative user-orientated product service systems in transdisciplinary settings. It also considers production-sided options, e.g. new technologies as the basis for novel food environments. The sound expertise on sustainability assessment and indicator systems is inherently included in all of the projects.

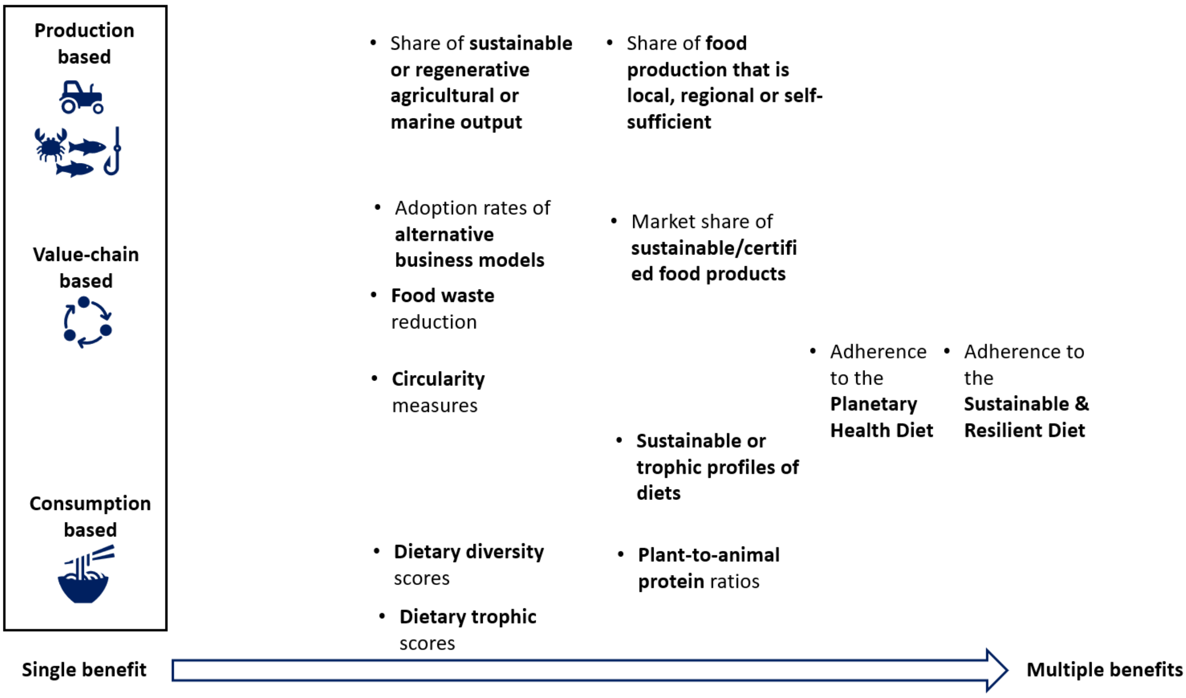
What could be potential indicators to gain traction?
During the workshop, we explored a range of potential indicators (types) that could help present and monitor progress in the transformation of the agri-food sector in a way that is both policy-relevant and communicable. **Emerging from the previously discussed innovations, we identified indicators that could be useful to measure their progress**. These identified indicators include:

- the share of food production that is local, regional, or self-sufficient,
- the share of agricultural output adopting sustainable or regenerative practices,
- dietary diversity scores, dietary trophic scores
- plant-to-animal protein ratios,
- the sustainability or trophic profiles of diets (Lukas et al., 2014),
- percentage of calories that are healthy, climate friendly, biodiversity friendly and safe (Deutsche Gesellschaft für Hauswirtschaft e. V., 2024; Heinz et al., 2023; Hunecke et al., 2025a)
- adherence to the Planetary Health Diet (Willett et al., 2019),
- adherence to the "Sustainable & Resilient Diet" (Hunecke et al., 2025b)
- the market share of sustainable or certified food products,
- share of consumers following the planetary health diet/ the Sustainable & Resilient Diet
- share of alternative business models such as farm-to-fork or community-supported agriculture,
- or metrics of food waste reduction and circularity.

These Indicators were then broadly categorised by their **position along the agri-food sector's value chain** (production side, consumer side, or more holistic value chain perspective). It was further noted that certain indicators emphasise transition by highlighting specific elements directional shifts, such as reductions in food waste or the food diversity score of diets, whereas others synthesise multiple dimensions, like nutrition, environmental impact, and affordability into composite measures. These distinctions help clarify whether an indicator is illustrating current system performance, long-term impact, or the pace of transformation.

Figure 1 maps the identified indicators along these categories. The figure shows the indicators' position within the value chain (production, consumption, or broader value chain perspective) and whether whether they address a single benefit or multiple co-benefits. This helped clarify the strengths and limitations of each indicator category. For example, production-based indicators connect regional resilience and sustainability but risk neglecting consumption patterns. Consumer-based indicators may link system-level change to consumption and dietary behaviours and health outcomes but may overlook structural barriers to adopting sustainable diets. Value-chain indicators are useful for capturing broad structural shifts but depend on standardised definitions and harmonised data, which may often not be sufficiently available.

Figure 1: Example of classification of identified indicators



Source: Own representation based on the workshop discussions.

Across all types, **health-centred indicators emerged as especially promising**. Framing health as a central entry point appears to offer a credible and resonant way to aggregate and communicate multiple co-benefits, including climate mitigation, biodiversity, conservation, and social equity. Moreover, a health-oriented narrative is often more accessible to a broader public and may thus support broader political acceptance and engagement. Participants noted, however, that this would require careful framing and possibly a taxonomy-like structure to define boundaries (e.g., “do no significant harm” principles) and ensure alignment with broader societal goals rather than individual lifestyle preferences.

Outlook: Towards a shared metric for agri-food sector transformation

Bringing these strands together, a key insight from the workshop was the importance of clearly distinguishing between overarching policy objectives and the operational role of indicators in advancing them. While goals like improving health, mitigating climate change, enhancing biodiversity, and fostering employment provide the strategic direction, indicators must serve as practical tool translating this ambition into measurable signals that can guide action, align diverse actors, and enable accountability.

This led to a set of open questions that remain central to the next phase of work:

- Is it plausible to develop one central indicator, likely health-based, that can effectively capture systemic co-benefits across the agrifood domain - if some loss of precision is accepted in exchange?
- How should such an indicator be framed within a taxonomy, for example by establishing red lines or minimum criteria, to ensure it reflects broader environmental and societal goals rather than individual preferences, and to consider it motivational rather than bashing individual habits?
- What institutional and governance conditions are necessary for such an indicator to gain political traction and be integrated into decision-making processes?

In light of these discussions, the workshop identified several next steps.

- To assess the existing conceptual and empirical groundwork on food, health, and sustainability indicators, with the aim of understanding where common foundations already exist and where gaps remain. To the extent possible this should also reflect the need to align coastal ‘blue’ marine food with a prevailing terrestrial farm-oriented agenda.
- Developing a **health-centred progress indicator** that is both robust and broadly communicable.

- This includes testing its legitimacy and relevance with diverse stakeholder groups (e.g., policymakers, researchers, and civil society) and exploring how it could be embedded into existing monitoring systems or sustainability frameworks at national, European, and international levels.

Thus, we aim to contribute towards bridging the gap between innovation and governance by providing a shared reference point, capable of mobilising support, aligning efforts, and enabling accountability in the transformation of the agrifood system.

References

Becke, C., Diógenes, A., Eljasik, P., Ferraz, R., Gallani, S., Roy, K., Lopes, I., Naas, C., Ogashawara, I., & Ribeiro, A. (2025). *Advancing sustainability and circularity in aquaculture to build a resilient global food system*. Deutsche Akademie der Naturforscher Leopoldina.

Béné, C. (2022). Why the Great Food Transformation may not happen – A deep-dive into our food systems' political economy, controversies and politics of evidence. *World Development*, *154*, 105881. https://doi.org/10.1016/j.worlddev.2022.105881

Crona, B. I., Wassénius, E., Jonell, M., Koehn, J. Z., Short, R., Tigchelaar, M., Daw, T. M., Golden, C. D., Gephart, J. A., Allison, E. H., Bush, S. R., Cao, L., Cheung, W. W. L., DeClerck, F., Fanzo, J., Gelcich, S., Kishore, A., Halpern, B. S., Hicks, C. C., … Wabnitz, C. C. C. (2023). Four ways blue foods can help achieve food system ambitions across nations. *Nature*, *616*(7955), 104–112. https://doi.org/10.1038/s41586-023-05737-x

da Silva Vieira, R., Lyytimäki, J., Virkkunen, H., Tool, B., & Köhler, J. (2025). *Towards European food systems transition monitoring framework and indicators*. https://doi.org/10.5281/ZENODO.14673804

Deutsche Gesellschaft für Hauswirtschaft e. V. (2024). Für Nachhaltigkeit sorgen. Dokumentation der Jahrestagung 2023 der Deutschen Gesellschaft für Hauswirtschaft. *Hauswirtschaft und Wissenschaft*, *72*, 1–62. https://doi.org/10.23782/HUW_04_2024

Elzen, B., & Barbier, M. (2024). *Agro-food transitions group (AFTG)*. https://www.transitionsnetwork.org/thematic-groups/transitions-in-agro-food-systems-aftg/

Engelmann, T., Speck, M., Rohn, H., Bienge, K., Langen, N., Howell, E., Göbel, C., Friedrich, S., Teitscheid, P., Bowry, J., Liedtke, C., & Monetti, S. (2018). Sustainability Assessment of Out-of-Home Meals: Potentials and Challenges of Applying the Indicator sets NAHGAST Meal-Basic and NAHGAST Meal-Pro. *Sustainability*, *10*(2), 562. https://doi.org/10.3390/su10020562

EU Comission. (2022). *REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL 2022 Report on the Achievement of the 2020 Renewable Energy Targets* (No. COM/2022/639 final).

Even, B., Thai, H. T. M., Pham, H. T. M., & Béné, C. (2024). Defining barriers to food systems sustainability: A novel conceptual framework. *Frontiers in Sustainable Food Systems*, *8*, 1453999. https://doi.org/10.3389/fsufs.2024.1453999

FAO. (2018). *Sustainable food systems Concept and framework*. https://openknowledge.fao.org/server/api/core/bitstreams/b620989c-407b-4caf-a152-f790f55fec71/content

Franco, A., Miserocchi, L., & Testi, D. (2023). Energy Indicators for Enabling Energy Transition in Industry. *Energies*, *16*(2), 581. https://doi.org/10.3390/en16020581

Hale, T. N., Chan, S., Hsu, A., Clapper, A., Elliott, C., Faria, P., Kuramochi, T., McDaniel, S., Morgado, M., Roelfsema, M., Santaella, M., Singh, N., Tout, I., Weber, C., Weinfurter, A., & Widerberg, O. (2021). Sub- and non-state climate action: A framework to assess progress, implementation and impact. *Climate Policy*, *21*(3), 406–420. https://doi.org/10.1080/14693062.2020.1828796

Hansson, H., Säll, S., Abouhatab, A., Ahlgren, S., Berggren, Å., Hallström, E., Lundqvist, P., Persson, U. M., Rydhmer, L., Röös, E., Tidåker, P., Winkvist, A., & Zhu, L. (2024). An indicator framework to guide food system sustainability transition – The case of Sweden. *Environmental and Sustainability Indicators*, *22*, 100403. https://doi.org/10.1016/j.indic.2024.100403

Heinz, J., Menzel, A., Wagner, L., Langen, N., & Speck, M. (2023). Dishing up biodiversity: How does out-of-home catering affect biodiversity? *Ernahrungs Umschau*, *70*(10), 116–124. https://doi.org/10.4455/eu.2023.017

Höhne, N., & Roy, J. (2021, November 3). *A seismograph for measuring the transformation to net zero greenhouse gas emissions – discussion paper*. New Climate Institute.

https://newclimate.org/resources/publications/a-seismograph-for-measuring-the-transformation-to-net-zero-greenhouse-gas

Hunecke, C., Thom, F., Vogt, J. H., Bellingrath-Kimura, S. D., Brück, T., Gaupp, F., Geppert, F., Grune, T., Herzfeld, T., Kulling, S. E., Ojha, S., Piorr, A., Regierer, B., Renner, B., Schlüter, O., Schreiner, M., Springmann, M., Weith, T., & Wiedmer, P. (2025a). Sustainable and Resilient Agrifood Systems (SARAS). A Leibniz Position. *Sustainable Development*, sd.3468. https://doi.org/10.1002/sd.3468

Hunecke, C., Thom, F., Vogt, J. H., Bellingrath-Kimura, S. D., Brück, T., Gaupp, F., Geppert, F., Grune, T., Herzfeld, T., Kulling, S. E., Ojha, S., Piorr, A., Regierer, B., Renner, B., Schlüter, O., Schreiner, M., Springmann, M., Weith, T., & Wiedmer, P. (2025b). Sustainable and Resilient Agrifood Systems (SARAS). A Leibniz Position. *Sustainable Development*, sd.3468. https://doi.org/10.1002/sd.3468

Lukas, M., Scheiper, M.-L., Ansorge, J., Rohn, H., Liedke, C., & Teitscheid, P. (2014). The nutritional footprint. *Ernahrungs Umschau*, *2014*(61(11)), 164–170. https://doi.org/10.4455/eu.2014.028

Mukherjee, K., Trieb, J., Niegowska Conforti, M., Di Martino, M., Fattori, V., & Lipp, M. (2025). *Exploring the future landscape of new food sources and production systems*.

Rockström, J., Thilsted, S. H., Willett, W. C., Gordon, L. J., Herrero, M., Hicks, C. C., Mason-D'Croz, D., Rao, N., Springmann, M., & Wright, E. C. (2025). The EAT–Lancet Commission on healthy, sustainable, and just food systems. *The Lancet*, *406*(10512), 1625–1700.

Schneider, K. R., Fanzo, J., Haddad, L., Herrero, M., Moncayo, J. R., Herforth, A., Remans, R., Guarin, A., Resnick, D., Covic, N., Béné, C., Cattaneo, A., Aburto, N., Ambikapathi, R., Aytekin, D., Barquera, S., Battersby, J., Beal, T., Molina, P. B., … Wiebe, K. (2023). The state of food systems worldwide in the countdown to 2030. *Nature Food*, *4*(12), 1090–1110. https://doi.org/10.1038/s43016-023-00885-9

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L., … Murray, C. J. L. (2019). Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, *393*(10170), 447–492. https://doi.org/10.1016/S0140-6736(18)31788-4