Food system models and methodologies within Wageningen University & Research: Opportunities for deepening our food systems work

WAGENINGEN
UNIVERSITY & RESEARCH

Just Dengerink[1], Herman Brouwer[2], 2020. *Food system models and methodologies within Wageningen University & Research: Opportunities for deepening our food systems work.* Wageningen, Wageningen University & Research, Report 2020-023. 24 pp.; 22 fig.; 1 tab.; 28 ref.

1 Wageningen Economic Research
2 Wageningen Centre for Development Innovation

Funding: the authors would like to acknowledge funding from the Wageningen University & Research 'Food Security and Valuing Water programme' that is supported by the Dutch Ministry of Agriculture, Nature and Food Security

This report can be downloaded for free at https://doi.org/10.18174/516691 or at www.wur.eu/cdi (under publications).

Wageningen University & Research Report 2020-023 | Project code 8141908500

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1. Introduction

This paper presents a first overview of different food system models and methodologies in use at Wageningen University & Research. It shows how these food system models and methodologies relate to developments in food systems thinking and practice outside Wageningen. Also, this paper identifies opportunities for deepening our food systems work at Wageningen University & Research.

In Section 2, an overview is given of the origins of the conceptual thinking around food systems, and the different ways in which this thinking has been applied in models and methodologies across the world. Section 3 gives a general overview of the different types of food systems work that are been carried out at the different institutes in Wageningen. In Section 4, we zoom in at 10 models that are used within Wageningen to describe food systems. Section 4 creates an overview of the 21 most important methodologies and tools used across Wageningen to analyse food systems. Finally, section 6 offers an overview of opportunities for deepening our food systems work, making use of food system models and methodologies from both inside and outside Wageningen University & Research.

2. Defining food systems

The food systems approach offers a new, more holistic perspective on food and nutrition security, by broadening the focus of researchers and policy makers from the *activities* in the food system to the food security, social and environmental *outcomes* and the socio-economic and environmental *drivers* of these food system activities. In doing so, the food systems approach not only shows how food systems interact with other (ecological, economic or political) systems but also analyses how each of the elements within a food system interact with each other in producing food system outcomes.

In line with a recent review of food system narratives (Bene et al., 2019), the recent literature on food systems can be divided into different strands of thinking.

1. **Food systems for improved environmental outcomes.** This field of literature explores the relation between food system activities and their environmental drivers and outcomes. Researchers in this field often come from the natural sciences. Food systems thinking originated from this strand of thinking, with the conceptual work from Ericksen (2008) and Ingram (2011) and the policy report of UNEP (2016) on food systems and natural resources.
2. **Food systems for improved nutrition & health.** This area of literature explores the relation between food system activities and their nutrition and health outcomes. Researchers in this field often have a background in nutrition, health or behavioural sciences. This field of thinking receives much attention in policy circles, with the recent work of the Global Panel on Agriculture and Food Systems for Nutrition (Global Panel, 2016), the work of the High Level Panel of Experts on Food Security and Nutrition (HLPE, 2017) and the recent report of the EAT-Lancet Commission on healthy diets from sustainable food systems (EAT, 2019).
3. **Food systems for feeding the world.** This area of literature focuses on food production systems and the closing of yield gaps, responding to the quest of 'how to feed 10 billion people in 2050'. Researchers often have a background in agronomy. In food security policy circles and in private sector platforms such as WEF, this narrative is still quite dominant. Examples of this literature are van Ittersum et al. (2016) on the question whether sub-Saharan Africa can feed itself, the FAO annual series State of Food Security and Nutrition in the World, and private sector food system outlooks such as WEF/Deloitte (2017) and WEF/McKinsey (2020).
4. ***Food systems for improved resource use.*** This strand of food systems literature is focused on how resource use can be improved by improving the circularity of food systems, optimising the re-use and recycling of resources in the food system. Examples of this literature are the work from the High Level Panel of Experts on Food Security and Nutrition on food losses and waste (HLPE, 2014) and the work of World Wildlife Fund and Metabolic on improving circularity of energy and material flows in global and European food systems (WWF, 2016; Metabolic, 2016). Researchers in this category often have backgrounds in economy, environmental science or industrial ecology.
5. ***Food systems for improved equity.*** This strand of food systems literature is focused on the need for food systems to produce more equitable outcomes. This literature includes literature around food systems governance (Hospes and Brons, 2016; Termeer et al., 2018) and recent literature around the political economy of food (Harris et al., 2019; Duncan and Claeys, 2018). Researchers in this field often have a background in the social sciences.

3. Overview of food systems work at WUR

Based on a systematic search through the WUR online environment (including the WUR research database research.wur.nl and WUR study handbook ssc.wur.nl), a total number of 588 pages could be found with reference to 'food system' or 'food systems'. Of these pages, 236 pages refer to food systems related publications, 174 pages refer to food systems related projects, 160 pages refer to food systems related activities and events, 9 pages refer to WUR media moments around food systems and 9 pages refer to food systems related courses.

Based on this systematic search, an overview can be created of 35 food systems research clusters, where we see a concentration of at least 3, but up to 20 inter-related food systems pages, publications, projects, activities, events, media moments and courses. In each of the five science groups of Wageningen University & Research we can find some of these food systems research clusters, with the largest concentration in the science group of Social Sciences. The largest number of food systems clusters can be found in the organisations Wageningen Centre for Development Innovation and Wageningen Economic Research.

Table 1 Overview of research clusters among the five science groups of Wageningen University & Research

Agro-tech & Food Sciences	Animal Sciences	Environmental Sciences	Plant Sciences	Social Sciences
Agrotechnology & Voedingswetenschappen • Complex food systems • Energy & nutrient production • Food Systems for Healthier Diets **Wageningen Food & Biobased Research** • Tackling Food Losses & Waste • Functionality in Food Systems	**Dierwetenschappen** • Role of livestock in future food systems • Small Fish and Food Security **Wageningen Marine Research** • Marine Lower Trophic Food Systems **Wageningen Livestock Research** • Livestock Eco-Agri-Food Systems	**Omgevingswetenschappen** • Sustainable food systems • Contribution to EAT-Lancet Rapport **Wageningen Environmental Research** • Biodiversity and food systems • Knowledge for sustainable food systems	**Plantenwetenschappen** • Food systems think tank • Farming systems ecology • Diversification of food systems **Wageningen Plant Research** • Circular food systems • Sustainable global food systems	**Maatschappijwetenschappen** • Governing Food Systems • Political Economy of Food Systems • Urban Food Systems • Food system transformations **Wageningen Centre for Development Innovation** • Safe & sustainable food systems in Dhaka • Food system resilience in protracted crisis • Food Systems courses • Governance platforms for healthier diets • Landscape approach to governing agri-food systems **Wageningen Economic Research** • The Food Systems Approach • Food systems decision-support tool • European food systems • Transition Support System • Agriculture for Nutrition and Health • Food Systems & Innovation Systems • Food Systems in International Trade • Food Systems for Healthier Diets

Figure 1 shows the development of the number of Wageningen publications on food systems over time, in a fifty-year period spanning from 1970 until 2019. This figure shows the amount of publications on food systems has been growing enormously over this period.

If we look at the Wageningen publications on food systems over time, we see that the concept of a food system has been sparsely used in the seventies, eighties and nineties, and only has reached scale since the early 2000s. After that, the amount of publications has risen from only a few each year to over 50 publications on food systems in the year 2008 alone.

We see a significant growth of publications on food systems after the publication of Polly Ericksen's foundational work on food systems and natural resources (Ericksen, 2008). Another spike can be seen more recently, after the recent publication of a series of authoritative reports by international organisations (HLPE 2014, 2017; UNEP, 2016; Global Panel, 2016).

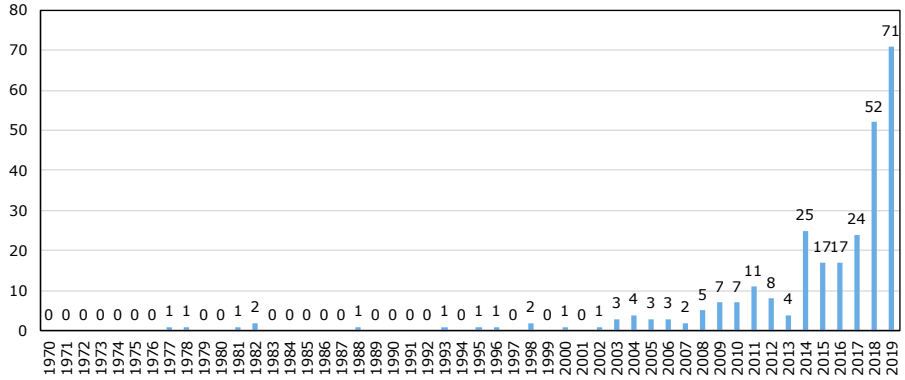

Figure 1 Number of Wageningen publications on food systems (1970-2019)

4. Overview of food system models at WUR

Across the food systems research clusters at Wageningen University & Research, several food system models are often used or referred to. In this chapter, we describe the ten most important ones.

The Ericksen (2008) food system activities and outcomes model

Many researchers, publications and projects in Wageningen refer to the first detailed conceptualisation of a food system by Polly Ericksen in the journal *Global Environmental Change*, which became the basis of much later work by scholars and international organisations on food systems (Figure 2). The Oxford food systems scholar John Ingram helped popularise her work among scholars and policy makers by including her conceptualisations in his paper on the food system approach in the journal *Food Security* (Ingram, 2011).

The conceptualisation of Ericksen is composed of two parts. In the first part, she differentiates between *food system activities* which take place in the value chain, such as production, distribution and consumption, and *food system outcomes*, which are the results of these activities in terms of food security, social welfare and environmental welfare.

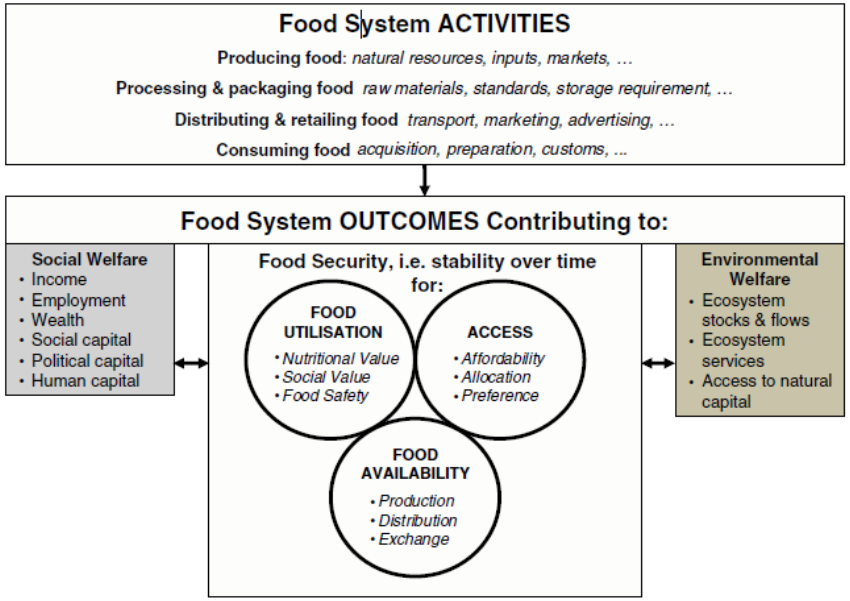

Figure 2 The Ericksen (2007) food system activities and outcomes model

The Ericksen (2008) food systems drivers and feedbacks model

The second part of the conceptualisation of food systems by Ericksen (Figure 2) shows how the activities and outcomes of the food system are driven by forces external to the food system. On the one hand, changes in the natural environment (*global environmental change drivers*) have a significant influence on the food system. On the other hand, *socio-economic drivers* determine much of what happens in the food system. How food system activities and outcomes are affected, depends much on the interaction between these environmental and socio-economic drivers.

Another important element of the conceptualisation by Ericksen are the environmental and socio-economic feedbacks in the system, which show that the activities and outcomes of the food system in turn might have an effect on the environmental and socio-economic systems that drive them.

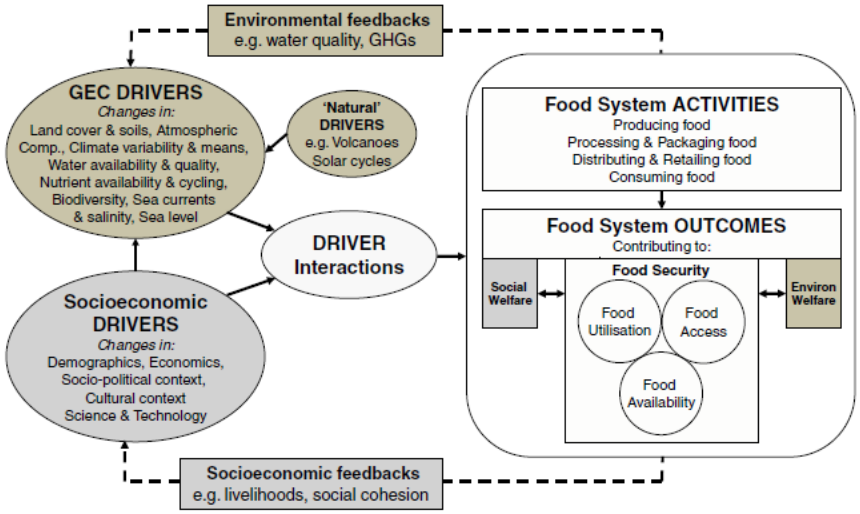

Figure 3 The Ericksen (2007) food system drivers and feedbacks model

The Hussain and Miller (2014) Eco-agri-food system nexus model

The model from Hussain and Miller (2014; Figure 4) is often referred to in WUR projects and publications on circular food systems and the role of livestock (Baltussen et al., 2017). This model explicitly differentiates between *agricultural and food systems* on the one hand, and *human systems* and *ecosystems and biodiversity* on the other hand. Similar to Ericksen (2008), the socio-economic and the environmental systems drive the food system activities and their outcomes.

In this conceptualisation, the interaction between these systems is made explicit by showing how human systems and ecosystems both support the food system, but are also affected in many ways by its activities.

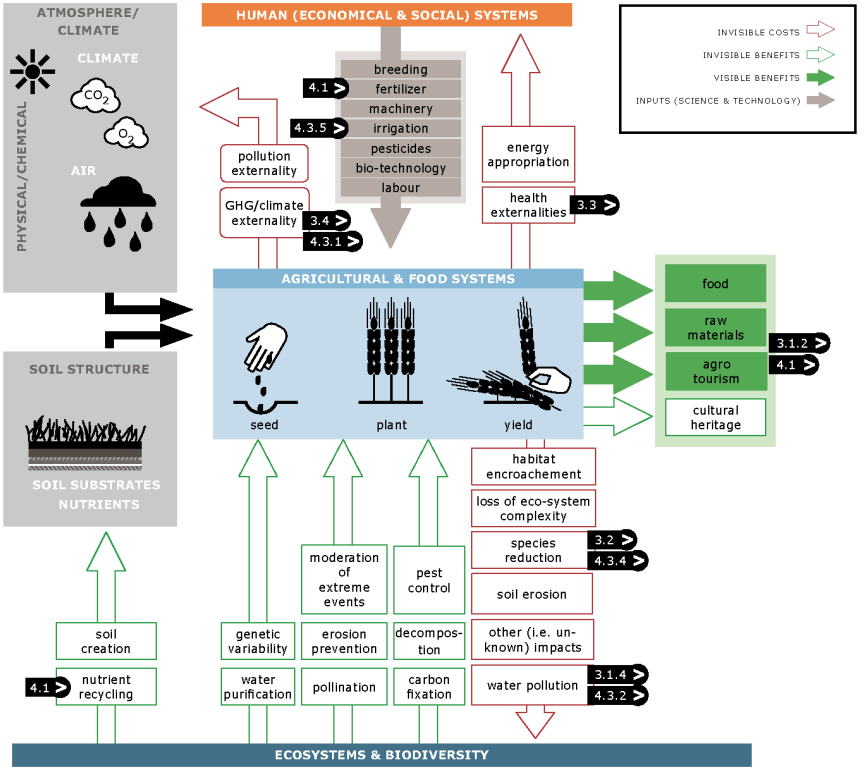

Figure 4 The Hussain and Miller (2014) Eco-agri-food system nexus model

The UNEP (2016) Food systems and natural resources model

This conceptual model from the UNEP report on Food systems and natural resources (Figure 5) draws heavily on the earlier work by Ericksen (2008) and Ingram (2011), while giving much more detail to the activities in the food system and their interaction with a wide range of environmental drivers.

These environmental drivers are divided into three parts: natural resources, including renewables and non-renewables, environmental impacts and biophysical drivers. The detailed attention for environmental drivers is one of the reasons why this model is widely used among Wageningen researchers working on agriculture and the environment.

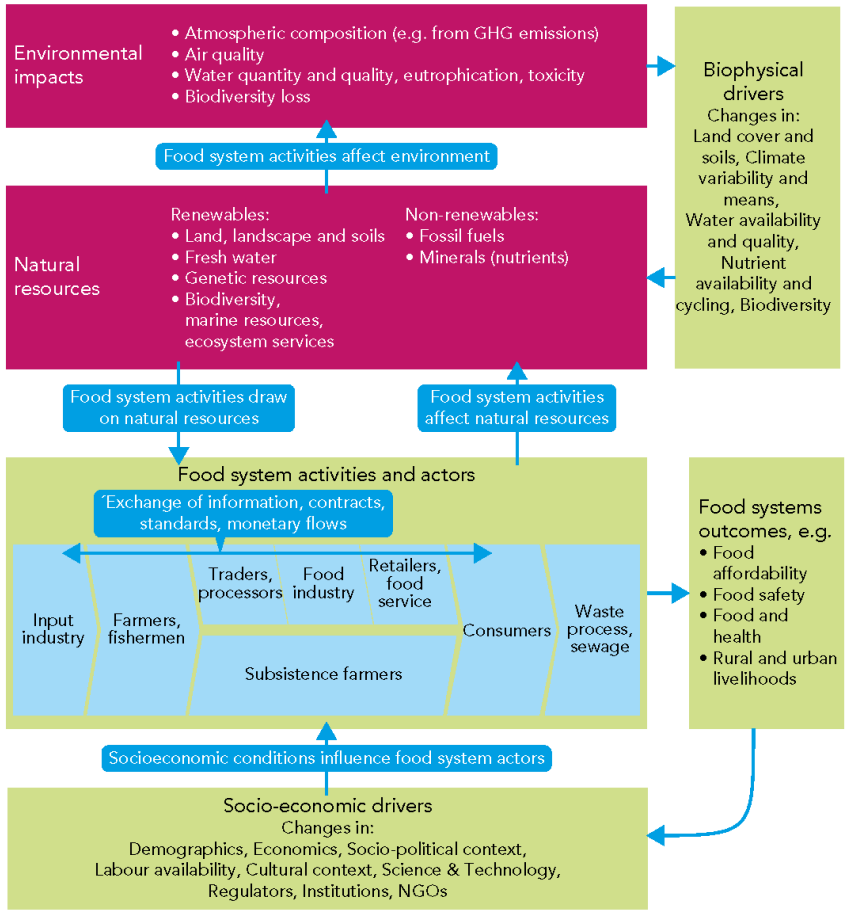

Figure 5 The UNEP (2016) food systems and natural resources model

The Global Panel (2016) Drivers of food systems model

This model, developed by the Global Panel on Agriculture and Food Systems for Nutrition, takes a different angle than many other models. While the drivers of the food system are more in the background in this model, the food system activities and their food security outcomes get more attention.

Diet quality is taken as the most important outcome, which according to the model is not only influenced by the activities (subsystems) in the wider food supply system, but also by the food environment and the consumer. This model helps shift the traditional focus of agricultural research on *production of food* towards a research agenda that is focused on improving the healthy and nutritious *consumption of food*.

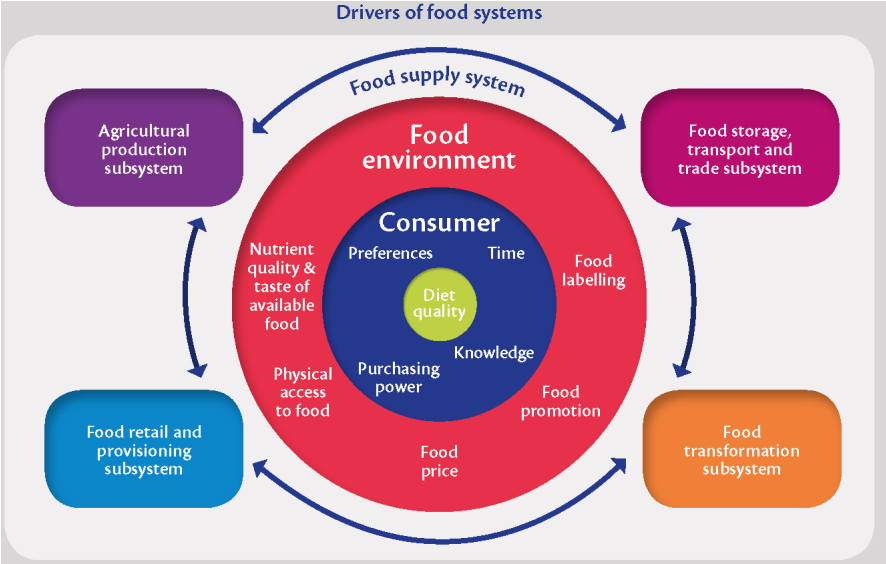

Figure 6 The Global Panel (2016) Drivers of food systems model

The HLPE (2017) Food systems for diets and nutrition model

The model developed by the High Level of Experts on Food Security and Nutrition of the Committee on World Food Security attempts to reconcile the work of Ericksen (2008) and Ingram (2011) with the work around food systems for nutrition and healthy diets in the work of the Global Panel. Apart from social, economic and environmental outcomes of the food system, the nutrition and health outcomes of the food system are explicitly mentioned.

This complex model shows how not only food supply chains, but also food environments and consumer behaviour, are influenced by a range of drivers that are external to the food system. It also shows how consumer behaviour affects both the food environment and the dynamics in food supply chains. Moreover, the model pays explicit attention to the role of political, programme and institutional actions and their impact on food supply chains, food environments, consumer behaviour and food system drivers.

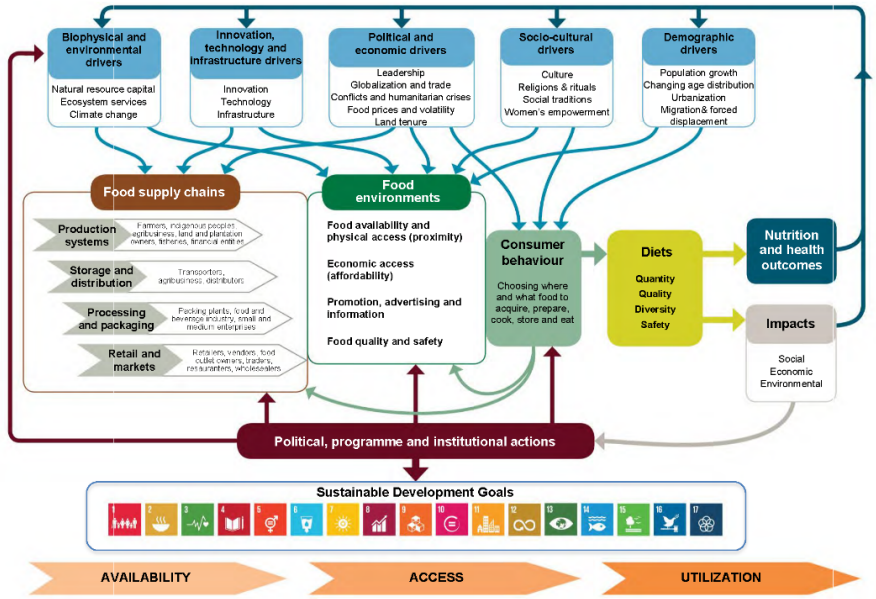

Figure 7 The HLPE (2017) Food systems for diets and nutrition model

The van Berkum et al. (2018) conceptual food system model

This conceptual model has been described in the report by van Berkum et al. (2018) from Wageningen Economic Research, and combines elements of conceptual models in key food systems reports (Ericksen, 2008; Ingram, 2011; UNEP, 2016; Global Panel, 2016; HLPE, 2017). It is referred to in a wide range of publications and projects in the social sciences group and is used as a basis of the WUR-broad Knowledge Base (KB) Food Security program, funded by the Dutch Ministry of Agriculture.

In line with the work on food systems for nutrition (Global Panel, 2016; HLPE, 2017), the model pays attention to the way in which the food supply system is influenced by the food environment and consumer characteristics. In line with the global environmental change literature (Ericksen, 2008; Ingram, 2011; UNEP, 2016) the model also shows how food system activities are both driven by environmental and socio-economic drivers, while also producing environmental and socio-economic outcomes.

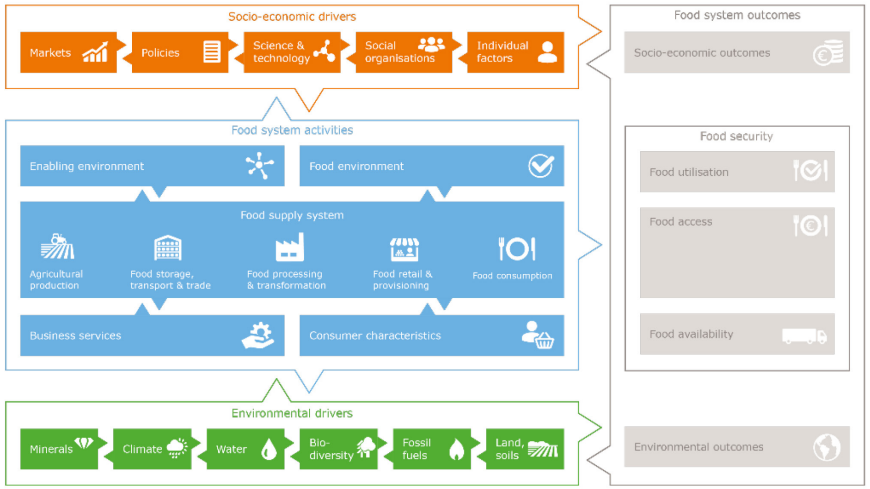

Figure 8 The van Berkum et al. (2018) conceptual food system model

The SUSFANS (2018) European Union food system model

This conceptual model has been used for the interdisciplinary WUR research programme SUSFANS, which aims to provide an integral approach to food and nutrition security in the European Union. The model uses elements from the global environmental change literature (Ericksen, 2008; Ingram, 2011; UNEP, 2016) but pays explicit attention to the role of European Union policy, European policy makers and other key actors in the EU food system.

Moreover, the drivers of the food system are adjusted to the context of the European food system and include specific attention to dynamics around consumers, producers and other food chain actors. Additional to the food system outcomes, a separate box is added on the status of the EU food and nutrition security and sustainability performance, which has a direct feedback to the European policy on food and nutrition security.

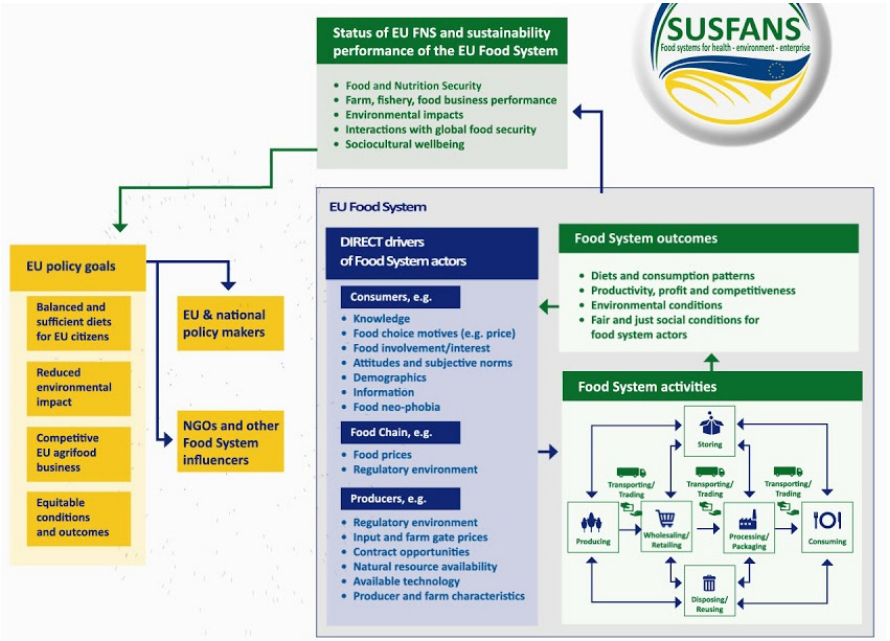

Figure 9 The SUSFANS (2018) EU food system model

The Wageningen (2019) circular agri-food system model

Recently, there has been a lot of attention in Wageningen research and communication on the future role of livestock in food systems. In response, researchers and communication employees of Wageningen have been working on the circular agri-food system model. This model shows how cattle can play an important role in a circular food system, in which manure from cows, pigs and chicken can fertilise the land and improve productivity of crops, of which the by-products can again serve as animal feed.

With its focus on the Dutch concept of circular agriculture, this model deviates from many of the food system models that are present in the international literature on food systems.

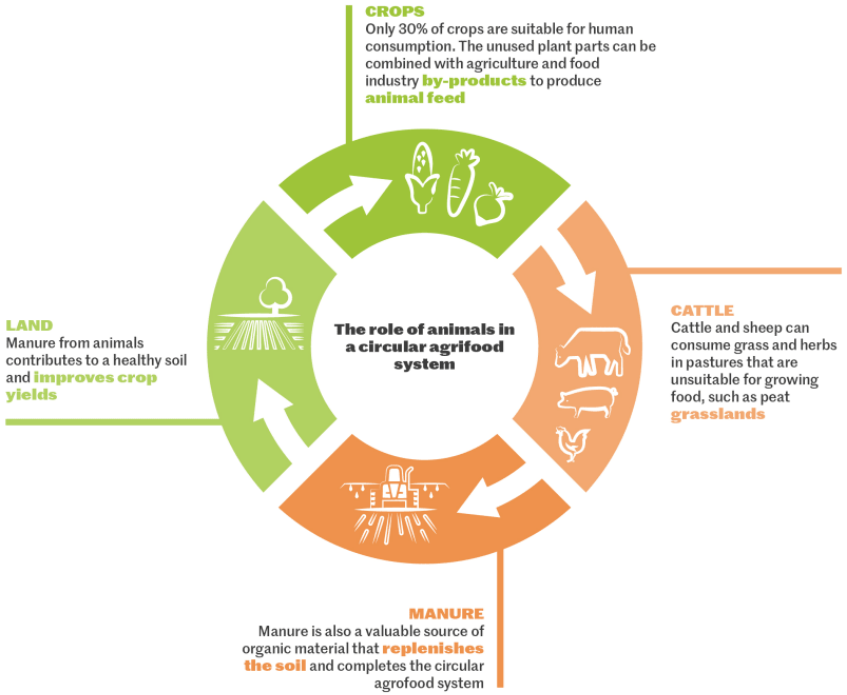

Figure 10 The Wageningen (2019) circular agri-food system model

Woodhill, Hasnain & Griffith (2020) food systems framework

Another food system model that includes circularity has gained attention recently: the Woodhill (2020) food systems framework, part of the Foresight4Food Initiative. This shows how circularity is at the heart of the food system activities, where value chain activities are intertwined with a continuous cycle of storage, use and recycling.

Moreover, this model pays attention to the embeddedness of nesting of different systems. It shows how food systems are nested inside wider human systems, and how these human systems are again part of larger natural systems. Similar to other food systems frameworks, it highlights the feedback mechanisms between food system outcomes and drivers.

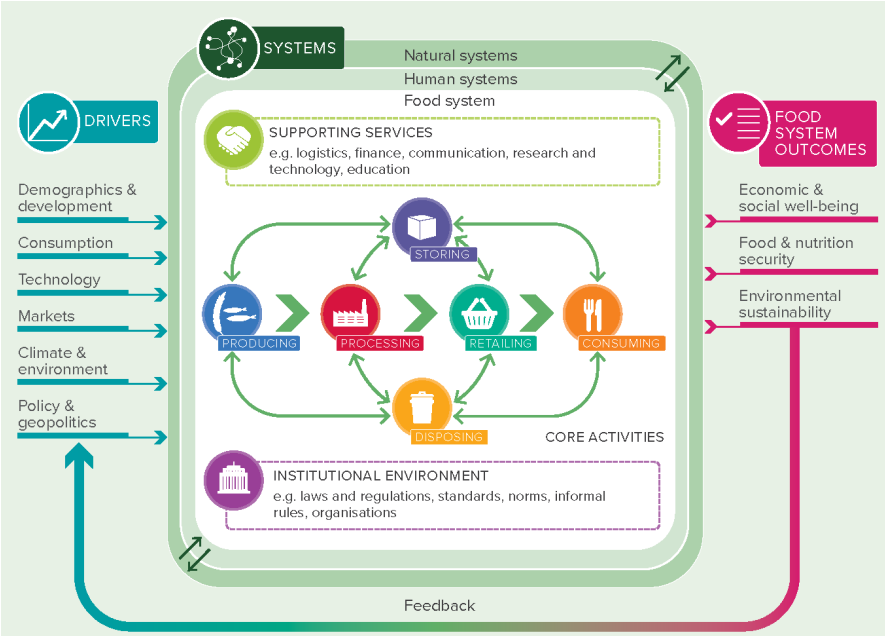

Figure 11 The Woodhill Hasnain & Griffith (2020) food systems framework

5. Overview of food systems methodologies at WUR

Across the food systems research clusters in Wageningen University & Research, different food systems methodologies and tools are being used. The following tools and methodologies feature prominently in different WUR research publications, projects and courses.

Mapping of food systems elements and their interactions

Different projects and publications across Wageningen have a food systems map as a central part of their analysis. In this mapping exercise, the different elements of the food system (e.g. drivers, activities, outcomes) are described. Very often, this mapping also includes an assessment of the main trends that relate to these key food system elements.

Some of these projects also map the interactions between these food system elements. Such an analysis can bring insights into how drivers of the food system impact food system activities, which food system activities produce which outcomes and how food system outcomes affect food system drivers.

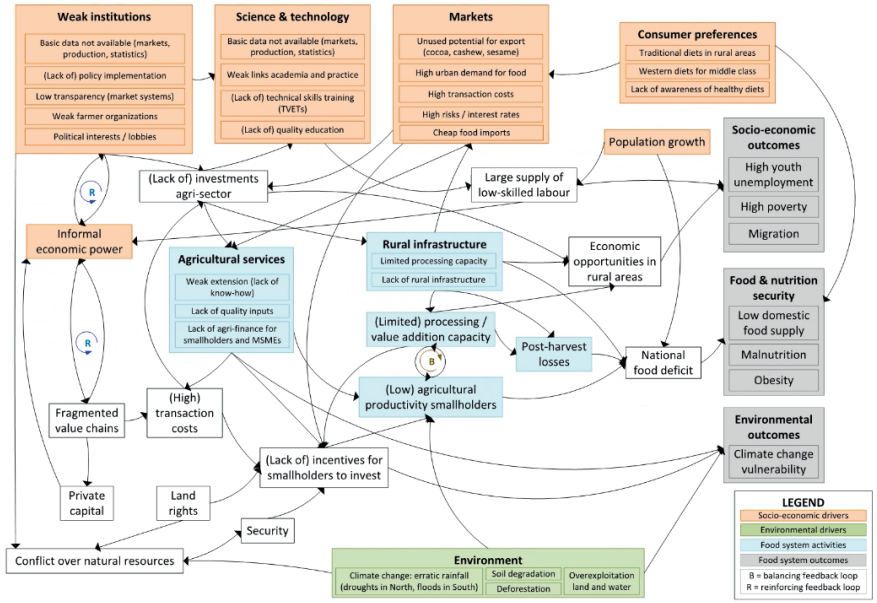

Figure 12 Mapping of food systems elements and their interactions

Identifying archetypes of food system behaviour

A range of food systems projects and studies take the analysis of the interactions between food systems analysis one step further. They analyse the feedback mechanisms that are at play in the interaction between food system elements. For example: how does food production affect soil quality and how do changes in soil quality in turn affect food production?

Studying the interrelations of food system elements helps to understand the behaviour of the food system. In order to structure these interactions, some studies try to identify certain problematic types of system behaviour that prevent the food system from having its desired outcomes. Using archetypes from systems thinking theory such as tragedy of the commons, success to the successful or fixes that fail (example Figure 13) they identify different types of problematic system behaviour that need to be addressed to improve the outcomes of the food system.

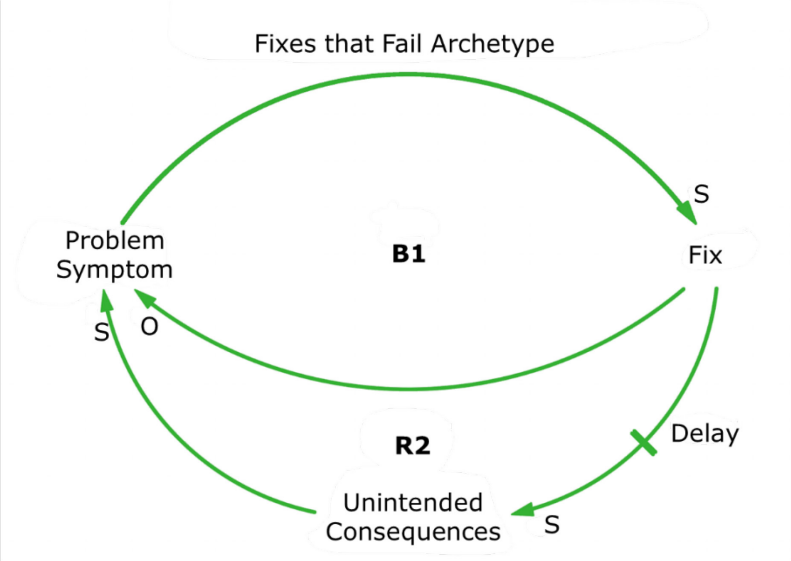

Figure 13 Identifying archetypes of food system behaviour

Describing different levels of systems thinking

Many of the analytical tools in food systems studies originate from systems theory. One important element of systems theory is the identification of those parts of the system that are most likely to change or transform the rest of the system.

Systems-thinking literature often refers to the thinking model of Maani and Cavana (2000). This model distinguishes four levels of thinking (Figure 14): events or symptoms, patterns of behaviours, systemic structures and mental models. Most decisions and interventions are based on the visible 'events and symptoms' (also called end-of-pipe solutions), even though these are just the tip of the iceberg in reality. Patterns are linked sets of events (i.e. trends) that create a history, and interventions at this level try to anticipate and adjust future trends.

Systemic structures reveal how patterns and system components relate to and affect each other. Interventions at this level aim to (re)design the system structure. Mental models reflect beliefs, values and assumptions that we personally hold and feed our reasons for doing things the way we do – yet these mental models rarely come to the surface (e.g. Nguyen and Bosch, 2013).

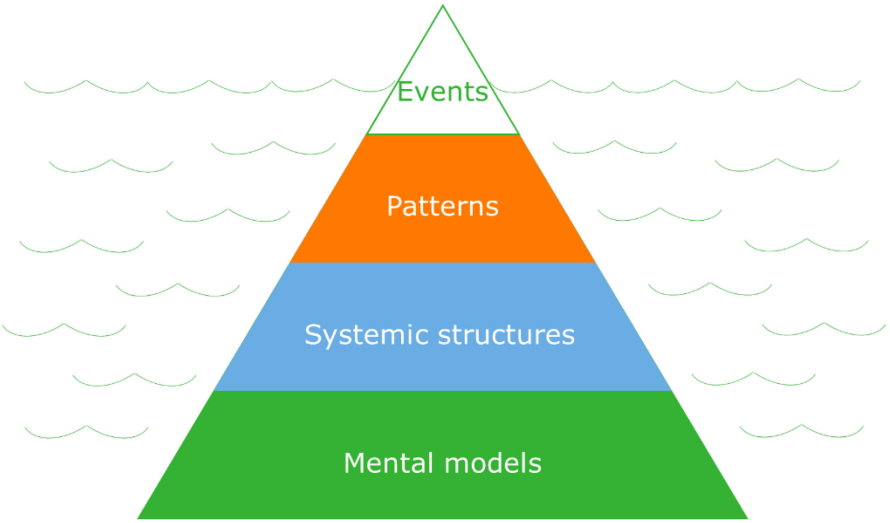

Figure 14 Describing different levels of systems thinking

Identifying leverage points for change

Systems thinking helps to understand deeper system structures that are at the root of the problem (Metabolic, 2018). This helps to identify useful leverage points for systemic change. The model of Donella Meadows (1999), as represented in Abson (2017, Figure 15) provides a useful framework to think about which place in the system has most potential to generate wider system change.

It shows how the *intent and design* of systems have larger impact on the system outcomes than the *feedbacks and parameters* of the system. Such a categorisation helps to think about what are the most effective leverage points to change a food systems for the better.

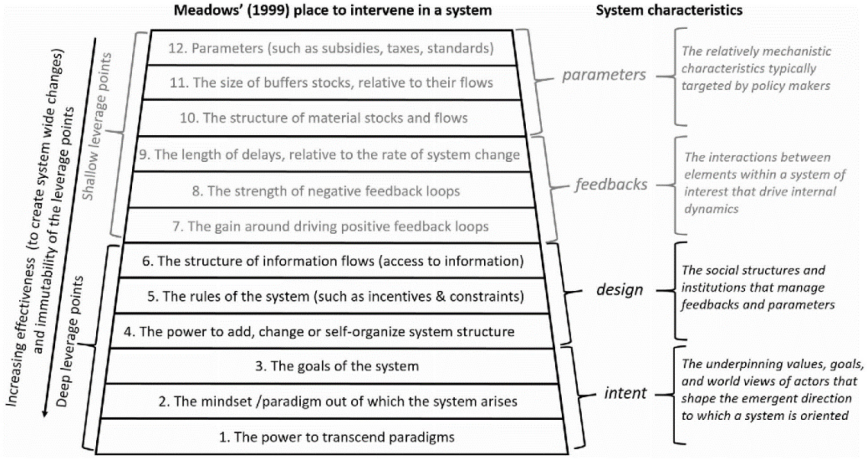

Figure 15 Identifying leverage points for change

Multi-level perspective: niches, regimes and landscapes

Many of the analytical tools used in food systems projects and publications have their origin in political science and deal with the governance of food systems. An important analytical framework in this respect is the multi-level perspective (Geels and Schot, 2007; Figure 16), which describes food systems transitions as a process of niches innovations, supported by socio-technical regimes, leading to new socio-technical landscapes.

Analysing which niches in a food system have the largest potential of scaling up, which socio-technical regimes might support what type of niches and understanding which new socio-technical landscapes might be on the horizon, can help to achieve a deeper understanding of food system transitions.

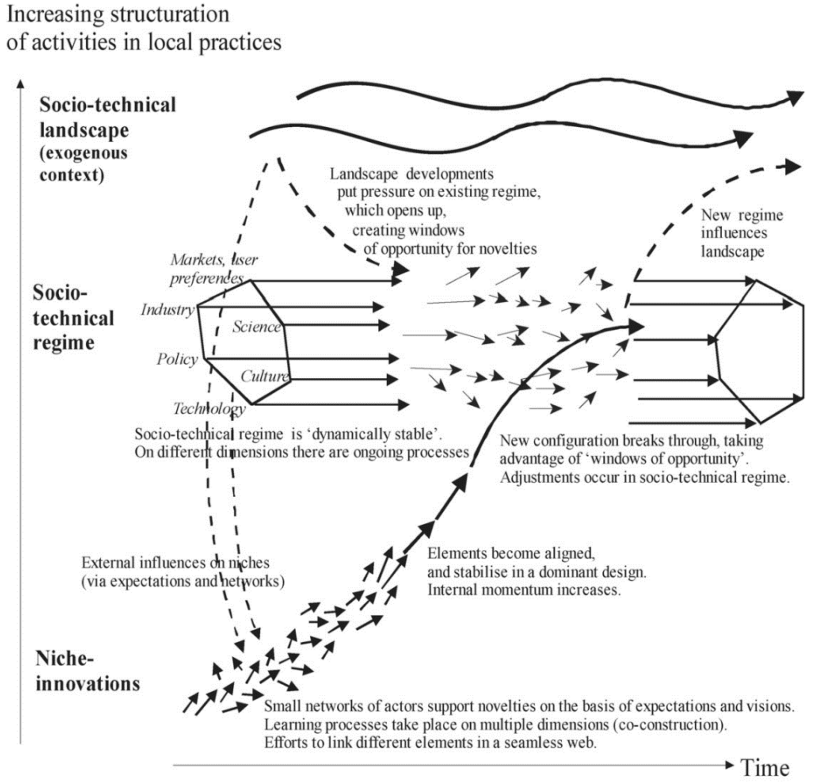

Figure 16 Multi-level perspective: niches, regimes and landscapes

Food systems transition: scope and type of approach

This analytical model (Figure 17) is developed by Seerp Wigboldus of Wageningen Centre for Development Innovation. It has featured in a recent publication in Sustainability (Wigboldus et al., 2020) and has a central role in the emerging analytical framework of the WUR-broad Knowledge Base (KB) Food Security programme.

The model helps to categorise different approaches to food system transitions. On the one hand it provides a framework to think about the scope of such approaches: are we talking about minor changes in practices of the food system or systematic change across regional and global scales?

On the other hand it helps to understand the type of approach to food system transition better. Which transitions are merely reinforcing current food systems, which ones are mainly reforming the food system and which ones are transforming the food system completely?

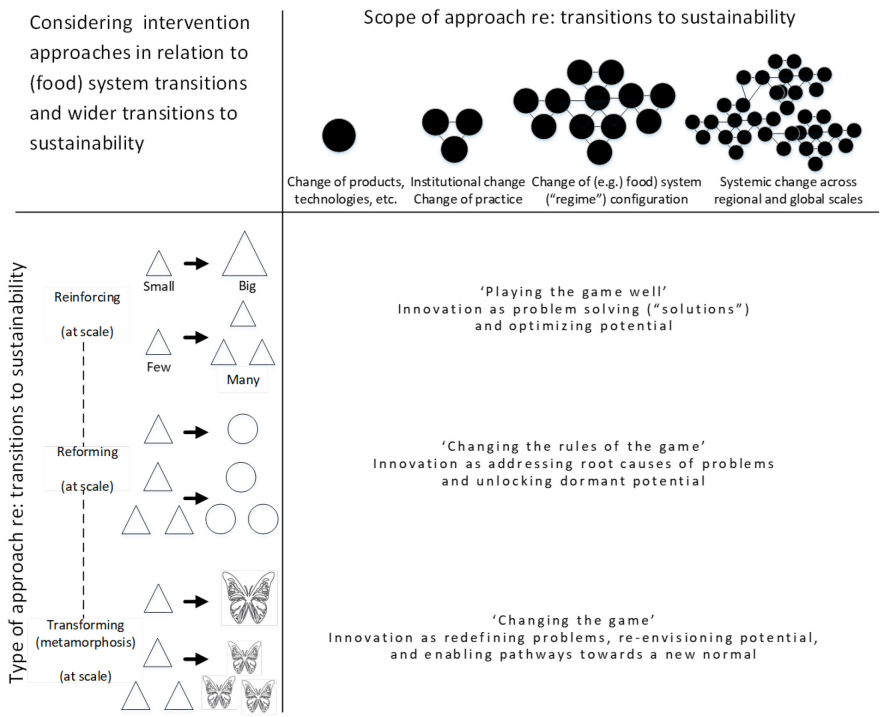

Figure 17 Food systems transitions: scope and type of approach

The Transition Support System (TSS) approach

This approach has been developed by an interdisciplinary team of WUR researchers including Marijke Dijkshoorn-Dekker (Wageningen Economic Research) with the aim of supporting governments with insights to drive their food system transitions (Figure 18). This approach has been applied and tested in the province of Overijssel and for a region in North-Ghana.

The approach is a combination of different steps and methods, ranging from determining the urgency of change, doing scenario analyses, more in-depth analysis, creating future insights with scenario thinking and the evaluation of the impact of the transition.

The approach aims to have a close involvement of all important stakeholders in the food system, by including them in discussions about (intermediate) results from the analysis of the food system and using their expertise in coming up with recommendations for the development of the food system.

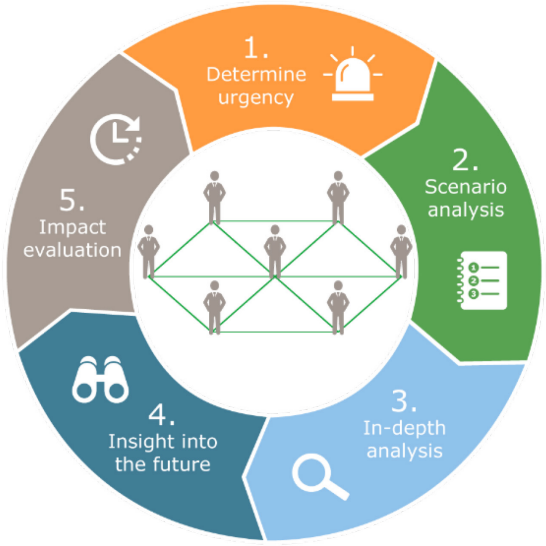

Figure 18 The Transition Support System (TSS) Approach

The SUSFANS modelling and metrics toolbox

The interdisciplinary WUR research programme SUSFANS, coordinated by Thom Achterbosch (Wageningen Economic Research) which aims to provide an integral approach to food and nutrition security in the European Union, has a toolbox comprising two elements: measuring key metrics on the status and trends of the food system, and modelling possible future developments of the food system with advanced modelling techniques.

The SUSFANS metrics make use of publicly available European statistical data on equity, nutrition, the economy and the environment. The modelling techniques make use of existing models that include EU member states, such as MAGNET on the macro-economy, SHARP and DIET on diet and health indicators and GLOBIOM and CAPRI on primary production data.

The combination of metrics and modelling allows SUSFANS to both show past trends in food and nutrition security across EU member states, but also make predictions and recommendations about the futures state of food and nutrition security in the European Union.

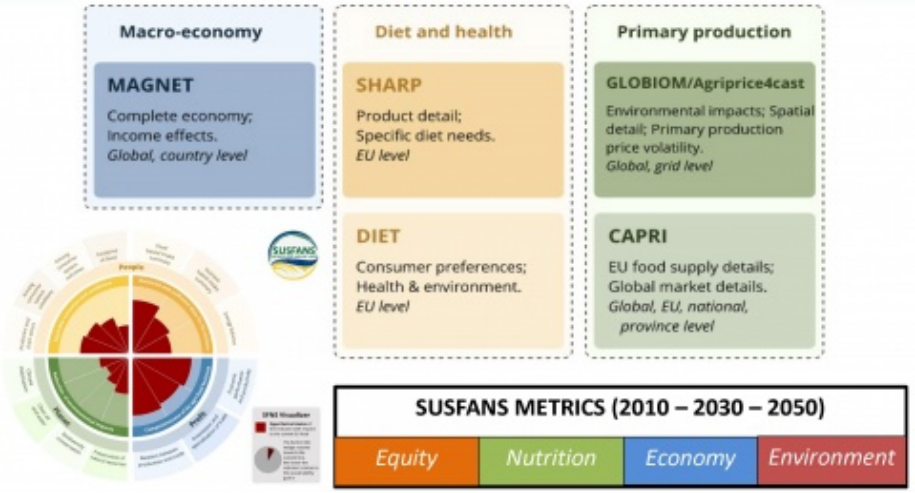

Figure 19 The SUSFANS modelling and metrics toolbox

The Food Systems Decision Support (FSDS) tool

This tool (Figure 20) is developed by a team of researchers from WUR and KIT Royal Tropical Institute in order to support the Ministry of Foreign Affairs with developing recommendations for food and nutrition security programming at the level of Dutch embassies. This tool has been applied in Ethiopia, Niger, Burkina Faso and Nigeria and will be soon applied in a wider range of lower and middle income countries across the globe.

The tool has seven steps, including food system mapping, drawing causal processes, recognising food system behaviour and identifying leverage points. It also includes a stakeholder analysis to see which leverage points are feasible within the current stakeholder dynamics. See Posthumus et al. (2018a, 2018b, 2018c) for methodological details.

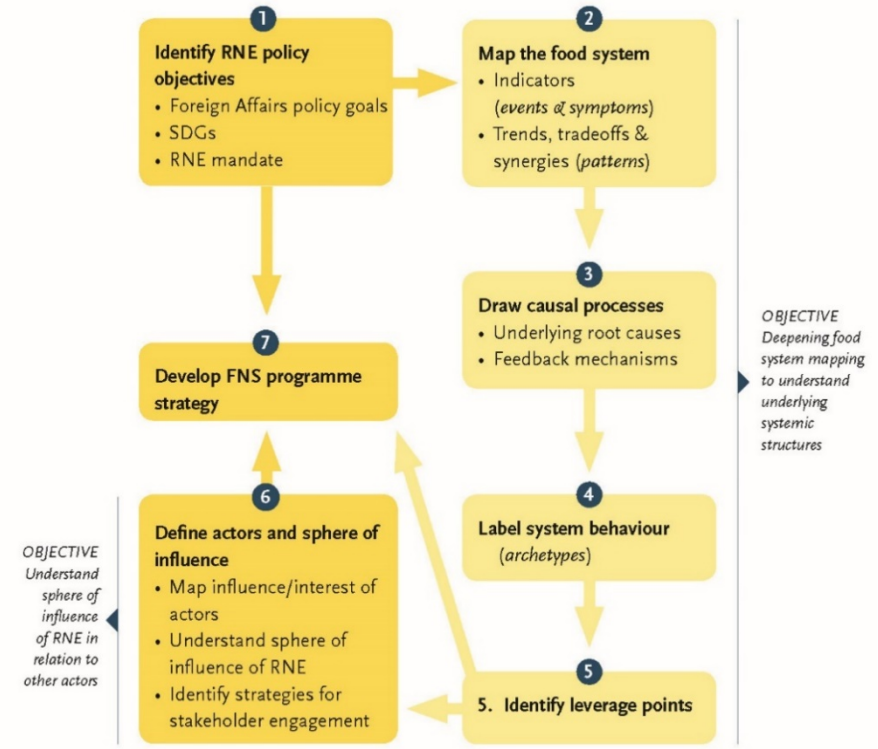

Figure 20 The Food Systems Decision-Support (FSDS) Tool

The food systems hourglass approach

The food systems hourglass approach (Figure 21), developed by Wageningen Economic Research, is a framework that invites researchers to combine macro-level and micro-level food systems analyses, in order to create useful insights for improving food system outcomes.

Moreover, it shows how different parts of the food system (drivers, activities and outcomes) might need different food system methodologies to best understand the dynamics of each of these parts of the food system.

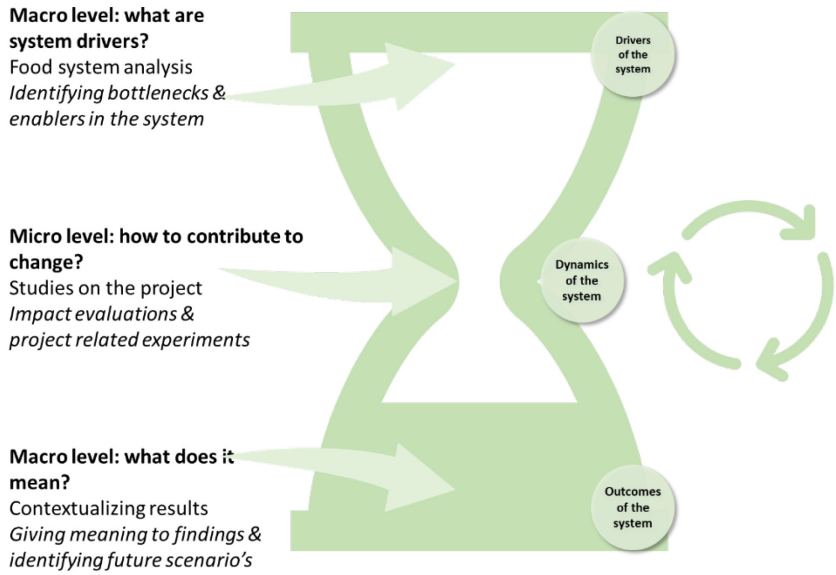

Figure 21 The Food Systems Hourglass Approach

Food system governance arrangement principles

In order to identify what forms of governance are most appropriate to govern food systems in a more holistic way, this diagnostic tool by Termeer et al. (2018) presents 5 principles: System-based problem framing; Boundary-spanning structures, Adaptability; Inclusiveness; Transformative capacity.

The fifth principle (Transformative capacity) is considered to be underlying the other four principles.

The tool can be used to analyse strengths and weaknesses of different food governance arrangements, and has been used in South Africa.

Principles	Challenges	Indicators
1. System-based problem framing	To deal with interlinked issues, drivers, and feedback loops	- beyond one dimensional problem definition - feedback mechanisms - integrative narrative - room for reflexivity
2. Boundary-spanning structures	To organise connectivity across boundaries of sub-systems involved	- interactions across levels and sectors - spanning siloed governance structures - public-private partnerships
3. Adaptability	To respond flexibly to inherent uncertainties and volatility in non-linear systems	- monitoring systems - decentralisation and self-organisation - flexibility - learning while doing
4. Inclusiveness	To involve actors who are affected by the problem and the proposed policies	- involvement of marginalised voices - social differentiation amongst participants - involvement of local communities and networks
5. Transformative capacity	To overcome path-dependencies and create adequate conditions to foster structural change	- addressing path dependencies and lock-ins - leadership - resources - political will

Figure 22 Five principles for food system governance arrangements

6. Opportunities for deepening our food systems work

Food systems research at Wageningen would benefit from more interdisciplinary cooperation in food system projects
This paper shows, that although food system researchers across Wageningen are aware of the work of others within the university, only a minority of food systems projects at WUR involve researchers from different institutes and/or departments.

Much of the work on food systems is centred around one of the five strands of food systems literature around environmental outcomes, healthy diets, feeding the world, improved resources use, and improved equity.

A more holistic approach to food systems research would be to create more research collaboration across academic fields, such that a truly interdisciplinary approach to food systems emerges.

There is a need in Wageningen to connect better with the wider literature and international policy debate on food systems
While some researchers working with the concept of food systems have their work well embedded in the existing international literature on food systems, thsi review suggests that many WUR researchers seem to be only partially aware of the wider literature and debate on food systems.

It would be useful for Wageningen researchers to connect better to the origin of the food system concept and its many analytical dimensions, before using the food system terminology in their work. Otherwise, there is a risk of food systems becoming a 'container term', used only to frame or position research that does lack any specific food systems angle.

A good understanding of the food systems literature might also inspire researchers to use new types of research methods from the field of systems thinking of governance, that can help to improve their understanding of food systems in their work.

Food systems projects can benefit from linking different strands of food systems thinking and combining food system models
Currently, many researchers using the food system concept stay within their research field, focusing mainly on environmental impacts, nutrition, feeding the world, resource use, or governance. Borrowing insights from different strands of food systems thinking might help researchers to develop a more holistic understanding of food systems transitions.

There is a lot of potential in combining insights from different food system models and methodologies. Within and outside Wageningen a wide range of these food system models and methodologies are available. Creatively combining their elements might allow researchers to find a better fit to their specific research challenge.

There is a need for an easy-to-use toolbox with short descriptions of food systems tools and exercises
Knowledge of food system methodologies and easy-to-use analytical tools to understand food systems, are scattered over different Wageningen researchers, institutes and departments.

This paper further shows that WUR researchers are currently using tools that support the *analysis* of food systems. Tools that support food system *transformation*, providing an action-oriented perspective on what to do after analysis of food systems, are scarce. Given WURs ambitions to create societal value, more tools are needed that can be used with stakeholders to support food system transformation.

With increased international attention to the theme of food systems, it would be interesting to see if the available spectrum of food system methodologies and tools could be made more widely available to all WUR researchers.

This should be done in an accessible format, but with sufficient background information for researchers to be able to apply these tools and methodologies in their day-to-day work.

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Wageningen University & Research
REPORT
2020-023
ISBN 978-94-6395-335-1

The mission of Wageningen University & Research is “To explore the potential of nature to improve the quality of life”. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 12,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.