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CONFERENCE 2025

Food Systems Science: Establishing a Common Framework and Network

First European Food Systems Science Conference

Embracing Complexity: Systems Thinking, Systems Knowing, Systems Doing

26th March

Corinna Hawkes,
Food and Agriculture Organization of the United Nations (FAO)

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Embracing Complexity: Systems Thinking, Systems Knowing, Systems Doing

Corinna Hawkes
Director, Agrifood Systems and Food Safety Division, FAO

FoSSNet Conference March 25-27, Oxford, UK, Session on **Food Systems Science in Food Systems Transformation**

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Dalia Mattioni

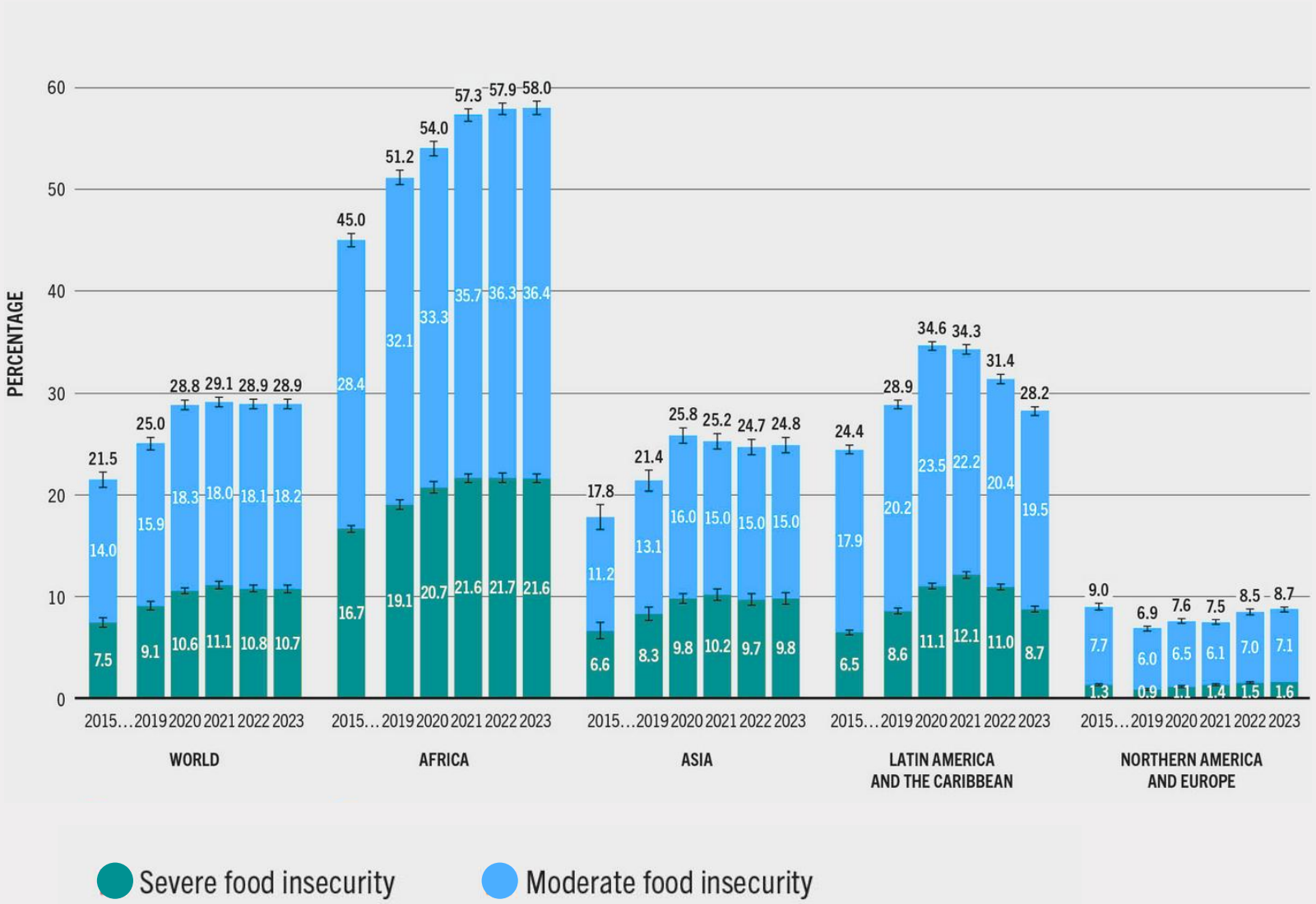
Maryam Rahmanian

Brian Cook

Moderate and severe food insecurity, 2023

2.3 billion people at global level are moderately or severely food insecure. The prevalence remained relatively unchanged between 2021 and 2023, following a sharp increase from 2019 to 2020.

Latin America and the Caribbean are the only region showing notable reduction.



Source: The State of the World Food Security and Nutrition in the World 2024.

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What is “(agri)food systems transformation”?

The process of changing the way agrifood systems function to enable them to deliver their purpose: food security and nutrition for all for today and tomorrow.

Requires delivering multiple outcomes in a way that is mutually reinforcing.

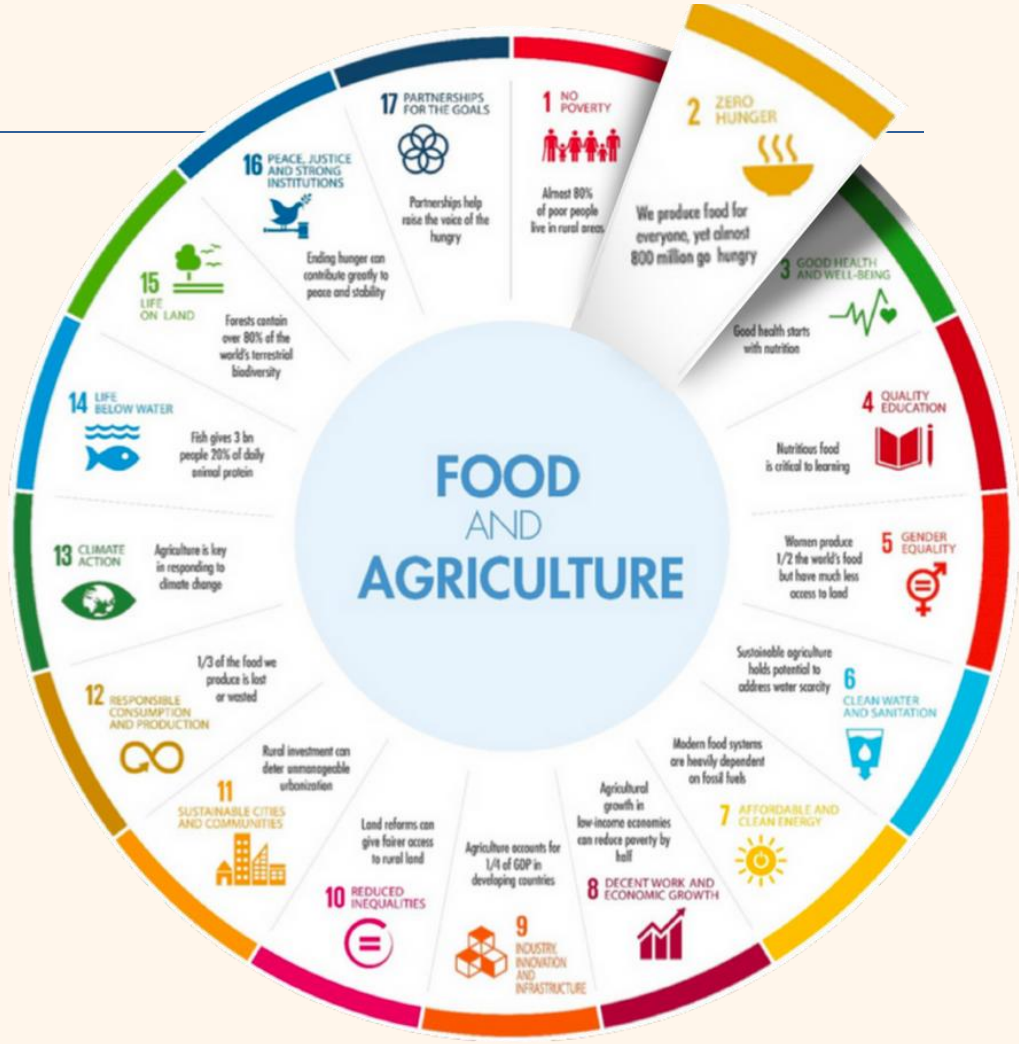
Eventually leads to a transformation of outcomes.

BETTER PRODUCTION

BETTER NUTRITION

BETTER ENVIRONMENT

BETTER LIFE

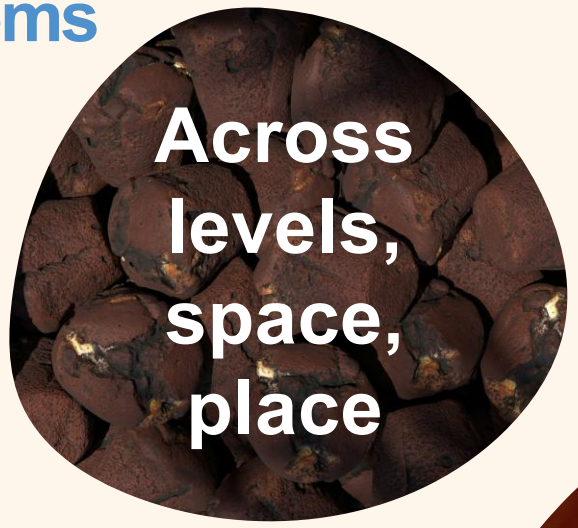


Agrifood system transformation occurs through changing relationships – connections, linkages, interdependencies

- Transformation involves changing relationships. In modifying these relationships, transformation shifts how the system functions and the results it delivers.

- In practice *(agri)food system transformation* involves changing policies and practices from fork to farm towards the desired outcomes while accounting for feedback loops, ripple effects and opportunities for positive impacts across multiple outcomes

Key relationships in agrifood systems



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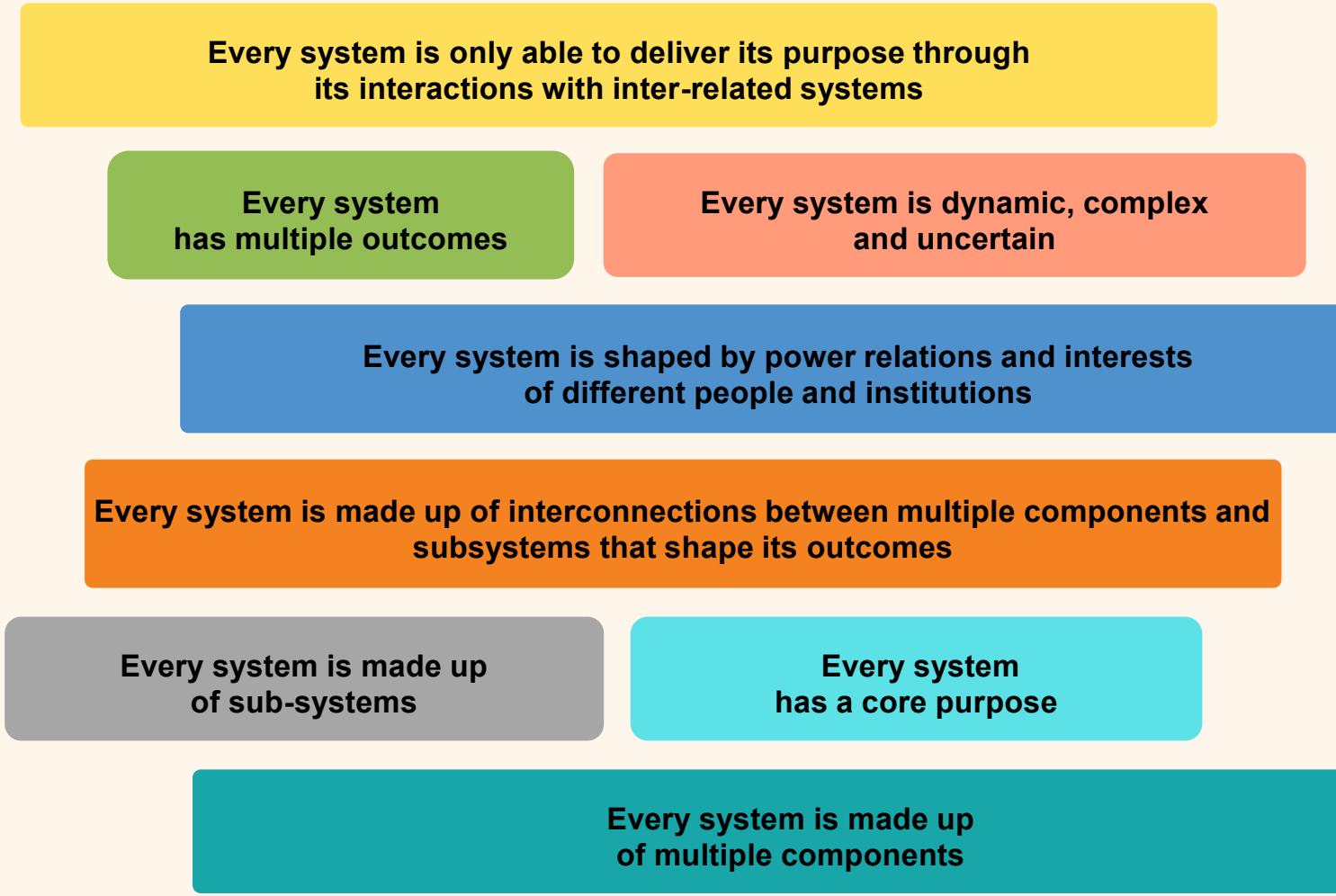
A systems approach to agrifood system transformation

A systems approach is a way of thinking, acting and working together that connects the different components & outcomes of agrifood systems and inter-related systems to change the way the system functions (“transformation”) to achieve and sustain a different, better set of outcomes at scale.

A systems approach gives changemakers the opportunity to unlock more value from existing solutions by making and modifying relationships between them towards the outcomes they want to see

Learning from systems science: a systems approach offers potential by embracing complexity, working with, rather than against reality

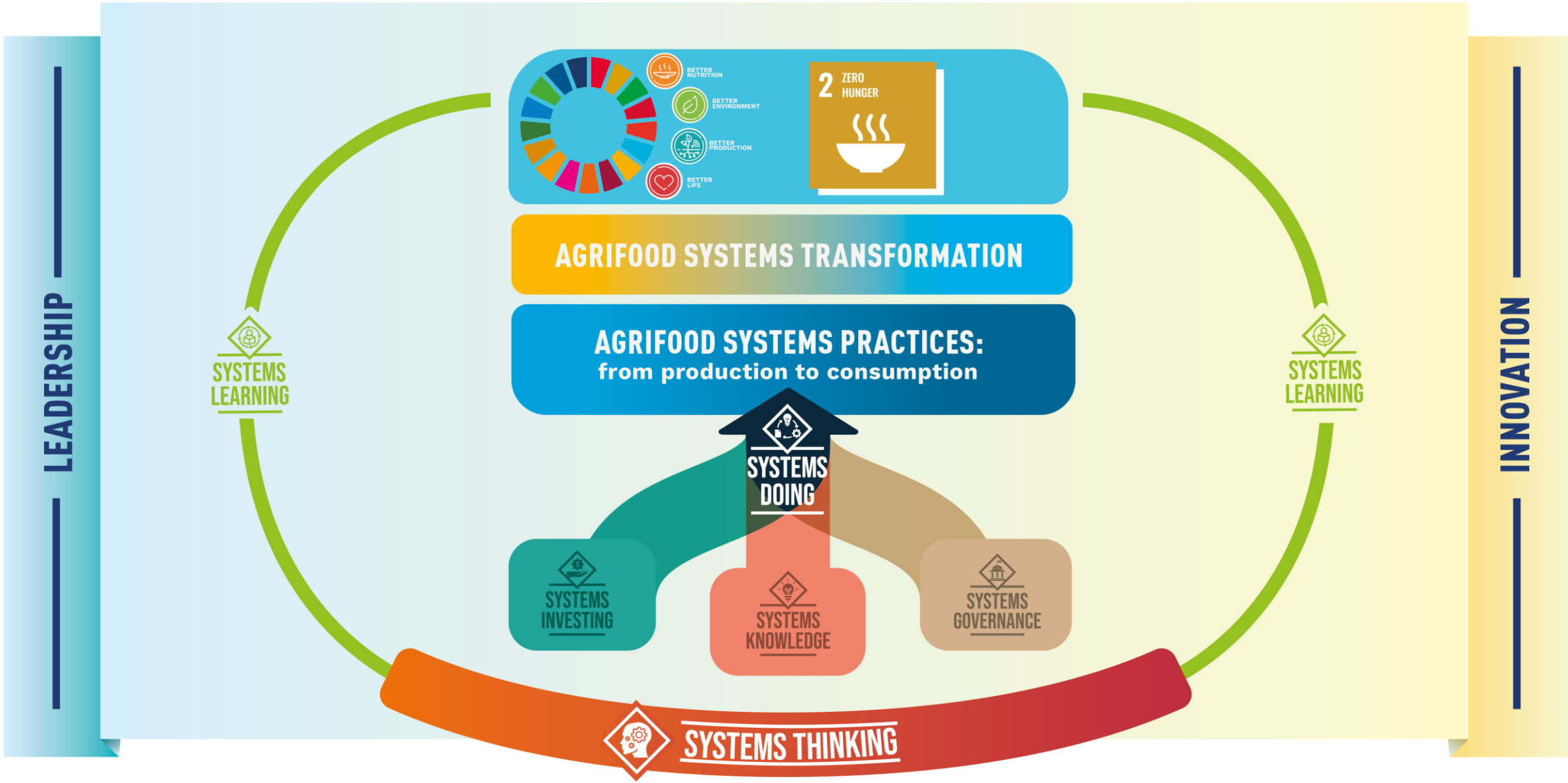


The six elements of implementing a systems approach

The concrete differences in the way we think, act and work together

	From isolation (silos)….	…. to connection (systems)
Systems Thinking	Seeing priorities, problems & solutions in isolation	Seeing beyond mandates and identifying interconnections
Systems Knowledge	Assessing problems, outcomes, causes from single disciplines & sources, in isolation	System-wide analysis of interlinkages & outcomes from multiple sources
Systems Doing	Fragmented interventions	Implementing & interlinking aligned, multipurpose actions
Systems Governance	Segmented institutions and decision-making	Leadership, joint planning, and managing conflict across sectors
Systems Investment	Inflexible, short-term, uncoordinated funding	Resourcing flexibly across the system over the long-term from multiple sources
Systems Learning	Prescriptive action with one-time evaluations and inflexible procedures	Experimenting and continuously co-learning and adapting in real-time

AGRIFOOD SYSTEM TRANSFORMATION THROUGH A **SYSTEMS APPROACH**



How to take action differently? Three priority shifts

SYSTEMS DOING

Policy & actions

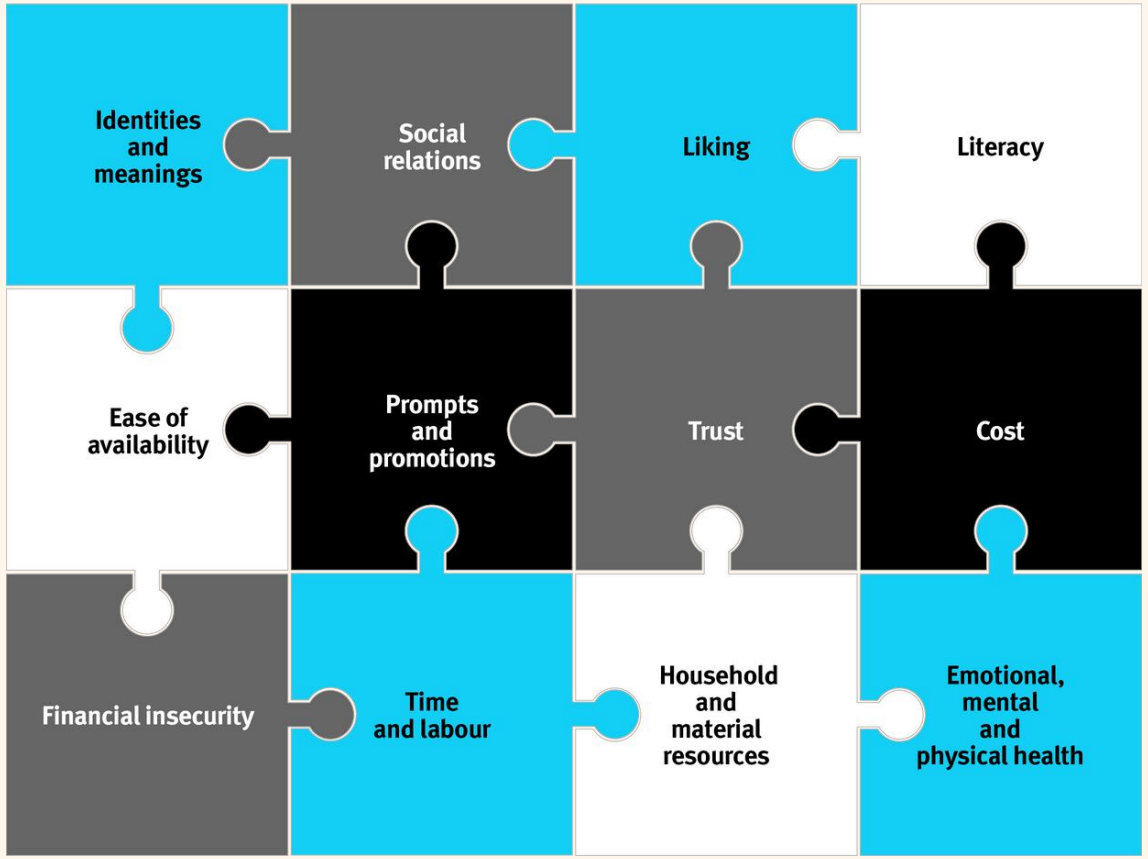
Implementing actions that leverage interconnections

	From isolation (silos)….	**…. to connection (systems)**
	Fragmented interventions	*Implementing & interlinking aligned, multipurpose actions*
Priority Shift 1	**From disconnected actions to…** Addressing a priority problem with single or disconnected agrifood system interventions	**…portfolios of interlinked actions** Bringing together a portfolio of interlinked actions to address a priority problem, taking account of consequences for other outcomes

Priority Shift 1.
Portfolios of interlinked actions

Consider the full picture of people's lived realities

Getting policies and interventions to work for better diets for all.



Source: Hawkes C, Gallagher-Squires C, Spires M, Hawkins N, Neve K, Brock J, Isaacs A, Parrish S, Coleman P. The full picture of people's realities must be considered to deliver better diets for all. Nat Food. 2024 Nov;5(11):894-900.

How to take action differently? Three priority shifts

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Priority Shift 1	**From disconnected actions to…** Addressing a priority problem with single or disconnected agrifood system interventions	**…portfolios of interlinked actions** Bringing together a portfolio of interlinked actions to address a priority problem, taking account of consequences for other outcomes
Priority Shift 2	**From single objective actions to...** Actions that consider just one objective	**…multipurpose actions** Delivering multipurpose actions designed for co-benefits

Priority Shift 2.
Multipurpose actions

ENTRY POINT

School food subsystem

Priority problem
poor child nutrition

- Certified environmental standards
- Change in procurement regulations
- Co-design of menus with children
- Logistical infrastructure for shorter-supply chains
- Investment in SMEs for meal preparation
- School nutrition standards
- School Meals Coalition

- BETTER PRODUCTION
- BETTER NUTRITION
- BETTER ENVIRONMEN
- BETTER LIFE

2 ZERO HUNGER

How to take action differently? Three priority shifts

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Policy & actions

Implementing actions that leverage interconnections

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Priority Shift 2	**From single objective actions to...** Actions that consider just one objective	**…multipurpose actions** Delivering multipurpose actions designed for co-benefits
Priority Shift 3	**From actions that ignore tradeoffs to…** Taking actions that fly blind into tradeoffs or deliberately ignore them	**…innovations to mitigate tradeoffs** Equity-focused innovations to manage and mitigate tradeoffs between outcomes, people and interests

Priority Shift 3.
Innovations to mitigate tradeoffs

Example: localizing school food

POTENTIAL TRADEOFF 1	Between higher and lower cost food
POTENTIAL TRADEOFF 2	Between local economic benefits and economic gains to existing food sources (national, global, corporate)
POTENTIAL TRADEOFF 3	Between higher and lower environmental impacts from transportation

Source: Jablonski BBR, Milbourne P, Maderson S, Morgan K. Considering tradeoffs in "local" food policies: examples from school feeding programmes. Front Nutr. 2023 Sep 12;10:1242493

SYSTEMS KNOWLEDGE

Data & evidence

The data & evidence to inform aligned action

What does systems doing imply for food systems research and science? Three priority shifts

	From isolation (silos)…. *Assessing problems, outcomes, causes in isolation from single disciplines & sources*	**…. to connection (systems)** *System-wide analysis of interlinkages & outcomes from multiple sources*
Priority Shift 1	**From understanding only core drivers to…** Identifying only the causes and drivers of problems in agrifood systems	**…identify priority connections** Identifying entry points, dysfunctions, blockages and enablers of implementation and impact across agrifood systems

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SYSTEMS KNOWLEDGE

Priority Shift 1.
Identify priority connections

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From healthy food environments to healthy wellbeing environments: Policy insights from a focused ethnography with low-income parents' in England

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ARTICLE INFO

Keywords:
Food provisioning environments
Food practice
Low-income
Inequalities
Obesity

ABSTRACT

Overweight and obesity continue to increase globally. In England, as in many other countries, this disproportionately affects people who experience socioeconomic deprivation. One factor blamed for inequalities in obesity is unhealthy food provisioning environments (FPEs), leading to a focus on policies and interventions to change FPEs. This paper aims to provide insights into how FPE policies could more effectively tackle inequalities in obesity by addressing a key research gap: how the structural contexts in which people live their lives influence their interaction with their FPEs. It aims to understand how low-income families engage with FPEs through in-depth focused ethnographic research with 60 parents across three locations in England: Great Yarmouth, Stoke-on-Trent, and the London Borough of Lewisham. Analysis was guided by sociological perspectives. FPEs simultaneously push low-income families towards unhealthy products while supporting multiple other family needs, such as social wellbeing. FPE policies and interventions to address obesity must acknowledge this challenge and consider not just the makeup of FPEs themselves but how various structural contexts shape how people come to use them.

1. Introduction

Rates of overweight and obesity continue to climb worldwide with 39% of adults and 18% of children living with overweight or obesity in 2016 (WHO, 2021). In England, which has one of the highest rates globally, 64.2% of adults and 40.9% of 10–11 year olds were living with overweight or obesity in 2019 and 2021 respectively (Baker, 2022). Prevalence disproportionately affects individuals at the lower end of the socioeconomic spectrum (Baker, 2021). Data from the UK National Child Measurement Programme in 2019–20 suggests that not only is child obesity increasing in absolute terms, but children living in the most deprived areas of England are more than twice as likely to have obesity as those in the least deprived (NHS Digital, 2020). This is despite child obesity being a key local and national policy focus.

Increasingly, food provisioning environments (FPEs), which are the foods available to people in their surroundings as they go about their everyday lives and the nutritional quality, safety, price, convenience, labelling, and promotion of these foods (FAO, 2016) are blamed for people's diet quality and associated health outcomes. This stems from an understanding that diets are shaped by the foods available to people in their surroundings (Swinburn et al., 2013; C. Turner et al., 2018). FPEs in low-income neighbourhoods are considered to be particularly detrimental to health as they are often characterised by abundant fast food outlets and poorer than average access to fresh food (Burgoine et al., 2017; Lamy et al., 2015; Pitt et al., 2017). FPEs have thus been considered a critical intervention point in efforts to reduce inequalities in obesity. This includes interventions to change the nutritional quality of out of home foods, such as healthier catering schemes (Healthier Catering Commitment, n.d.); proposals to address labelling, marketing, and promotion of food (DHSC, 2020);

A particular focus in low income communities are policies that seek to alter the composition of the FPE, such as through zoning laws that prohibit the opening of new fast food outlets, or increasing physical access to outlets that provide fresh fruits and vegetables (Jilcott Pitts et al., 2021; Keeble et al., 2019). The theory behind these policies and interventions is that changing specific elements of FPEs shapes what people buy and eat. Yet despite the significant body of research in this area, it has proved difficult to identify consistent patterns (Adamowicz et al., 2022; Cummins and Macintyre, 2006; Hobbs et al., 2019; Jilcott Pitts et al., 2021; G. Turner et al., 2021; Widener, 2018). For example, exposure to outlets where people are regularly active such as on routes to work or school may be more important than those where people live.

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What does systems doing imply for food systems research and science? Three priority shifts

SYSTEMS KNOWLEDGE

Data & evidence

The data & evidence to inform aligned action

	From isolation (silos)….	…. to connection (systems)
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Priority Shift 1	**From understanding only core drivers to…** Identifying only the causes and drivers of problems in agrifood systems	**…identify priority connections** Identifying entry points, dysfunctions, blockages and enablers of implementation and impact across agrifood systems
Priority Shift 2	**From evidence from single sources to…** Understanding problems and solutions using data & evidence from single disciplines	**…participatory knowledge generation** Understand problems and solutions through data and evidence co-created by multiple stakeholders and disciplines
	From assessing single outcome to… Tracking and assessing different outcomes in isolation	

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Priority Shift 2.
Inclusive knowledge generation

Stakeholder-centered methods: perceived impacts of different policy options on agrifood system sustainability, Nakuru, Kenya

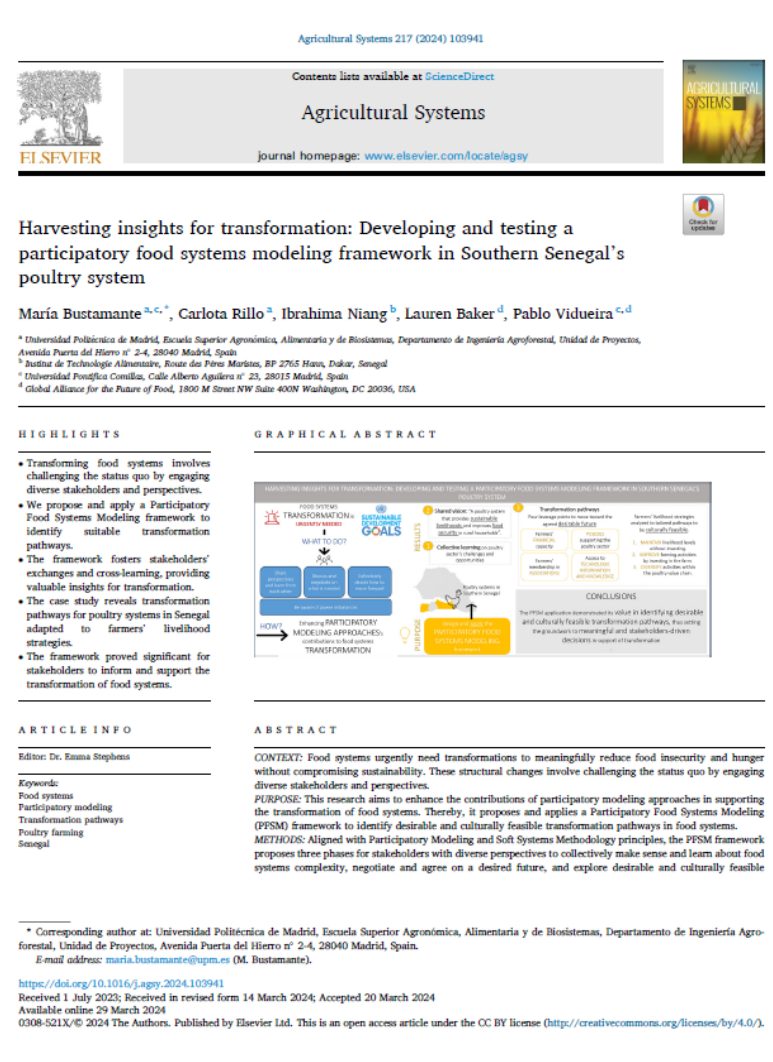
			Current maize support	Standard KS-1758	PGS certification	Public procurement	Seed support
Sustainability Nakuru's food system	Economic	Agricultural GDP	-0.1	0.0	0.4	0.5	0.6
		Poverty*	-0.1	0.1	0.4	0.5	0.6
	Social	Undernourishment*	0.3	0.1	0.4	0.6	0.5
		Undernutrition	-0.2	0.2	0.4	0.4	0.6
		Social equity	-0.1	-0.1	0.4	0.4	0.5
	Environmental	Adaptation	-0.4	-0.1	0.6	0.5	0.6
		Soil quality	-0.5	0.3	0.6	0.5	0.6

Note. Numeric scale of -1 (high negative impact) to 1 (high positive impact). Colour scale of -0.7 (red) to 0.7 (green).

*These indicators were deemed most important by interviewees

Identified large consensus on the need for higher availability and accessibility of quality seed to meet food security and multiple goals.

Source: D'Alessandro et al, 2021



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Harvesting insights for transformation: Developing and testing a participatory food systems modeling framework in Southern Senegal's poultry system

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HIGHLIGHTS

- Transforming food systems involves challenging the status quo by engaging diverse stakeholders and perspectives.
- We propose and apply a Participatory Food Systems Modeling framework to identify suitable transformation pathways.
- The framework fosters stakeholders' exchanges and cross-learning, providing valuable insights for transformation.
- The case study reveals transformation pathways for poultry systems in Senegal adapted to farmers' livelihood strategies.
- The framework proved significant for stakeholders to inform and support the transformation of food systems.

GRAPHICAL ABSTRACT

ARTICLE INFO

Editor: Dr. Emma Stephens

Keywords:
Food systems
Participatory modeling
Transformation pathways
Poultry farming
Senegal

ABSTRACT

CONTEXT: Food systems urgently need transformations to meaningfully reduce food insecurity and hunger without compromising sustainability. These structural changes involve challenging the status quo by engaging diverse stakeholders and perspectives.
PURPOSE: This research aims to enhance the contributions of participatory modeling approaches in supporting the transformation of food systems. Thereby, it proposes and applies a Participatory Food Systems Modeling (PFSM) framework to identify desirable and culturally feasible transformation pathways in food systems.
METHODS: Aligned with Participatory Modeling and Soft Systems Methodology principles, the PFSM framework proposes three phases for stakeholders with diverse perspectives to collectively make sense and learn about food systems complexity, negotiate and agree on a desired future, and explore desirable and culturally feasible

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What does systems doing imply for food systems research and science? Three priority shifts

SYSTEMS KNOWLEDGE

Data & evidence

The data & evidence to inform aligned action

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Priority Shift 2	**From evidence from single sources to…** Understanding problems and solutions using data & evidence from single disciplines	**…participatory knowledge generation** Understand problems and solutions through data and evidence co-created by multiple stakeholders and disciplines
Priority Shift 3	**From assessing single outcomes to…** Tracking and assessing different outcomes in isolation	**…monitor and analyse across outcomes** Track and assess across outcomes and assess tradeoffs and co-benefits of interventions with foresight

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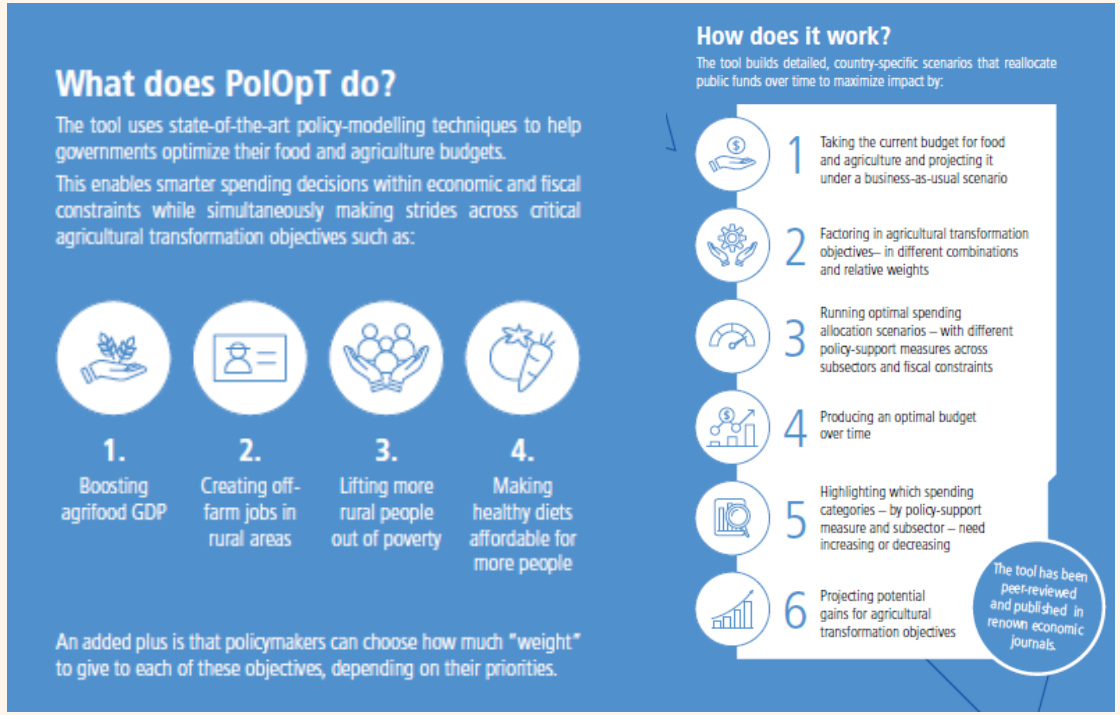
Priority Shift 3.
Monitor and analyze across outcomes



Potential socioeconomic gains of optimally reallocating public spending across policy-support measures in the crop farming and livestock sectors, 2025 and 2030

		Number of rural people lifted out of poverty	Off-farm jobs created in rural areas	More people who can afford healthy diet	Agrifood GDP increase (%)
Burkina Faso	2025	185 215	54 800	337 621	2%
	2030	616 717	182 709	1 448 952	8%
Ethiopia	2025	596 802	46 371	3 186 681	2%
	2030	728 939	66 256	5 254 814	2%
Ghana	2025	236 992	133 310	4 216 027	6%
	2030	275 699	181 503	5 383 325	8%
Mozambique	2025	321 955	90 095	661 723	9%
	2030	555 336	150 914	1 265 444	11%
Nigeria	2025	427 166	183 819	1 023 286	1%
	2030	460 287	213 092	1 857 148	1%
Uganda	2025	250 120	81 954	1 043 022	3%
	2030	139 049	57 988	939 929	2%

Note: Deviation from a business-as-usual budget scenario.

Source: Sánchez, M.V., Cicowiez, M., Pernechele, V. & Battaglia, L. 2024. *The opportunity cost of not repurposing public expenditure in food and agriculture in sub-Saharan African countries – Background paper for The State of Food Security and Nutrition in the World 2024.* FAO Agricultural Development Economics Working Paper 24-07. Rome.

SYSTEMS THINKING

Mindsets

Mindsets that connect the dots

What are the implications for skills and competences? Three priority shifts

	From isolation (silos)…. *Seeing priorities, problems & solutions in isolation*	**…. to connection (systems)** *Seeing beyond mandates and identifying interconnections*
Priority Shift 1	**From seeing the problem to…** Seeing only the visible and direct causes of any problem in agrifood systems	**…see the system** Recognizing problems in agrifood systems have multiple, interconnected underlying causes
Priority Shift 2	**From our own objective to…** Considering only own mandate, objective, priorities and perspective	**..collective vision** Identifying synergies with other priorities and understanding other's perspectives
Priority Shift 3	**From asking "what works" to…** Searching for high-impact silver bullet interventions in agrifood systems within our own mandate	**..ask "what needs to change in the system to enable impact"** Seeking mutually complementary solutions in different parts of agrifood systems and inter-related systems

Key messages

- Orient food systems science to providing data and evidence to inform Systems Doing
- Embrace diversity of methods for Systems Knowledge (and be clear what they are)
- Build capacity among food systems research community for Systems Thinking

Thank you

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