

REPORT 2

State of the Debate on Agri-Food Systems Transformation



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Contents

Preface	iv
Key messages	1
1 Introduction	2
1.1 State of the debate.....	2
2 Analysis methodology	6
3 The results of the analysis	8
3.1 People - Nourishing everyone for health and wellbeing.....	9
3.1.1 Food security	9
3.1.2 Nutritional health	9
3.1.3 Knowledge systems.....	10
3.2 Planet - Producing in harmony with nature	12
3.2.1 Climate change	12
3.2.2 Ecosystem integrity	12
3.2.3 The role of technology	13
3.3 Prosperity - Inclusive, transformative and equitable recovery for Agenda 2030.....	14
3.3.1 Affordability of healthy nutrition	14
3.3.2 Trade dynamics	15
3.3.3 Financing instruments	17
4 Summary and discussion	18
4.1 International stakeholder groups and main approaches.....	18
4.2 Frameworks and pathways.....	23
4.3 Common action areas.....	28
5 What's missing in the debate	30
Appendix 1	32
References	34

Preface

Why we urgently need an international policy framework to govern agri-food systems transformation

The internationally agreed sustainability goals of the 2030 Agenda, the Paris climate agreement and the goals of three **Rio Conventions** that address, respectively, climate (UNFCCC), land restoration (UNCCD) and biodiversity (CBD) **cannot be achieved without a transformation of the world's agri-food systems.**

Today's increasingly industrialized and concentrated agri-food systems are contributing to accelerated biodiversity loss, climate change and other environmental impacts, while failing to address rising food insecurity, malnutrition and food waste. They are also undermining more biologically diverse and climate-resilient food production and distribution systems that are built around smallholder production and local markets.

Transformative agricultural practices, on the other hand, **have the potential to future proof agri-food systems.** An example is when farming sequesters atmospheric carbon, effectively creating a massive carbon sink in the ground, while simultaneously improving soil health.

At the same time, the world continues to feel the impacts of multiple interlinked crises: a climate emergency; ongoing consequences of the COVID-19 pandemic; distortion of global trade in agricultural commodities by the Russian war in Ukraine and its contribution to rising energy and food insecurity; continuing conflict hotspots within countries and across national borders; and the environmental, social and health impacts and external cost of unsustainable production and consumption patterns. We refer to these crises collectively as the **"4 Cs" – Climate, Covid, Conflict and Costs.**

Beyond their immediate consequences, the 4 Cs have introduced new variables that **necessitate a rethink of how to implement existing multilateral agreements.** The 4 Cs impede progress made on internationally agreed sustainable development goals and hence appropriate strategies need to be developed in face of these new challenges to achieve inclusive and sustainable global development. A unique characteristic of today's agri-food systems is that they are simultaneously a casualty, an underlying cause, and a potential solution to these crises. Transitioning to sustainable and resilient agri-food systems has, therefore, the potential to mitigate and respond positively to these crises. However, this can succeed only if proposed transformative actions duly factor in the 4 Cs.

Achieving the right to food for all while transitioning to a more socially inclusive and environmentally sustainable future therefore calls for nothing less than the transformation of our agri-food systems. While a systemic international agreement for agri-food systems transformation has yet to be developed – which from experience could take up to a decade to negotiate and ratify – **the three Rio Conventions could offer insights on possible entry points, as well as pathways towards the required transformative actions.** Not only do they draw their legitimacy from three legally binding international treaties but with their joint focus on the environmental pillar of sustainable development, the Conventions already have a broad mandate to pursue greater synergies.

This provides a fitting starting point for jointly exploring how to address agri-food systems transformation with the existing mandate of each Convention coordinating the efforts. A possible approach is to build on the “Food Days” introduced at all three sessions of the Rio Convention Conference of the Parties in 2022, to practically demonstrate how to **move beyond consensus on the need for urgent transformation towards specific proposals** on what needs to be done, and who should take responsibility for initiating action.

Such efforts can benefit from adopting **True Cost Accounting approaches**, which undertake integrated assessments of all externalities of agri-food systems. This **can support decision makers** to quantify both the value that a transformation of agri-food systems can bring to global sustainability processes, as well as the costs of inaction.

The coordinated action of the three Rio conventions under an **international policy framework would also provide the necessary financial resources** for the required transformative measures. Under this framework, transformative actions in agri-food systems can be funded based on their contributions to fulfilling the mandate of the three Rio Conventions, using a mechanism similar to the Rio Markers mechanism of the European Commission.

Corresponding actions under an international policy framework will also be needed at the regional and national levels. **A whole-of-government approach is required** to stimulate exchanges and negotiations across sectors and make tough choices about how to balance global goals with local needs. The ‘synergies agenda’ can be further expanded upon by revisiting existing commitments and targets that touch on food security, social inclusion, international trade, and other relevant elements within the Rio Conventions to drive more transformative actions. This would strengthen political structures that focus on the right to food, healthy nutrition, and protecting land, biodiversity and climate.

The FORESEE (4C) Report Series: A brief outline

TMG's new report series *FORESEE (4C) – The Transformation of Agri-Food Systems in Times of Multiple Crises* informs the debate on agri-food system transformation in six ways:

1. Identifying the key issues and hence the need for transformation of our agri-food systems,
2. Analysing the conditions that make transformation both urgent and complex,
3. Assessing the extent to which the existing policy landscape is suitable for transformative action,
4. Analysing the debate to better understand where different actors agree or disagree on transformation pathways,
5. Identifying blind spots and neglected issues in the debate,
6. Proposing recommendations on how to advance the conversation.

The first report, *Current Conditions & Policy Frameworks of Agri-Food Systems Transformation* takes a systems view of the aforementioned challenges. It outlines the ecological, health and social challenges of current agri-food systems and analyses how these interact with the 4 Cs (Climate, Covid-19, Conflict and Costs). Furthermore, the report reviews the existing policy frameworks at the international level that inform the direction of, and could potentially steer, the transformation of agri-food systems.

The second report, *State of the Debate on Agri-Food Systems Transformation*, conducts a critical discourse analysis to examine alignment, as well as divergence in current understanding of agri-food systems and potential pathways for agri-food systems transformation. The analysis further reveals important blind spots that have only been marginally addressed in the transformation debate but are essential for a holistic approach.

Current gaps in the agri-food systems transformation debate are analyzed in more detail in the third report, *Blind Spots in the Debate on Agri-Food Systems Transformation*, which also provides recommendations to address these gaps.

The report series was developed by TMG together with a group of experts from different disciplines and backgrounds. In an iterative process of meetings and workshops, the experts provided advice and feedback on the development of the reports and contributed as authors to the second and third reports in the series. The research was made possible thanks to funding under the Assessment and Communication of Climate Impacts of Food (CLIF) project through the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection.



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Key messages

1

The current debate around the need to change the way food is produced, valued, and consumed involves a wide range of actors, from civil society and expert groups to corporations, governmental and intergovernmental organizations.

2

Based on numerous scientific studies showing that current agri-food systems do not deliver healthy food for all people yet contribute to many of the world's sustainability problems, a consensus has emerged that incremental changes are no longer enough and that a transformation of the agri-food system is needed. However, there is not yet consensus on how to achieve this, and a variety of approaches have been advanced.

3

Although the proposed approaches aim for different solutions to the problems, they can all be positioned within the three thematic areas of people, planet, and prosperity.

4

Broadly speaking, the different approaches and transformation pathways can be divided into those that propose structural changes and those that propose technical or technological fixes.

5

There is general agreement among stakeholders that a transformed food production system should deliver nutritious food to people and equity to farmers, but not at the cost of human and planetary health.

6

Several issues that are absent or inadequately addressed in the debate. These include inefficient governance of agri-food systems and transformation processes, polarization of opinions hampering a coherent strategy for transformation, ignoring traditional knowledge and practices, externalized costs, and role of trade dynamics in agri-food systems transformation.

1

Introduction

The discourse around the need to create sustainable agri-food systems has gained momentum in recent years within civil society, the business sector, and both governmental and intergovernmental bodies.¹

An increasing number of reports and recommendations about agri-food systems transformation published by a variety of expert groups and international organizations have stimulated political as well as scholarly interest and have begun to inform global policy dialogues. A recent example was the United Nations Food System Summit (UNFSS), which took place in September 2021. It aimed to “launch bold new actions to transform the way the world produces and consumes food, delivering progress on all 17 Sustainable Development Goals”.²

This report presents the finding of a documentary analysis which adds to the existing literature by deepening our understanding of both common and diverging opinions on how to transform global agri-food systems.ⁱ It draws upon recent international discourses such as the United Nations Food Systems Summit 2021 (UNFSS) and conversations around agriculture and food systems at the Food Pavilion of the 27th Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC COP27). The analysis aims to determine if a common global transformation pathway can be identified or if broader differences and polarized approaches dominate the debate.

After providing an overview on the findings of previous literature reviews, we proceed with a discourse analysis and a discussion of the results. At the end we provide a brief overview of the topics that are absent or inadequately addressed in the debate.

1.1 State of the debate

In recent years, there has been an exponential increase in the volume of scientific publications on the topic of ‘food system transformation’ (Figure 1). With this increase in publications by a range of stakeholder groups, the scope of diverging interpretations and sometimes conflicting solutions for transformation pathways has also broadened. To date, only a few studies have conducted an in-depth literature review and discourse analysis of such reports, exploring and problematizing the different narratives and understandings of food systems transformation.^{3,4}

i For details on the analysis see Report 1 of the *FORESEE (4C) – The Transformation of Agri-Food Systems in Times of Multiple Crises* series.

Growing field of research

Number of scientific publications on “food system transformation”

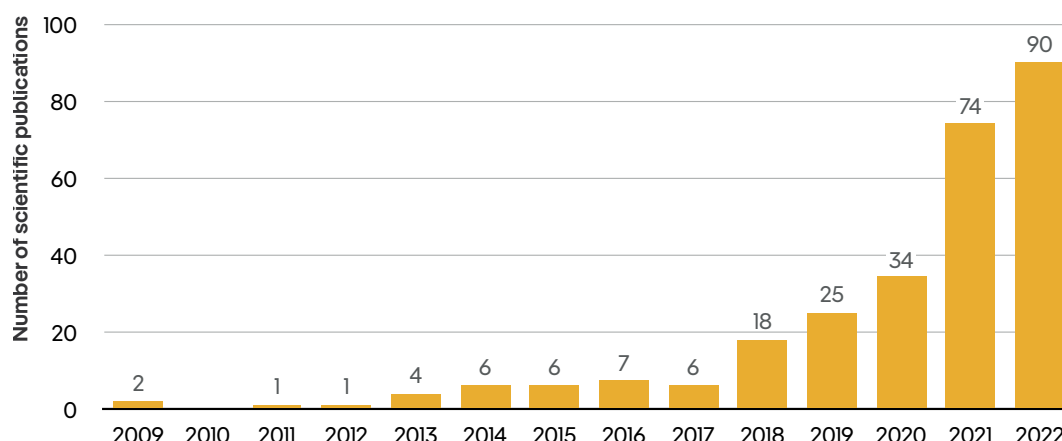


FIGURE 1 The number of scientific publications published per year with the term ‘food system transformation’ in their titles or abstracts in Scopus, Elsevier.

The key findings of these studies are summarized in the following sections.

A study by Béné *et al.* (2019)³, which does not explicitly refer to ‘transformation’ but to the agri-food systems sustainability literature more generally, provides valuable insights into the differing narratives around failing agri-food systems, proposed solutions, and the varying interpretations of sustainability within these narratives. Analysing a wide range of documents on agri-food systems (between 2000 and 2017), they find that the concepts of sustainability and transformation – though widely used and acknowledged by various communities of practice (agriculture, nutrition, agroecology, socio-ecology) – remain poorly defined.

While there seems to be agreement on the problem statement that “the food system is failing us and we need to do something about it”, Béné *et al.* (2019)³ identify diverging interpretations of the actual nature of the problem. The literature criticizes the inadequacy of current agri-food systems to:

- feed the future world population;
- provide diverse healthy diets;
- produce equal and equitable benefits;
- function sustainably without negative impacts on the environment.

Subsequently, different understandings of priorities for action (e.g., closing the yield gap; closing the nutrient gap; decentralization etc.), which signify different narratives, have developed over time.

Béné *et al.* (2019) conclude that any agenda for sustainable food systems needs to consider political economy and that food systems research needs to focus more on trade-offs to better understand them.³

Slater *et al.* (2022)⁴ analyzed numerous major reports on agri-food systems transformation (published between 2016 and 2020) and their recommendations issued by state actors, market actors and civil society,ⁱⁱ and assessed the transformative potential of these recommendations. They found that some of the causes and drivers of current food system challenges – for example, political economy factors including power asymmetries between actors and corporate concentration of power – are rarely addressed. Instead of seeking to initiate paradigm shifts and transform agri-food systems by radically changing existing structures, most of the recommendations aim to adjust or reform agri-food systems by improving only parts of the system. Many of those recommendations use broad and ambiguous language that only gives information about *what* type of action is required but ignores *how* the envisioned changes can be achieved.⁴

The authors find that the reports published by independent expert groups and NGOs propose more transformative actions grounded in challenging political and economic structures, while market actors focus on more apolitical market-based and technical solutions. There are similarities in messaging across all the reports, such as the opportunity of food systems transformation to deliver on the SDGs, fulfil obligations under the Paris Agreement, and achieve other relevant internationally agreed goals (e.g., on biodiversity), and on the common goal to move towards healthy and sustainable food systems for people and the planet.^{3,4}

TABLE 1 The main objectives of sustainable food systems based on a survey conducted by the German Federal Environment Agencyⁱⁱⁱ

Objectives	Public approval (survey)
Good working and income conditions for workers	Predominantly
Empowerment of the rural sector	Predominantly
Regional trade and production systems	Predominantly
Global free trade	Partially
Promoting regional, seasonal, and fresh produce	Predominantly
Reduction in consumption of animal products	Partially
Government support for healthy diets	Partially
Government support for more eco-friendly products	Predominantly
Ban on genetic engineering	Predominantly
Extensive mechanization of agriculture	Partially
Smallholder agriculture	Predominantly
Combination of bio-, ego- and sociotropic values	Predominantly

A study conducted by Germany's Federal Environment Agency (*Umweltbundesamt*) presents an overview of the societal understanding and approval of the different aspects and possible objectives of a sustainable agri-food system⁵. The results of a survey conducted by the agency are presented in the following table, where 'predominantly' represents the case where more than 66% of the survey respondents agreed 'fully and completely' or 'tended to agree'

ii Actor categories were defined according to Baker and Demaio (2019): state actors include intergovernmental organizations; market actors include private-interest for-profit organizations; civil society includes NGOs, social movements, research organizations and academics.

iii German Federal Environment Agency, Transformation des Ernährungssystems: Grundlagen und Perspektiven. https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2019-08-15_texte_84-2019_transf-ern-apl_0.pdf

with the proposition. The marker 'partially' represents cases where between 33% and 66% of the respondents stated that they agreed 'fully and completely' or 'tended to agree'. In the event of several surveys on a specific objective, an average was used for overall assessment of the objective.⁵

2

Analysis methodology

The analysis considers the global agenda of fifteen international institutions (based on published reports and their webpages) that exercise significant influence on policymakers and that present the view of the agri-food systems from a global perspective.

The reports included in the analysis are listed in Appendix 1. The action plan proposed by the 2021 United Nations Food Systems Summit (UNFSS) forms the basis for the analysis. We analyzed the discourse on agri-food system transformation by diverse expert groups and organizations as well as the varying narratives and pathway approaches contained therein in view of the three major thematic areas of interest – **People**, **Planet**, and **Prosperity**. These three themes were highlighted in the speech by the UN Secretary General at the conclusion of the UN Food Systems Summit in September 2021.⁶ Based on the analysis, the focus of the different approaches and narratives can be summarized under the aims listed under the following thematic areas, viewed from the listed thematic lenses:

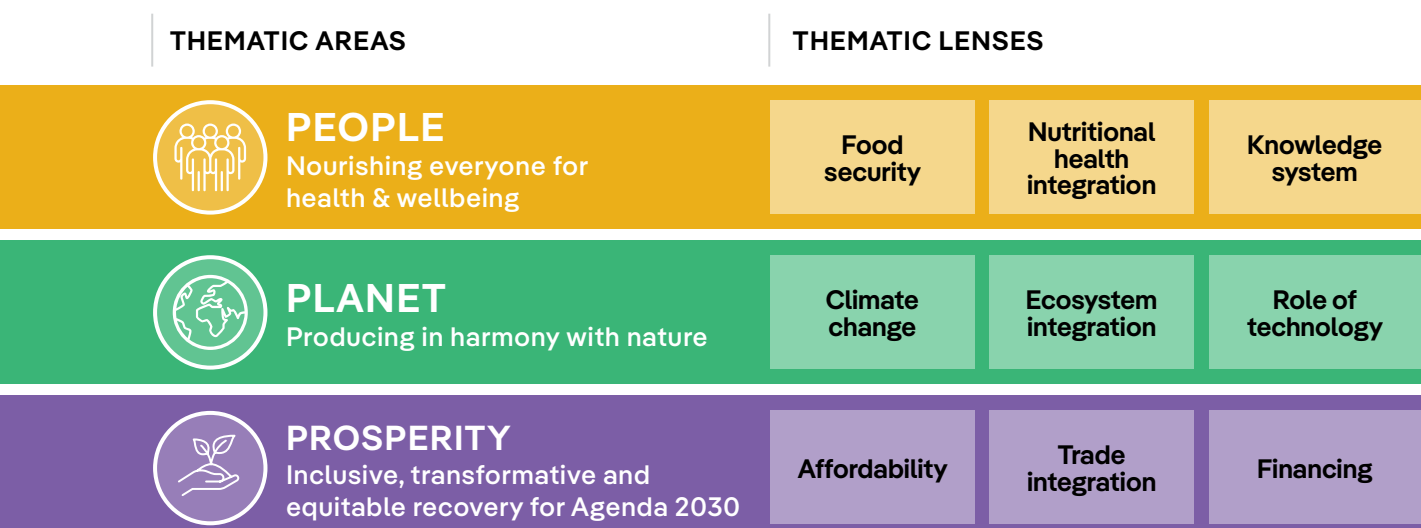


FIGURE 2 The three major thematic areas of interest and associated thematic lenses.

Our analysis summarizes areas of convergence and divergence among the different institutions (organizations) for each of these nine areas of special consideration (thematic lenses). The proposed approaches and main pathways are then evaluated in terms of their relevance to the five action areas proposed by the UNFSS:⁶

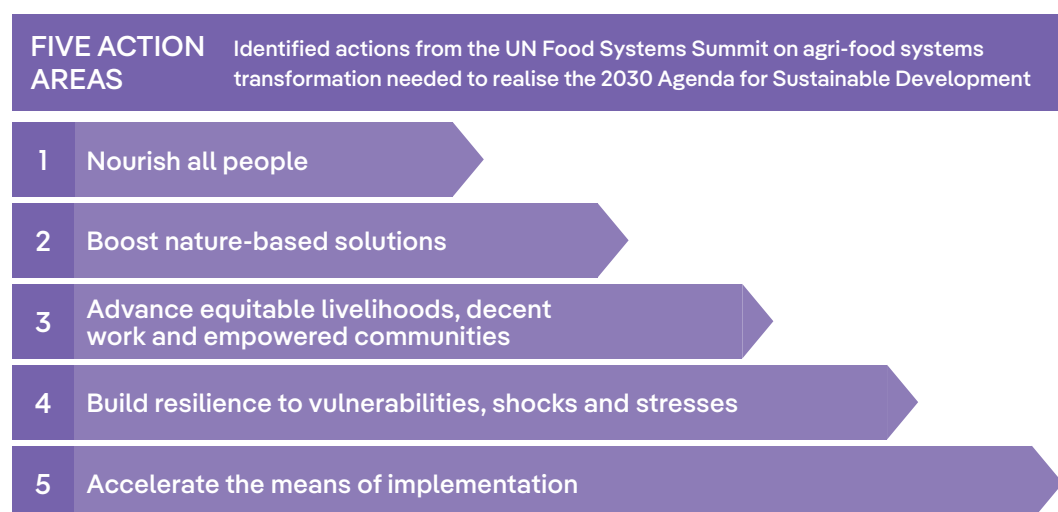


FIGURE 3 Five action areas proposed by the UN Food Systems Summit in 2021.

For this analysis, the publications of fifteen international or intergovernmental organizations and institutions were reviewed. These organizations represent the bulk of the participants in the international debate on agri-food systems. The organizations selected for this analysis can be broadly divided into three main stakeholder groups as follows:

- **Civil society and expert groups:**
 - Global Alliance for the Future of Food (GAFF)
 - International Panel of Experts on Sustainable Food Systems (IPES-Food)
 - International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD+10)
 - European Commission's Standing Committee on Agricultural Research (SCAR)
 - Glasgow Food and Climate Declaration (UNFCCC-Glasgow)
- **Businesses and expert groups:**
 - World Economic Forum (WEF)
 - World Business Council for Sustainable Development (WBCSD)
 - EAT-Lancet Commission (EAT)
 - Food and Land Use Coalition (FOLU)
 - Food, Agriculture, Biodiversity, Land-Use and Energy Consortium (FABLE)
- **Intergovernmental organizations and initiatives:**
 - United Nations Food System Summit (UNFSS)
 - Food and Agriculture Organization of the United Nations (FAO)
 - International Fund for Agricultural Development (IFAD)
 - Consortium of International Agricultural Research Centres (CGIAR)
 - International Food Policy Research Institute (IFPRI)

3 The results of the analysis

The analysis is presented in the following section and is divided into three sub-sections corresponding to the three fundamental thematic areas of action – people, planet, prosperity.⁷

These sub-sections present the approaches promoted by the different organizations for each area of interest. The findings derive from an analysis of the reports by actors listed in Appendix 1. The tables in the following sub-section present the approaches that the different organizations advance.

The discourse analysis framework

The ways proposed by various organizations to transform the food system have been grouped into three types of approaches under the three thematic areas of the UN Food Summit and the further nine areas for special consideration




 PEOPLE Nourishing everyone for health and wellbeing		
Food security	Nutritional health	Knowledge system
<ul style="list-style-type: none"> • Production approach • Dietary approach • Access approach 	<ul style="list-style-type: none"> • Soil-based approach • Novel food approach • Foodomics approach 	<ul style="list-style-type: none"> • Producer-centred approach • Science-based approach • Access-based approach
 PLANET Producing in harmony with nature		
Climate change	Ecosystem integration	Role of technology
<ul style="list-style-type: none"> • Agricultural practices approach • Technology-centred approach • Dietary approach 	<ul style="list-style-type: none"> • Management approach • Dietary approach • Innovations approach 	<ul style="list-style-type: none"> • Endogenous technology approach • Exogenous technology approach • Closing the technology gap
 PROSPERITY Inclusive, transformative & equitable recovery for the 2030 agenda		
Affordability	Trade	Financing
<ul style="list-style-type: none"> • Smallholder's affordability approach • Public support approach • Poverty-sensitive approach 	<ul style="list-style-type: none"> • Localization approach • Regulated markets approach • Sustainable globalization approach 	<ul style="list-style-type: none"> • Incentivizing autonomous growth • Public support approach • Integrated approach

FIGURE 4 The analysis framework based on the UNFSS thematic areas of People, Planet, Prosperity and the results of the analysis in the form of the different proposed approaches

3.1 PEOPLE

Nourishing everyone for health and wellbeing

3.1.1 Food security

In the analyzed publications, there appears to be consensus that, in terms of calorie demand, the world produces enough food to meet global needs,^{7,8,9} but that yield per hectare is no longer a sufficient performance metric. With the Sustainable Development Goals (SDGs) in sight, the transformation discourse unites the different actors around the desire for integrated policies and the application of a systems approach.^{3,4} The complex issues of food security – encompassing availability, access, distribution, and stability – are addressed by all, yet views differ on which practices or innovations would solve the hunger and nutrition problems. In the current and the following sub-sections, the organizations are broadly grouped into three categories based on the overarching approach they dominantly promote.

The main approaches promoted by these organizations for ensuring nutritious food for the world population can be summarized as follows:

Production approach

Engaging more people on the food supply side (to support rural development and employment instead of transferring land-based farming to industrial production in labs and buildings), including feminist agroecology (IPES-Food, GAFF), regenerative agriculture (WEF), nature-positive farming (WBCSD, FOLU), circular systems (SCAR) and diversified (IFAD) systems.

Dietary approach

Focusing on changing demand through dietary shifts (EAT, FOLU, FABLE, UN).

Access approach

Leveraging producers' control over productive resources, from promoting food sovereignty (IPES-Food, IAASTD+10) and local food systems (FAO) to repurposing agricultural support (CGIAR).

Several stakeholders explicitly recognize that gender equality and empowerment are important levers for food security and for agri-food systems transformation more generally because of women's central role in agriculture and in decisions regarding health and nutrition (FOLU, UNFSS, GAFF).

3.1.2 Nutritional health

There is a general recognition that unhealthy diets and the resulting malnutrition contribute in a major way to the global syndemic of non-communicable diseases (such as heart disease, cancer, COPD, and diabetes), and that there is therefore a need to produce and supply healthier and more nutritious foods. All parties call for more proactive government policies (procurement, taxation, regulation) to promote healthy nutrition and discourage unhealthy options. There is a general agreement that trans fats, salt, and sugar content in food must be reduced, that more fruits, vegetables and nuts are required, and that healthy and sustainable diets match climate

and biodiversity strategies. Recommendations to eat less meat aim for better health outcomes, with reduced meat consumption having a positive environmental side effect as pressure on land is reduced.

However, there is an enormous divide regarding which kind of food (production) ensures more nutrition and health. The different approaches can be summarized as follows:

Soil-based food approach

This approach encourages a shift from extractive to restorative agriculture, such as agroecology, including integrated and grass-fed animal systems that pay more attention to animal welfare and food quality (GAFF, IPES-Food, IAASTD+10).

Novel food approach

This approach trusts in the capacity of digital and genetic science to produce more nutritious, affordable food, including a diversified protein supply from plant-based, insect-based, and laboratory-cultured food (WBCSD, EAT, FOLU, FABLE).

Foodomics approach

Between these two opposed approaches, the UN system combines a classical view of biochemical food composition inventories with modern tools (e.g., mass spectrometry technologies, bioinformatics, microbiome science) to promote industrial fortification and biofortification of certain foods (UN, FAO, IFAD, CGIAR).

3.1.3 Knowledge systems

Knowledge is one of two contentious topics (in addition to technology) in debates on agri-food systems reform, as it includes both indigenous, traditional ecological knowledge and modern or Western scientific knowledge. The latter is often understood to be universal while the former is often thought to only relate to particular people and their understanding of the world. Yet indigenous knowledge and land management based on observation of natural processes play a crucial role in agri-food systems. This knowledge system that puts immense value on empirical practice and traditional knowledge passed down through many generations encompasses millennia of traditions that are being supplanted by the industrial and digital revolutions. Contrary to this approach, the modern knowledge system is led by the positivist belief that technology of one kind or the other can solve all humanity's problems. Science-based innovations in agri-food systems include intelligence and robotics, remote sensing, big data analysis, genetic engineering, genome editing, plant-based and insect-derived protein, cell factories, microbiome and soil and plant health technologies, plant nutrition technologies, animal production and health technologies, using insects and oil-rich modified legumes as fish feed in sustainable aquaculture, sub-surface drip irrigation with conservation agriculture, precision agriculture, vertical farming, indoor farming, and digitized food processing.

The choice of knowledge system to be followed in transforming the agri-food systems will determine which pathways the transformation will follow. While knowledge can be considered a public good, innovations are mostly held privately. Although research and development is usually funded by public money, the profits from and control over the end products is concentrated in a few hands. This can cause power asymmetries, an issue that is poorly

addressed by most stakeholders. Some stakeholders (e.g., CGIAR) claim that science-policy interfaces could play a decisive role in creating a level playing field if they were able to overcome polarized debates and sectoral fragmentation. The heart of the issue is that science is often limited to technological innovations, rather than being considered as a whole knowledge system including soft skills, hard technologies, and indigenous and traditional knowledge. Furthermore, power and politics are often not considered in the context of technological innovations.

Food system stakeholders recognize, to differing degrees, the need to blend traditional and modern knowledge (based on science and innovation), as well as the need for transdisciplinary research to enhance both agroecological and technical innovation. The approaches to agri-food systems transformation advanced by the organizations we analyzed can be categorized as follows:

Producer-centred approach

This approach stipulates that agroecological knowledge and indigenous foodways, articulated through the practices of food producers, need to be strengthened – and this requires democratizing knowledge systems and curtailing corporate power (GAFF, IPES-Food, IAASTD+10).

Science-based approach

Focus on ‘multi-stakeholderism’, whereby corporations draw governments, scientists, and some civil society organizations into a new form of multilateralism, guided by scientific targets (WEF, EAT) and financially supported by governments (FOLU, FABLE). To this end, some actors at the UNFSS proposed creating an IPCC-like organization called the ‘International Panel for Food System Science’ to establish a common science base and develop consensus around contentious areas of policy. However, civil society organizations did not welcome this proposal as they believe the Committee on World Food Security (CFS) already carries this mandate.

Access-based approach

This approach stipulates that farmers should have greater access to digital technologies to manage resources more efficiently, reduce food loss, connect with new types of customers (SCAR), and access different kinds of social and economic services, such as digital finance, FinTech, digital agricultural insurance schemes and farm registries (FAO’s Digital Farmer Services, IFAD).

3.2 PLANET

Producing in harmony with nature

3.2.1 Climate change

Climate resilience is among the mostly shared narratives for agri-food systems transformation. There is a general concurrence with the Glasgow Food and Climate Declaration, which embeds food and land use reforms in the ambitious Nationally Determined Contribution (NDC) submissions under the UN Framework Convention on Climate Change (UNFCCC). Carbon farming, leading to carbon sequestration and emissions reduction, and the associated payment schemes for farmers are proposed as useful incentives (UNFSS, IFAD), along with climate risk insurance and forecast-based government financing (FAO) and re-purposing agricultural subsidies to finance both mitigation and enhancement of agricultural productivity (CGIAR). However, approaches to climate change resilience are mostly divided regarding which solutions are more appropriate for adaptation, mitigation, and risk prevention. Some of these approaches focus mainly on adaptation while others give due consideration to mitigation. These approaches can be summarized as follows:

Agriculture practices approach

Climate resilience that builds on natural processes, such as agroecology, benefits smallholder farmers, rehabilitates degraded land and pastures, while reducing risk through reduced reliance on fossil fuel-based agricultural inputs, and increased soil carbon sequestration (GAFF, IAASTD+10). IPES-Food reports that civil society-led food system transformation could shift USD 4 trillion from the industrial food supply chain to food sovereignty and agroecology, cut 75% of food systems' GHG emissions, and deliver incalculable benefits to the lives and livelihoods of billions of people over the next 25 years.

Technology-centred approach

Technology-centred solutions (e.g., geo-engineering, large-scale carbon capture), climate-smart agriculture (WBCSD), improved feed, methane capture from pork and dairy operations (FABLE), and carbon offset trading schemes (WEF) are considered the most effective interventions, though there are calls for governments to put a price on carbon and to scale up initiatives such as REDD+ (Reduce Emissions from Deforestation and forest Degradation, plus foster conservation) (FOLU).

Dietary approach

For the global food system to become a net carbon sink, substantial shifts are needed towards plant-based diets (WEF, EAT, FOLU, FABLE) and dramatic reductions in food loss and waste (EAT, FOLU, FABLE, CGIAR).

3.2.2 Ecosystem integrity

To address agri-food systems externalities and enhance ecosystem services, there is broad agreement that circular bioeconomy strategies will allow agri-food systems to operate within planetary boundaries. The proposed transformation approaches among the stakeholders differ as shown in the following table, though all concur that minimizing food waste plays an important role:

Management approach

Adaptation to climate change and the protection of biodiversity cannot be steered by a set of technologies but by building producers' capacities to manage the environment (GAFF, IPES-Food, IAASTD+10) through agroecological innovations (SCAR, IFAD) and diversified smallholder farms (WBCSD, IFAD).

Dietary approach

Dietary shifts (mostly towards plant-based proteins) will free lands that could be allocated to biodiversity restoration (EAT, FOLU). Stimulating demand for sustainably produced foods contributes to demand-pull for nature-positive shifts in the production system (CGIAR).

Innovations approach

A new emphasis is emerging on 'blue transformation' through sustainable intensification of aquaculture (FAO) and novel protein sources, such as insects and micro- and macroalgae (seaweed), yeast and bacterial biomass (microbial protein) for fishmeal (IFAD).

3.2.3 The role of technology

Technology is the second contentious topic in the debate on the transformation of agri-food systems and is closely related to the knowledge issue. Time-tested methodologies and the idea of farmers' sovereignty stand in opposition to the advance of 'techno-fixes' and the corporate control over both agricultural inputs and outputs. Conceptually, the debate opposes the transition from 'values' to 'tools' as the way to address political and social questions.

The polarized approaches to technology refer to agroecology and indigenous practices on the one hand, and the industrial, digitized and gene-sequencing supply chain on the other, promoting a fourth agricultural revolution through disruptive technologies. The different approaches may be summarized as follows:

Endogenous technology approach

This approach promotes endogenous technologies. These are technologies that already exist within the system, are rooted in traditional and indigenous knowledge, agroecology, diversity, and universal basic access to resources (land, seeds, water, culture), and are people-led (GAFF). This approach prescribes that such technologies must be protected by a UN treaty to monitor, regulate, or recall technologies that are dangerous or failing, enforce antitrust and competition policy, remove investor protections in trade agreements, and allow for multi-country class-action lawsuits against agribusinesses (IPES-Food). Considering governments' limited capacity to regulate, the most powerful mechanism for change would be the removal of energy subsidies (IAASTD). To address excessive concentration of ownership, use and control of big data, and inequalities in income distribution, some stakeholders demand further research and better governance. This approach argues that even though the spread of advanced technologies is likely to increase the profitability of food-related livelihoods and create new job opportunities, the net job balance is likely to be negative (FAO).

Exogenous technology approach

This approach advances externally driven technologies, including digital and agro-genomic technologies, as new analytical tools that allow for precise management of productive resources (and hence better ecological functioning of agricultural systems), as well as consumption (i.e., boosting healthy diets) and waste (i.e., effective tracking of feed and food flows). Farmers must have access to digital technologies and innovations across the value chain to sustainably intensify production, including through gene-edited seeds, radical improvements in fertilizer and water efficiency, 5G and Artificial Intelligence to improve pest control and crop genetics, recycling of phosphorus, changes in crop and feed management to mitigate climate change, blockchain and other tracking technologies to monitor food transport and avoid waste, etc. (SCAR, WEF, WBCSD, EAT, FOLU, FABLE, FAO).

Closing the technological gap approach

This approach holds that smallholder farming is labour intensive but often very efficient: small scale farmers produce 30–34% of global food supply on just 24% of global cropland. There is a need to invest in digital technologies while overcoming obstacles of connectivity, diffusion, and infrastructure. To avoid information imbalances with buyers, multiple delivery channels and platforms will have to coexist, combining traditional and advanced delivery channels as well as intermediaries with mobile-based solutions on the ground, via extension services, loan officers, street-level agents, etc. (IFAD).

3.3 PROSPERITY

Inclusive, transformative and equitable recovery for Agenda 2030

3.3.1 Affordability of healthy nutrition

During the UNFSS discussions questions relating to externalities (due to waste, environmental impact of production, etc.) of agri-food systems came to the fore, leading to conversations about the true costs of food. Several stakeholders explicitly recognize that the transformation of agri-food systems requires that we redefine the value of food by measuring and internalizing externalities through True Cost Accounting (TCA) (UN, GAFF, SCAR). However, concerns exist that internalizing externalities might raise food prices and thus make healthy food less affordable. Nevertheless, TCA may also trigger the adoption of circular models, leading to fair prices with the help of supportive policies throughout the value chain. The role of government procurement policies in anchoring demand for healthy food is acknowledged for both agroecological products and novel foods. The discussion is also linked to the question of how the transition to sustainable agri-food systems can be financed: What costs and cost reduction are likely in shifting to more sustainable patterns of production and consumption? Who currently bears the cost and who is likely to bear the costs of these changes? Would the internalized (de-externalized) costs need to be reflected in the food prices that consumers pay, or can this be managed some other way? TCA is used to expand the standpoint from a produced capital approach to a holistic view of costs, by considering social, human, and environmental capital, too.

Although all parties agree on the need to improve farmers' and workers' wellbeing across food value chains by strengthening decent work and income opportunities, some key issues have not been discussed across the board. For example, IPES-Food reports that the effect of the digital revolution on labour demand may lead to the abandonment of 300 million farms, the forced migration of well over 1 billion people, the dismantling of diversified food webs that sustain most of the world's population, and the surrendering of food security of billions of people in favour of untested technologies managed by for-profit companies.

There are different approaches that are being advanced to ensure the economic viability of farming, as well as the affordability of healthy food. The different approaches, some more dependent than others on safety nets and cash transfers, are summarized as follows:

Smallholder's affordability approach

Agroecology inspires innovations that are knowledge-intensive, productive, profitable, culturally, socially, and environmentally beneficial, and readily adaptable by small/medium-scale producers (GAFF, IAASTD+10, IPES-Food). This approach advances the premise that sustainable food systems can rebuild ecosystems and deliver affordable and sustainable diets for all (UNFCCC-Glasgow).

Public support approach

If food prices were to reflect true costs, healthy diets might become even less affordable for low-income consumers, in the absence of structural changes in the policy landscape. The affordability of food products must be addressed by strengthening public safety nets for rural individuals and stranded communities to ensure a just transition (WEF, FOLU, UN). More generally, the resilience of those most vulnerable to economic adversity should be strengthened through in-kind or cash support programmes to lessen the impact of food price volatility (FAO).

Poverty-sensitive approach

To boost demand for healthy diets, poor people must not only possess the necessary purchasing power, but also be equipped with the awareness and information to make better food choices. Without deliberate actions to ensure that sustainable production systems are inclusive, poor people could be left behind or even harmed. Higher incomes, but also social safety nets and cash transfers can increase purchasing power and create opportunities for large numbers of small-scale producers. This can be done by helping small producers, particularly the young, market their products and develop entrepreneurial capacity (IFAD).

3.3.2 Trade dynamics

There is general agreement among the stakeholders that Covid-19 has disrupted food supply and demand in complex ways and has shed light on the resilience of local and regional food chains. On the one hand, stakeholders argue that free trade leads to better prices, boosts agricultural productivity and sustainability through the diffusion of technology and innovation, and provides access to a diversified food basket. On the other hand, some point to the risks associated with free trade, including increasing inequality, negative impacts on health, increased energy use and environmental damages (IFPRI). It is argued that, unlike previous Free Trade

Agreements (FTAs) which opened up new markets, the FTAs of the 2020s and 2030s could serve primarily to secure access to resources, protect rights to corporate exploitation of big farm data, and suppress unfavourable regulations (IPES-Food).

This raises questions regarding multilateral trade negotiations, with some pathways supporting trade openness and other supporting local agri-food systems resilience, as summarized below:

Localization approach

Territorial food systems, including short supply chain initiatives, community and household food production, producer and consumer cooperatives and ethical consumerism, should be supported to counter future food price surges (IPES-Food). Fair and equitable terms of trade must be designed to overcome the 'global treadmill' and foster local and regional value chains, offering greater protection from financial speculation and international corporate domination (IAASTD+10), without undercutting efforts to mitigate climate change, protect human rights, preserve health, or ensure fairer wealth distribution (SCAR). Large importers (e.g., EU, China) have an incentive to promote sustainable policies in exporting countries and assess their resilience to agricultural trade and supply disruptions (FABLE).

Regulated market approach

Trade is a vital tool to minimize food prices and to maintain food security, particularly in times of market stress and price volatility. Ensuring free and rule-based food trade will require a rejuvenation of multilateral trade negotiations. To avoid panic-induced price spikes, transparent information on production, stocks and government interventions around the world are critical and must be made widely available (UN). Improving access to markets and reducing trade barriers in certain cases to boost global and intraregional trade can be managed through e-commerce platforms, strengthened business engagements, market intelligence systems, and blockchain to build trust and increase food safety (FAO).

Sustainable globalization approach

Trade can enhance food security, but governments need to ensure full and fair competition and sound regulation and discourage trade in food produced at high cost to people and the environment. Badly managed trade can contribute to unhealthy diets and leave populations vulnerable to international food price spikes and balance of payments crises. Trade arrangements that support this approach include enabling low barriers and reduced risks for market entry. Furthermore, market prices and margins should permit smallholders to remain active in trade. Trade policy instruments (such as tariffs) must incentivize smallholder farmers to participate in the market and become part of modern supply chains; supportive policies should guarantee that market engagement also improves welfare (IFAD). Environmental and social risks and impacts should be integrated into governance, through true-cost accounting, sustainability assessment and reporting in line with emerging ESG standards (WBCSD).

3.3.3 Financing instruments

Public investment in agri-food systems has decreased significantly in the last 15 years, as shown by the FAO Agriculture Orientation Index (AOI) for government expenditure. Thirty-five per cent of the EU budget is spent on subsidies to farmers under the Common Agriculture Policy. Agri-food systems transformation necessitates investments and spendings from both public and private sectors. This investment is as much about climate action as it is about food and nutrition security. Thus, all parties agree to redirect existing financial flows to face climate emergencies and food-related epidemics. However, the degree to which certain stakeholders will bear the costs and the priority areas for financial allocations vary considerably, as the following approaches illustrate:

Incentivizing autonomous growth approach

The key priority here is funding for long-term research and inclusive, transdisciplinary programmes, designed in partnership with farmers, indigenous peoples and women, that address food sovereignty and the challenges of entrenched power and vested interests (GAFF). Under this approach the administrative and research budget lines of FAO, IFAD, WFP and CGIAR be redirected, along with major commodity subsidies to support agroecology and diversification, while addressing the untaxed externalities and revenues of corporations (IPES-Food, IAASTD+10).

Public support approach

This approach proposes that repurposed agriculture subsidies include funding for R&D to mitigate greenhouse gas emissions and to compensate farmers for the upfront costs of adopting more sustainable technologies and practices (CGIAR). Repurposing public investment and regulatory frameworks should provide positive incentives for businesses to commit to social and environmental responsibility and invest in healthy food (SCAR, WBCSD). To this end, countries must co-design an enabling environment that limits risk and protects the interest of investors, simplifies tax codes, penalizes corruption, has a strong legal system, protects ownership rights and ensures transparency (WEF).

Integrated support approach

The new food system must focus on increasing investments and policies for local midstream food businesses (SMEs), helping small farmers to become more productive and profitable, and focusing on social protection measures and cash transfers that encourage better diets and livelihood opportunities. Much greater coordination in public sector financing is needed, as well as the use of blended finance and private sector instruments to finance investments that promise both commercial and social returns (e.g., climate finance). Also needed are partnerships between public sector financing organizations and civil society organizations, and instruments that allow for the integration of environmental values into agricultural systems, such as sustainability labelling and payment for ecosystem services (IFAD).

Following the model of the Task Force on Climate-related Financial Disclosures, investors and financial institutions should develop a set of financing principles for food and land use, including innovative finance instruments (blended finance) to manage risks and leverage opportunities (FOLU, UN).

4

Summary and discussion

4.1 International stakeholder groups and main approaches

Our analysis of the discourse on agri-food systems transformation reveals that many farmers, activists, scientists, and consumers advocate for a new vision of food production and consumption (referred to, broadly as, the food sovereignty group), while representatives of industrial farmers, powerful agri-food businesses and affiliated scientists teaming with intergovernmental institutions and governments push for “business as usual” with some innovations (corporate innovations group). Somewhere in between the two groups stand IFAD and SCAR (in-between groups). The two main transformation pathways – food sovereignty pathway and corporate innovations pathway – offer a good overview of the diverging interpretations and approaches to agri-food systems transformation. However, it is important to note that these pathways are not mutually exclusive and that approaches and solutions for agri-food systems transformation can overlap.

The different transformation approaches

The transformation pathways proposed by different organizations are spread over a wide spectrum of approaches

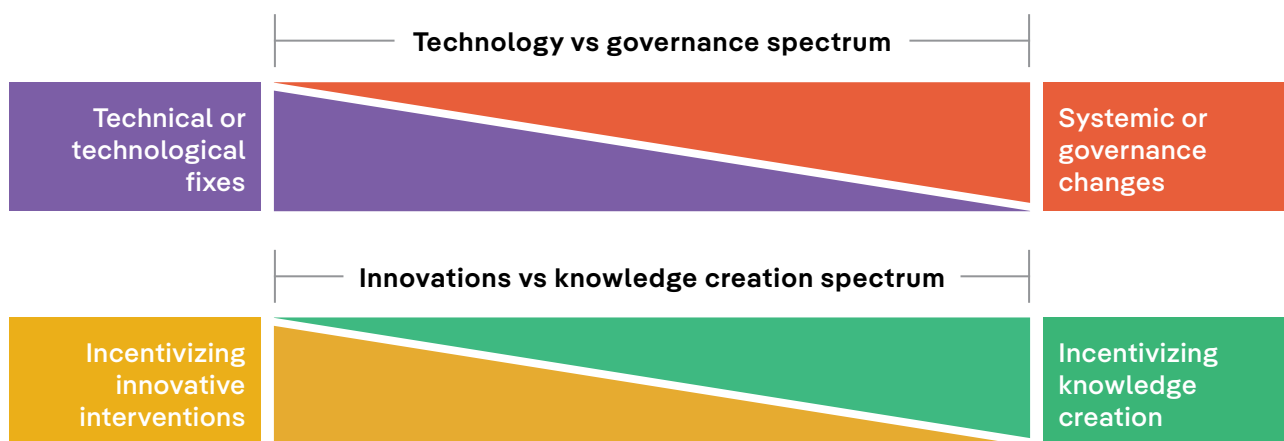


FIGURE 5 Two spectrums of approaches used to analyze transformation pathways from different organizations.

The preceding analyzes of the different areas of emphasis of each institution (within the three identified groups) for implementing agri-food systems transformation can be summarized by the following categorizations:

Food sovereignty group (Structural changes):

- IAASTD+10: scaling-up agroecology
- GAFF: adopting a multi-dimensional systems approach
- IPES-Food: addressing power relations
- UNFCCC-Glasgow: integrated food-climate policy

- **Corporate innovations group (Technological fixes):**

- WEF: the 'great reset'^{iv}
- WBCSD: corporate innovations
- FOLU: technological disruption
- EAT-Lancet: dietary shift based on artificial proteins
- FABEL: dietary shifts and sustainable intensification
- UNFSS: 'multi-stakeholderism'
- FAO: e-agriculture and e-villages
- CGIAR/IFPRI: diets-artificial protein entry for the science-policy interface

- **In-between group:**

- IFAD: investing in rural people
- SCAR: bioeconomy

TABLE 2 A summary of the main transformation pathways and the different constituent interventions.

Food sovereignty pathways	Corporate innovation pathways
Food production management	
<ul style="list-style-type: none"> • Agroecology • Organic • Biodynamic • Permaculture • Agroforestry • Grass-fed animal rearing • Holistic management of landscapes • Social innovations 	<ul style="list-style-type: none"> • Precision farming • Climate-smart agriculture • Vertical farming • Sustainable intensification • Conservation agriculture/tillage • Laboratory-cultured food
Approach	
<ul style="list-style-type: none"> • Functional integrity (synergistic) • Sufficiency • Human rights 	<ul style="list-style-type: none"> • Technocratic (reductionist) • Efficiency • Investor-oriented
Governance	
<ul style="list-style-type: none"> • Community-led • Democratic accountability • Farmers and civil society 	<ul style="list-style-type: none"> • Corporate-led • Authoritarian • New multi-stakeholderism
R&D	
<ul style="list-style-type: none"> • Social learning • Indigenous knowledge (farmers' rights) • Demand-driven 	<ul style="list-style-type: none"> • Technology-oriented • Science-based (intellectual property rights) • Research-driven

iv The "Great Reset" is a concept coined by WEF Director Klaus Schwab. It describes the need to "reset" the economy, create conditions for a "stakeholder economy", and establish a green capitalism. See also <https://www.weforum.org/great-reset/>

The diversity of proposals for transformation pathways

The landscape of agri-food system transformation reports or initiatives based on their stance regarding the role of knowledge, governance/systemic change, innovation incentivization and technical or technological solutions in the transformation process.

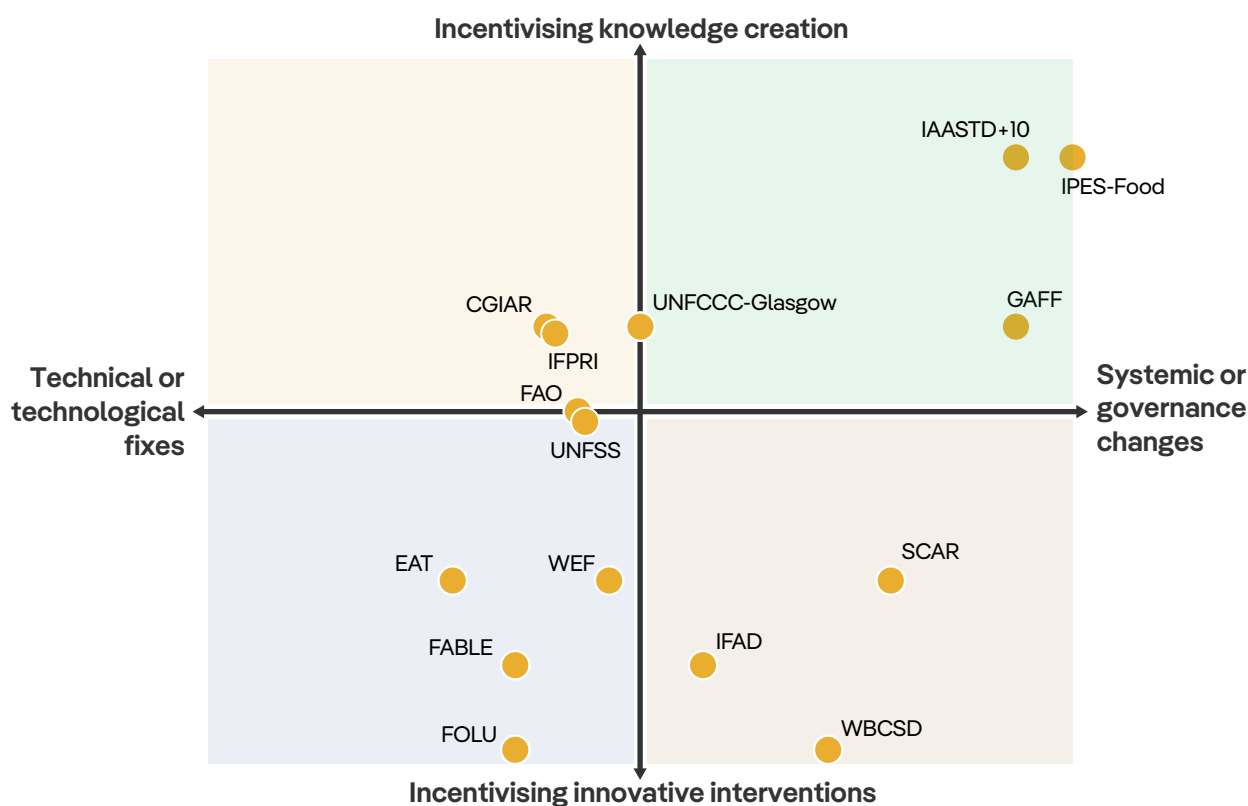


FIGURE 6 The agri-food transformation landscape and the placement of different organizations analyzed

Legend of agri-food systems transformation reports analyzed

13 reports from 15 organizations and initiatives were analyzed and placed on the agri-food transformation landscape from above are listed below:

IPES-Food	International Panel of Experts on Sustainable Food Systems A Long Food Movement: Transforming Food Systems by 2045 , 2021, IPES-Food and ETC Group.
IAASTD+10	International Assessment of Agricultural Knowledge, Science and Technology for Development Transformation of our food systems. The making of a paradigm shift , 2019, IAASTD+10.
GAFF	Global Alliance for the Future of Food The Politics of Knowledge: Understanding the Evidence for Agroecology, Regenerative Approaches, and Indigenous Foodways , 2021, GAFF.
SCAR	European Commission's Standing Committee on Agricultural Research Resilience and Transformation. Report of the 5th SCAR Foresight Exercise Expert Group - Natural Resources and Food Systems: Transitions Towards a 'Safe and Just' Operating Space , 2020, SCAR.

WBCSD	World Business Council for Sustainable Development CEO Guide to Food System Transformation , 2019, WBCSD.
IFAD	International Fund for Agricultural Development Rural Development Report 2021. Transforming Food Systems for Rural Prosperity , 2021, IFAD.
FOLU	Food and Land Use Coalition Growing Better: Ten Critical Transitions to Transform Food and Land Use , 2019, FOLU.
FABLE	Food, Agriculture, Biodiversity, Land-Use and Energy Consortium Pathways to Sustainable Land-Use and Food Systems , 2020, FABLE.
WEF	World Economic Forum Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation , 2018, WEF.
EAT	EAT-Lancet Commission Healthy Diets from Sustainable Food Systems. Food Planet Health , 2019, EAT.
UNFCCC- Glasgow	Glasgow Food and Climate Declaration
IFPRI & CGIAR	International Food Policy Research Institute & Consortium of International Agricultural Research Centres Inclusive Food System Transformations for Healthy Diets. National Experiences with a Global Challenge , 2020, CGIAR, IFPRI.
FAO	Food and Agriculture Organization of the United Nations Agriculture Food Systems Transformation: From Strategy to Action. Conference, Forty-second session , 2021, FAO.
UNFSS	United Nations Food System Summit Science and Innovation for Food Systems Transformation and Summit Actions, Papers by the Scientific Group and its partners in support of the UN Food Systems Summit , 2021, UNFSS;

BOX 1 Key agri-food systems terms

- **Agroecology**

Although there is no universal definition of agroecology, which in Latin America is equated with organic agriculture and in other countries with integrated systems, agroecology is generally understood as the simultaneous application of sustainable ecological and fair social principles to the design and management of food and agricultural systems. The following 10 elements emanated from the FAO's regional seminars on agroecology to guide countries in transforming their food and agricultural systems: diversity, synergies, efficiency, resilience, recycling, co-creation and sharing of knowledge (describing common characteristics of agroecological systems, foundational practices and innovation approaches); human and social values, culture and food traditions (context features); and responsible governance and circular and solidarity economy (enabling environment).² Agroecology is considered a science, a practice and a social movement that encompasses the entirety of the food system from the soil to the organization of human [societies](#).^{iv}

- **Agri-food systems**

Agri-food systems encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and the primary production of non-food agricultural products. These also include parts of the broader economic, societal and natural environments in which they are embedded. The food system is composed of sub-systems (e.g., farming, waste management, input supply systems, etc.) and interacts with other key systems (e.g., energy, trade, health systems, etc.). Therefore, a structural change in the food system might originate in a change in another system; for example, a policy promoting more biofuel in the energy system will have a significant impact on the food system.^v

- **Agri-food systems approach**

Agri-food system approach is a way of thinking and acting that considers the agri-food system in its totality, taking into account all elements, their relationships and related effects. It is not confined to any single sector, sub-system (e.g., value chain, market) or discipline, and thus broadens the framing and analysis of a particular issue as the result of an intricate web of interlinked activities and feedbacks. It considers all relevant causal variables of a problem and all social, environmental, and economic impacts of the solutions to achieve transformational systemic changes.

- **Traditional vs modern knowledge**

As the pressures of globalization and modernization have increased over time, traditional agricultural practices and knowledge appear to become obsolete. These pressures have created a shift away from a food system dependent on millions of farmers to a system controlled by a few large agribusinesses. Modern agricultural practices emphasize production, capital gain, input intensity and crop consistence. In contrast, traditional agricultural practices emphasize localization, biodiversity, shared genetic resources and a cultural appreciation for many different [crops](#).^{vi}

v Agroecology Europe: <https://www.agroecology-europe.org/>

vi Sustainable food systems. Concept and framework. <https://www.fao.org/3/ca2079en/CA2079EN.pdf>

vii COMPARISONS BETWEEN TRADITIONAL & SCIENTIFIC KNOWLEDGE, http://www.nativescience.org/html/traditional_and_scientific.html

4.2 Frameworks and pathways

While all of the publications analyzed discuss the nine relevant sub-topics corresponding to the core themes of people, planet and prosperity, only a few reports present comprehensive and concrete process frameworks or pathways for transformation based on specific steps and principles. For the purpose of further illustrating the diversity of approaches to agri-food systems transformation, some of these frameworks and transformation pathways are briefly presented as follows.

The stakeholder groups differ noticeably in their focus on agency. GAFF and IPES-Food derive their framework and pathways, from local experiences (bottom-up processes) and see the locus of change in civil society and social movements. FOLU presents actions that should be carried out by governments and businesses, while WBSCD focuses on actions for CEOs to transform food systems.

Below is a summary of the main pathways that are representative of the proposed approaches.

The Food Systems Transformation Framework

ORGANIZATION	Global Alliance for Food Systems and Biovision Foundation for Ecological Development (2019)
CATEGORY	Civil society and expert groups
SOURCE	Biovision Foundation for Ecological Development and Global Alliance for the Future of Food, Beacons of Hope: Accelerating Transformations to Sustainable Food Systems, 2019

FRAMEWORK DETAILS

Six principles

- Renewability
- Resilience
- Equity
- Diversity
- Health

Phases of transformation:

1. Establishing initiatives
2. Confronting policies and practices
3. Building legitimacy
4. Anchoring

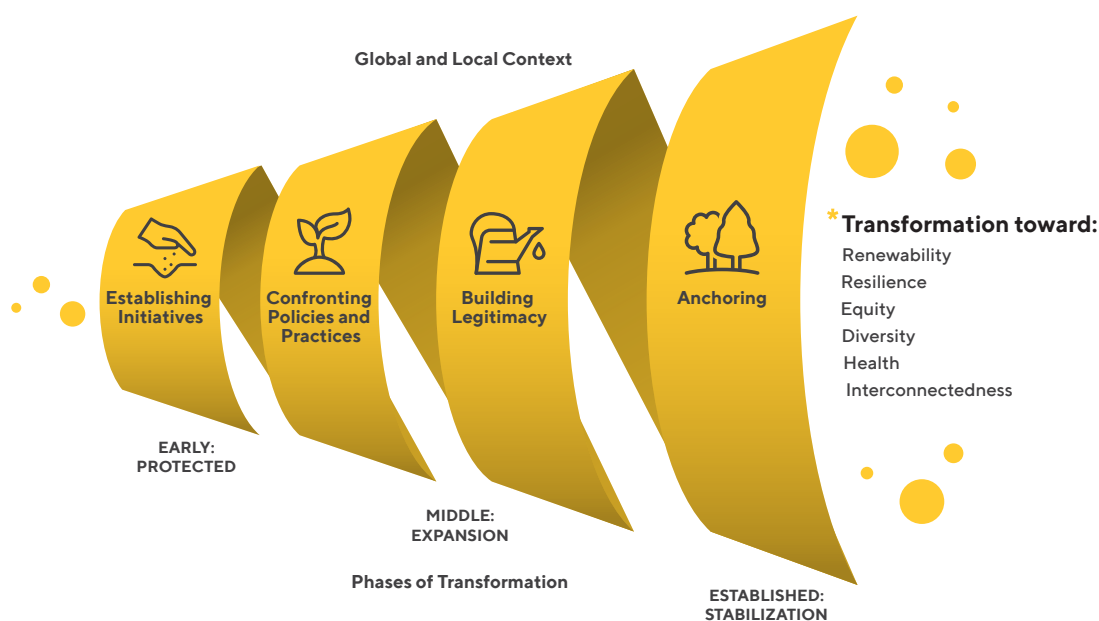


FIGURE 7 Visual representation of the Food Systems Transformation Framework

The Framework proposes a universal *process* for promoting the transformation of food systems guided by six principles. The Framework is based on the experiences from various local “best practice” initiatives and shall serve as a guide for collective action and discussion.

FOLU Transformation Pyramid

ORGANIZATION The Food and Land Use Coalition (2019)

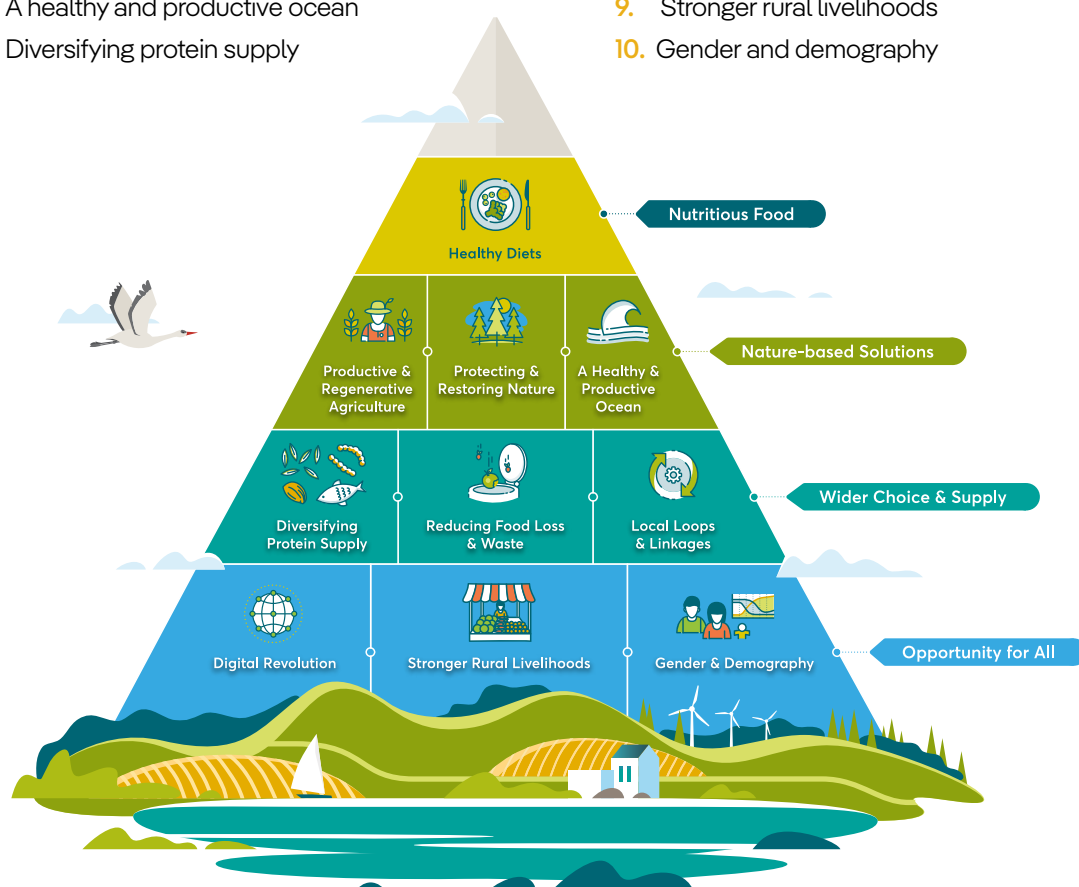
CATEGORY Businesses and expert groups

SOURCE The Food and Land Use Coalition (FOLU), Growing Better: Ten Critical Transitions to Transform Food and Land Use, 2019

FRAMEWORK DETAILS

Ten critical transitions

1. Healthy diet
2. Productive and regenerative agriculture
3. Protecting and restoring nature
4. A healthy and productive ocean
5. Diversifying protein supply
6. Reducing food loss & waste
7. Local loops and linkages
8. Digital revolution
9. Stronger rural livelihoods
10. Gender and demography



Economic Prize

\$5.7 trillion economic prize by 2030 and \$10.5 by 2050 based on avoided hidden costs



Investment Requirements

\$300-\$350 billion required each year for the transformation of food and land use systems to 2030



Business Opportunity

\$4.5 trillion annual opportunity for businesses associated with the ten critical transitions by 2030

FIGURE 8 Visual representation of the Food and Land Use Coalition Transformation Pyramid

The FOLU proposes a “*reform agenda*” of real actionable solutions that is centred around ten critical transitions. While concrete actions for governments and businesses are listed, “the specifics of the reform programme will inevitably vary from one country to the next, and from one community to the next.”

Four interrelated pathways of food systems reform and transformation¹⁰

ORGANIZATION IPES-Food - the International Panel of Experts on Sustainable Food Systems (2021)

CATEGORY Civil society and expert groups

FRAMEWORK DETAILS

Pathway 1: Rooting food systems in diversity, agroecology and human rights

Pathway 2: Transforming governance structures

Pathway 3: Shifting financial flows

Pathway 4: Rethinking the modalities of civil society collaboration

The pathways focus on a food system transformation led by civil society and social movements with concrete solutions such as reforming UN food agencies, establishing the tool of True Cost Accounting (TCA) in consumer information tools, etc.

Seven pathways where businesses can lead to accelerate transformation

ORGANIZATION WBCSD (2019)
CATEGORY Businesses and expert groups
SOURCE WBCSD, CEO Guide to Food System Transformation, 2019

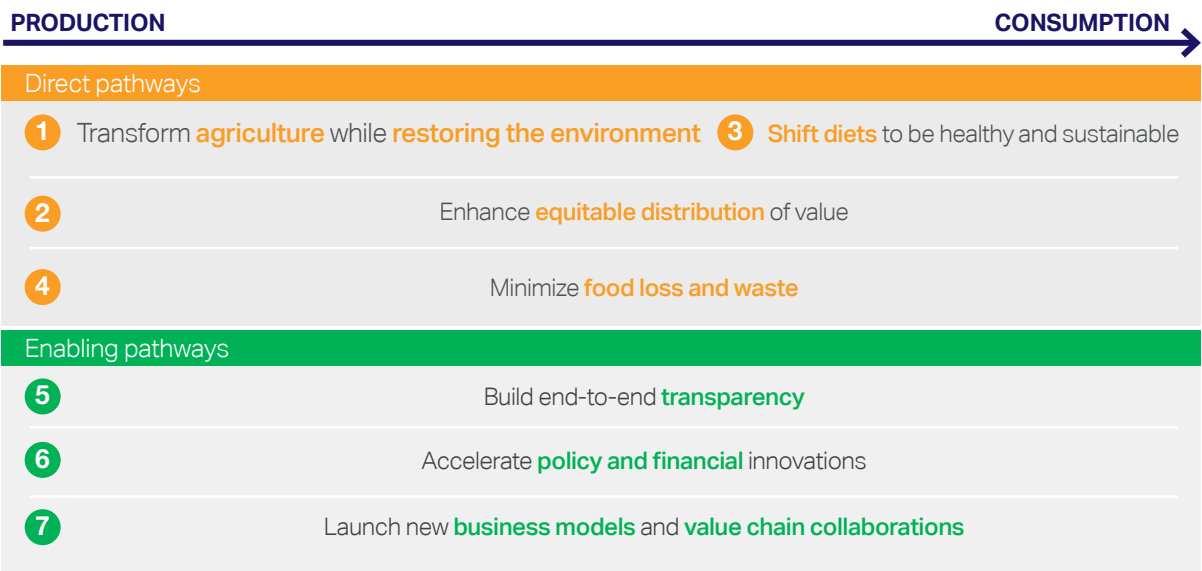


FIGURE 8 Visual representation of the Food and Land Use Coalition Transformation Pyramid

Seven pathways across the value chain with a focus on business leadership and opportunities are presented.

4.3 Common action areas

The desire to transform agri-food systems is shared by all agri-food systems stakeholders but based on different implementation pathways and narratives. These are summarized below, based on the five action tracks that emerged from the UN Food System Summit in 2021:

Nourish all people

All stakeholders agree that we must shift our vision of what an agri-food system does: from food supply (i.e., agricultural productivity) to food demand (i.e., shifting diets) and food utilization (e.g., decreasing food wastage). Just a few years ago, this understanding was lacking. Issues of rural development, which constitutes the basis for agricultural development, youth employment and migration mitigation feature prominently only in the IFAD agenda, while other stakeholders pay more attention to urban consumers. An important omission in the various transformation agendas is food-feed competition whereby a substantial share of cereals going to inefficient (in terms of protein conversion) livestock systems, biofuels, and bioplastics. Rather than investing vast resources in animal feed, we should turn to low-investment innovations such as producing quality feed from agricultural residues, biomass recycling and other renewable technologies that relieve the pressure on agricultural lands.

Boost nature-based solutions

The ‘food sovereignty group’ advocates for diversity and sufficiency through agroecology. Sufficiency in this case refers to eating less but of higher quality, particularly with respect to meat consumption, with grazed ruminants offering substantial carbon soil capture. The ‘innovations’ group prefers technologies that can influence the natural functioning of agri-ecosystems with genomics and with digital technologies that allow for more precise and efficient resource use. The EAT-Lancet diet shift promises to revolutionize agri-food systems as artificial proteins free up lands that can be repurposed for biodiversity restoration, while alternative protein sources are opened up by the growth of sustainable aquaculture and the ‘blue transformation’. There is some scientific controversy around these topics, especially genetically modified food. Innovations cannot be restricted to hardware or lab tweaking and much additional research is needed to better understand agroecological processes in order to establish truly circular systems or better understand the carbon cycle in agricultural lands.

Advance equitable livelihoods, decent work and empowered communities

The ‘food sovereignty’ and ‘in-between’ groups are concerned by the impact of the agri-food system transformation on smallholders who make up most of the world’s food insecure people, as well as most of the farming population. Stakeholders from these groups pose questions of social inequality and power imbalances, especially regarding class and gender, in their transformation agendas. The ‘innovation’ group, led by the WEF, points out that 80% of the world’s poor live in rural areas and depend on agriculture for their livelihood. However, this does not explain how the “transformative twelve” innovations^{viii} will help them; the primary beneficiaries seem to be those companies promoting the “innovation principle”. Many new precision agriculture technologies require reliable satellite, cellular, and internet infrastructure

viii The WEF identified 12 technology applications (such as e.g., alternative proteins, big data, and sensing technologies) that “illustrate the potential of emerging opportunities in food systems – including improving consumer nutrition, increasing supply chain efficiency and transparency and boosting farmer productivity and profitability” https://www3.weforum.org/docs/WEF_Innovation_with_a_Purpose_VF-reduced.pdf

that is not available in many rural areas around the world. The FAO proposes to create 1,000 *digitized villages* and reduce the gender digital divide by increasing rural women's access to digital technologies.

Build resilience to vulnerabilities, shocks and stresses

A systemic approach to agriculture takes into consideration the different complex and so far poorly understood ecosystem relationships. In this regard, for example, all groups propose somewhat effective strategies for climate resilience. However, the general resilience of future agri-food systems is not yet a key component of transformation pathways. While the 'innovations' group does not seem prepared to face issues related to unintended consequences of technological innovations, the 'food sovereignty' and 'in-between' groups consider functional integrity strategies that focus on a systemic understanding to improve system resilience.

Support means of implementation

Most stakeholders list 4–12 essential pathways towards effective agri-food systems transformation. Implementation areas discussed upon include R&D, investments, cooperation, and policies. The 'food sovereignty' group is committed to finding ways to consolidate those methods of cultivation and breeding that are suitable for individual territories and are more capable of improving environmental and social conditions, while the 'innovations group' studies new technological applications to further mechanize or 'technologize' food and agriculture, primarily for the benefit of transnational enterprises. The 'food sovereignty' group mostly calls for 'conducive and equitable' policies, while the 'innovation group' calls upon governments to carry the bulk of the transformation costs, including safety nets and compensations for incurred losses. Furthermore, businesses call on governments to provide open access to public sector data (e.g., on national land registries, fisheries, agriculture, and soil health) and to regulate and incentivize the private sector to provide open-source data where appropriate. A new development in the context of governance and implementation is the 'multi-stakeholderism' approach across large businesses and intergovernmental institutions, which may challenge the neutrality and relevance of some UN agencies. The UNFSS has increasingly focussed on what used to be more modest public-private partnerships, which may have led to a divide between civil society groups (including farmers, indigenous communities and scientists) and transnational agri-businesses.

5 What's missing in the debate?

While the analyzed publications and the pathways they espouse offer a wide range of entry points and recommendations for agri-food systems transformation, they share the shortcoming of describing *what* needs to be done rather than explaining *how* transformative changes can be achieved. This is closely connected to a failure to explicitly address sustainability trade-offs and a lack of foresight and scenario analysis in transformation agendas (e.g., in the context of the 4 Cs) and corresponding policy options. An analysis of transformations that have taken place in the past can provide much-needed direction towards the '*how*' of agri-food systems transformation.

Several important issues have only been marginally addressed in the agri-food systems transformation debate. An overarching topic that is gaining attention in international policy debates but that remains under-developed according to our analysis is the question of **governance**. As highlighted in recent studies^{11,12} governance is of fundamental importance for understanding and achieving transformative change in food systems. That is because there are complex dynamics at different levels (local, regional, global), and more attention needs to be given to the preconditions, processes, and mechanisms of successful and inclusive governance for sustainable agri-food systems. This is especially relevant for the achievement of good governance and democratic decision-making through '**multi-stakeholderism**'. This new governance model is based on the long history of private-sector influence over intergovernmental agencies and is closely connected to the issue of **corporate power** in global agri-food systems which is not sufficiently addressed in the agri-food systems transformation debate despite its relevance for possibly impeding transformative change and action. One result and possibly cause of power asymmetries in agri-food systems and in related negotiation forums is the **polarization** of interests and positions in relation to agri-food systems transformation. How can we bring different stakeholders with diverging interests to the table to design effective and transparent dialogue processes for agri-food systems transformation?

The UNFSS identified several levers of change that "are relevant across the full range of the SDGs and are critical for ensuring that different food systems become sustainable"¹³. These include finance, innovation, human rights (thanks to protests by different civil society groups) and gender equality. However, some of these issues are only briefly touched upon in the analyzed agri-food systems transformation debate and need further consideration for transformation pathways. The **right to adequate food** and a human rights-based approach to agri-food systems is rarely mentioned in the analyzed documents (an exception is a report

by IPES-Food). It is however of vital importance to hold states accountable for ensuring food availability, access, adequacy, stability, and sustainability. While **gender equality** has become central to development policy and practice, the agri-food systems transformation debate does not address this topic explicitly enough.¹⁴ The recent State of the Food and Nutrition Security in the World report¹⁵ calls for their inclusion alongside youth and indigenous people in future agri-food systems' discussions and actions.

The value of **indigenous peoples' food systems** and traditional knowledge systems and practices in terms of sustainability, nutrition and resilience is increasingly recognized in the agri-food systems transformation debate but further research and action is needed to design transformation pathways that include and build upon indigenous peoples' knowledge and experiences.¹⁶ **Resilience** will be of increasing value for agri-food systems transformation and became a new buzzword during the Covid-19 crisis. Achieving the SDGs requires resilient agri-food systems that withstand and recover from crisis or disruption and provide sufficient and stable supply and access to adequate food for all. Yet, little attention has been paid to the meaning of resilience for future agri-food systems and to developing and implementing resilience-oriented transformation pathways in a systematic manner.

Ultimately, the agri-food systems transformation debate lacks an in-depth analysis of the **economic system changes and the international trade framework** required for agri-food systems transformation. Under the current economic system, food production and consumption cause massive externalities. The Food and Land Use Coalition (2019) estimated that environmental, health and social costs amounted to at least USD 19.8 trillion a year which is more than twice the value of the food system's global output (USD 9 trillion).^{17,18} For agri-food systems transformation to be possible, externalized costs must be internalized through taxation and regulations, so food prices reflect the true costs to the environment, climate change and human health. **True Cost Accounting** (TCA) is an effective policy tool to address the pervasive imbalances in our global agri-food systems by revealing the "hidden costs" of food production. While TCA was a widely debated topic at the UNFSS it seems unclear if the momentum will generate real transformative action and if the recommendations (from the UNFSS as well as other stakeholders in the agri-food systems transformation debate) are sufficient to be taken up by policymakers and businesses. Further analyses are needed to understand *how* TCA can be effectively implemented at different policy levels as a central agri-food systems transformation lever.¹⁹

A detailed description of the missing gaps and recommendations for addressing them can be found in Report 3 of this series, entitled 'Blind Spots in the Debate on Agri-Food Systems Transformation'.

Appendix 1

List of reviewed documents

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ABOUT THE PROJECT

TMG Research gGmbH aims to help develop a more systematic understanding of how agri-food systems can be transformed as part of a project on the *Assessment and Communication of Climate Impacts of Food (CLIF)*, funded through the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and jointly implemented with corsus and WWF Germany. This project promotes sustainable consumption patterns and helps companies, policymakers, and consumers choose more sustainable options in relation to food. The main contribution of TMG to this project is in developing a more systematic understanding of how to transform agri-food systems by publishing a series of strategic reports on the current status of agri-food systems and the likely drivers and agents of their transformation.

This report is part of the *FORESEE (4C)* series on *The Transformation of Agri-Food Systems in Times of Multiple Crises*, which explores the current agri-food system in light of challenges linked to the four crises known as the 4 Cs (Climate, Covid-19, Conflict, and Cost of externalities). This part of the series reviews the state of the debate around agri-food systems transformation from the perspective of different organizations that represent a wide range of actors and stakeholders. Furthermore, this report provides an overview of the different proposed approaches to achieving the goals of agri-food system transformation aligned to the themes of people, planet, and prosperity. The report was drafted by TMG in consultations with an extended group of experts.

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