



Understanding the mechanisms to strengthen food systems through value chain-driven action

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This study was carried out by Wageningen Food & Biobased Research, subsidised by the Dutch Ministry of Agriculture, Nature and Food Quality and commissioned by Wageningen Food & Biobased Research.

Wageningen Food & Biobased Research
Wageningen, September 2022

Public

Report 2334

DOI 10.18174/577463

WFBR Project number: 2282700540-DP01

BAPS number: KB-35-002-001

Version: Final

Reviewer: dr. S. (Siemen) van Berkum

Approved by: dr. ir. H. (Henk) Wensink

Carried out by: Wageningen Food & Biobased Research

Subsidised by: the Dutch Ministry of Agriculture, Nature and Food Quality

Commissioned by: Wageningen Food & Biobased Research

This report is: Public

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Acknowledgement

This research was carried out within the motifs “Feeding cities and migration settlements” and “Improving food systems in less-favoured areas in East Africa”, as part of the programme Food Security and Valuing Water (KB-35-002-001) of Wageningen University & Research and was supported by the Dutch Ministry of Agriculture, Nature and Food Quality.

Abstract

Food system frameworks and approaches are increasingly informing researchers, development practitioners, and policymakers on the sustainable and equitable development of food production, consumption, and the systemic context of these activities. However, there is a disconnect between food systems thinking and decision-making by private organizations in the food value chains themselves, who are indispensable in realizing food system change. Based on a review of food systems frameworks, we identify three drivers of this disconnect, namely (1) misalignment of public and private goals, (2) a mismatch between macro-level and meso- and micro-level activities and interventions, and (3) ultimately identify a need to make food system approaches relevant for value chain actors. Subsequently, based on interviews with actors in the research and policy domains as well as in private companies, we explore if this disconnect may be bridged. In doing so, we distinguish between smallholders, micro-, small-, and medium-sized enterprises (MSMEs), and large companies in the private sector. These actors vary considerably in terms of size, scope, resources and capabilities, take up a different position in the food system, and therefore also require different approaches to leverage their potential for food system change. We close with a discussion of several examples (from around the world) of successful efforts to leverage value chain action for the improvement of food system outcomes.

1 Introduction

Food system frameworks and approaches are increasingly informing researchers, development practitioners, policymakers, and the private sector on the sustainable and equitable development of food production, consumption, and the systemic context of these activities. Food system (FS) approaches are integrative frameworks that take a holistic perspective on food-related activities, drivers (including inputs and the context broadly conceived) and outcomes (van Berkum et al. 2018), see figure below. As analytical frameworks, they highlight the interconnectedness of drivers, activities, and outcomes, as well as helping in identifying feedback loops, assessing trade-offs, and identifying root causes of issues that may lie in other parts of the food system.

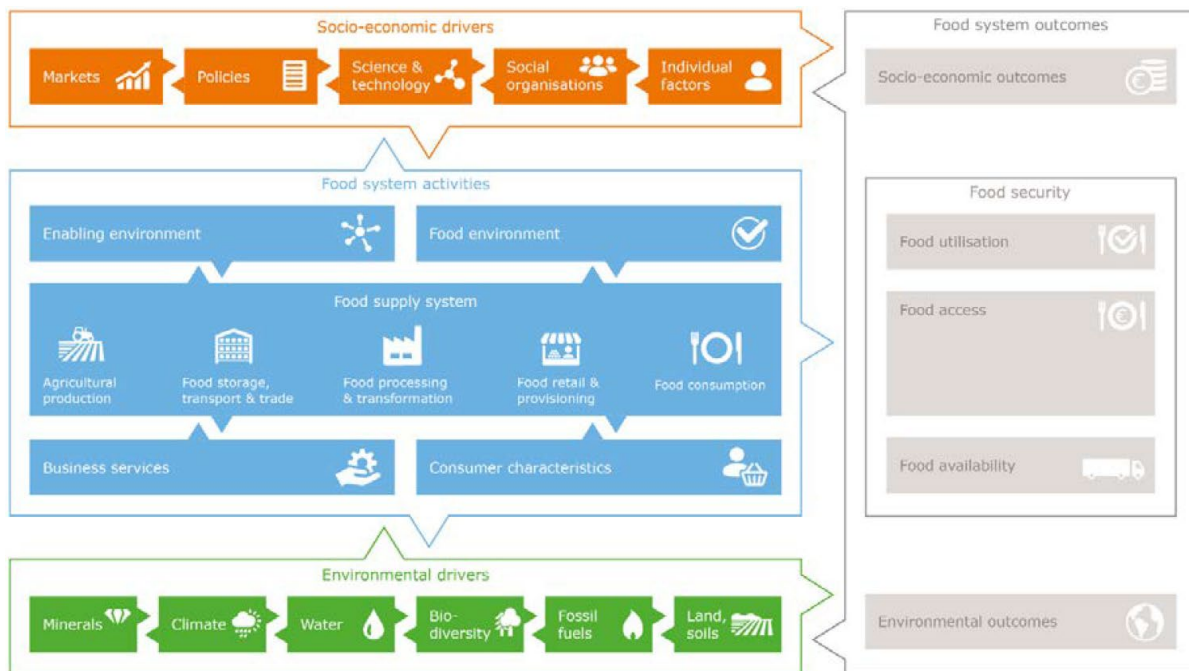


Figure 1. A way of mapping the relationships of the food system to its drivers (van Berkum et al. 2018: 10).

Numerous food system approaches have been proposed over the years, with slightly different conceptualizations and visualizations of elements and relations (see Dengerink & Brouwer (2020) for an overview). A common denominator however – apart from the ‘system’ perspective - is their definition of food system outcomes and emphasis on progress towards improved outcomes. As Ericksen (2008) highlights, food system outcomes correspond to the main development domains, with indicators related to food and nutrition security, socio-economic progress (including economic development as well as distributional aspects and equity) and environmental sustainability. Flagship publications endorsing the importance of FS approaches also stress linkages with the United Nations Sustainable Development Goals (SDGs) (UNEP 2016; Global Panel 2016; HLPE 2017), to which the commonly defined food system outcomes closely correspond – for example SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being) related to food and nutrition security, SDG 5 (Gender Equality) and SDG 8 (Decent Work and Economic Growth) related to socio-economic progress, and SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).

This emphasis on progress towards improved outcomes is reflected in the current use of food system approaches. In any work using food systems thinking – whether research-, policy-, or development-related – users operate on the assumption that these outcomes have intrinsic value, warranting action to improve on these outcomes. The main problem identified in food systems thinking is that these outcomes are not achieved to the extent that they should – as Bene et al. (2019) put it, “food systems are failing us”. As Van Berkum et al. (2018) phrase it, use of food system frameworks aims to “[increase] the supply of safe, healthy food within environmental limits in an inclusive way.” By focusing on these (public) values as the main system outcomes – and thus focusing efforts towards food system change on improvement on these outcomes – food systems thinking aligns well with domains that already operate on these values, such as policy and development cooperation.

A disconnect arises when considering that the food system activities themselves, and especially the food supply system itself (the food value chain (VC) from production to consumption), are usually organized and conducted by the private sector. Private organizations – big or small – that are involved in these activities generally do not primarily strive for the same systemic outcomes espoused by food systems thinking in research, development or policy communities, but rather objectives such as efficiency, profitability, and competitive advantage. Furthermore, the high-level notion of a food system is rather abstract to grasp for all actors who make up single parts of this complex system.

For general understanding we should distinguish between value chains and food systems. We define a value chain as a (typically linear) commercial business model in which companies produce, process and/or handle (and thereby adding value to) food products to be marketed towards end users (consumers). A food system encompasses all aspects that influence and are influenced by food production in a more holistic perspective of food- and nutrition security, environment etc. and – as an analytical tool as described above – primarily suits governments and development organizations. In FS approaches value chains are usually subsumed under the ‘food system activities’ component. It is important to understand the difference and interactions of value chains and food systems as well as the drivers of the decision makers in both. Only then, change can be brought about effectively with the right approach.

We aim to address the disconnect described above by taking a food systems approach. FS approaches are about identifying leverage points for structural changes, taking into account the interconnectedness of all aspects of the food system, and the resulting trade-offs, spillover effects, and systemic effects of interventions. On the other hand ‘classical’ value chain analyses (VCAs) emphasize optimization of specific commodity chains, and (with a more narrow scope) consider leverage points at specific chain stages, and the effect of interventions up and down the chain. This type of thinking operates with a straightforward linear conception of the chain (i.e. from production to consumption), and relatively limited attention for contextual factors or outcomes. Simply put, FS approaches exploit more holistic systems thinking versus the more linear thinking in VCAs. The figure below simplistically visualises the typical thinking on change in FS approaches and VCAs.

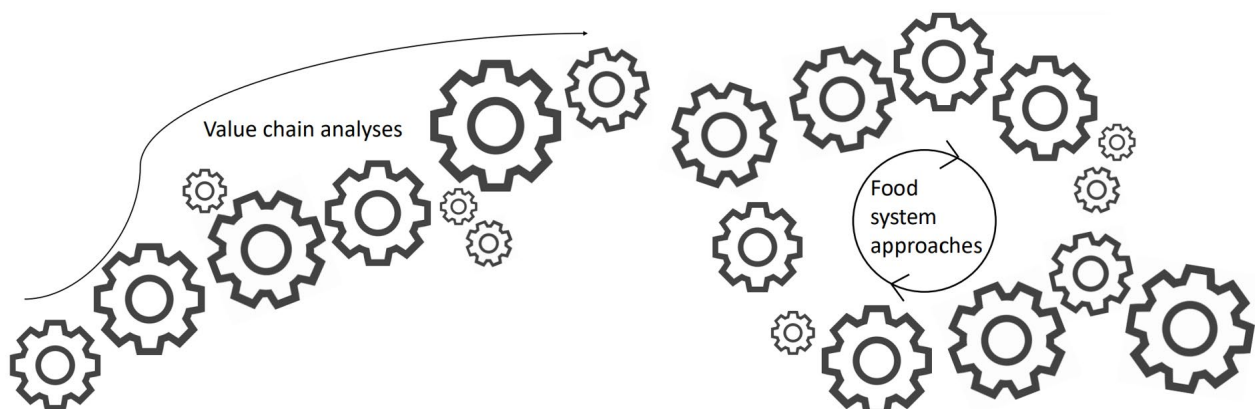


Figure 2. Simplistic visualization of change in value chain analyses and food system approaches (Vera Vernooij).

In this paper we address the question how food systems approaches can be operationalized to support private sector action in the food value chain. We consider this as both:

- 1) A value chain question: how can value chain actors utilize food systems thinking in their decision-making? And;
- 2) A policy question: how can policy stimulate value chain actors to contribute towards the desired food system outcomes?

Previous research has highlighted that private and public interests in the domain of food are not necessarily aligned (Poole et al. 2020) and that intermediate analytical steps are needed to identify which chain links and actors to target to improve the performance of food systems (Borman et al. 2022; Jacobi et al. 2019) – here defined as the extent to which the food system produces the desired outcomes. More comprehensively, a recent critical assessment of food systems approaches concludes that the approaches and their application remain rather descriptive and generic, seldomly address stakeholder interests, relationships, and governance structures, and therefore provide little actionable insight into how to effectuate system change (Brouwer et al. 2020). With this paper we aim to contribute to this research through exploring the mechanisms to strengthen food systems through value chains.

Value chains, the actors involved, and the markets they operate in are of course very diverse. We therefore make the necessary distinctions between different sizes of private sector actors, the geographical contexts they operate in, and the markets they supply. Specifically, we distinguish between smallholders, Micro, Small and Medium enterprises (MSMEs) and large companies – with company size, generally their capabilities (the organization-specific know-how, processes, routines, and culture that underpins a competitive business model) and resources (tangible and intangible) increase. We further distinguish between private sector actors operating in low and middle income countries (LMICs) and high income countries (HICs). These factors are assumed to influence the private sector actors' position in food systems as well as their priorities.

The content of this report uses two approaches to address the study's main question. First we conduct a literature research on the role of private sector actors in food system frameworks and identify the tensions and lacunae related to this. Secondly, 8 in-depth semi-structured interviews were conducted, with large companies working in LMICs (N=4), a public sector actor (N=1) from the Netherlands with relevant agri-food work experience, and Wageningen University and Research (WUR) researchers experienced with the application and development of the FS approach (N=3). The specific purpose of the interviews was to get an understanding of how researchers and users of FS frameworks can better help private sector actors with food chain optimization towards food system outcomes through a FS approach (interview brief with guiding questions are attached as annexes A, B, and C). Finally, the report builds on the authors' work experiences with the FS approach in the fields of postharvest technology and supply chain development.

This paper is structured as follows. Section 2 below explores how existing food system frameworks conceptualize the role of the private sector, and what venues they see for more actionable insights. Furthermore, we discuss what gaps we currently see between the guidance and insights that food system approaches offer, and the type of actionable guidance that is needed to support or stimulate private sector actors. In section 3 we explore several solution pathways to bridge these gaps and to steer value-chain driven food system change. Section 4 presents examples of practical applications of food system approaches. Last, section 5 concludes.

2 Food system approaches and private sector engagement

As discussed, food system approaches offer a holistic perspective on food chain activities (production, processing, distribution etc.), their socio-economic and environmental drivers, and outcomes (social and environmental welfare and food security). They aim to promote sufficient safe and healthy food for all while minimizing/eliminating environmental impact and resource use inefficiencies. Food security as a systemic issue was first put on the global agenda at the World Food Conference in 1974 (Maxwell 1996). Amartya Sen (1980) observed that limited food availability (supply) is rarely the root cause of food security issues, but accessibility is – extending the discussion of food security to other socio-economic issues related to equity and deprivation. Ericksen (2008) broadened this even further by highlighting that food systems should not only be seen in relation to outcomes related to food security, but also in relation to the (negative) effects the food system has on the environment – thus rounding out the alignment of food system outcomes with sustainable development.

Diverse food system approaches exist with differences in terminology and schematic representations, but focusing on the same outcomes – food security, socio-economic and environmental outcomes, aligned with common targets in sustainable development and (since 2015) the UN SDGs. Due to the emphasis on predominantly public goals and the complex, generic and descriptive nature of food system approaches, their target audience and main users can mostly be found in the policy, development cooperation and research domains (Bene et al. 2019; Dengerink & Brouwer 2020; Ericksen 2008; Ericksen et al. 2009; Ingram, 2011). To a limited extent however, the frameworks do occasionally refer to the involvement of private value chain actors in food system change efforts. Table 1 lists some of the most prominent food system approaches, describes the most important characteristics, and outlines how these frameworks specifically address private sector involvement.

Table 1. Overview of prominent food system approaches, their most important characteristics, and how they address private sector involvement.

Framework	Description	Role of private value chain actors
Ericksen (2008; Ericksen et al., 2009)	Aims to understand global environmental change and food system interactions. Linking food system activities (value chain, physical) to environmental and societal outcomes. Specifically normative goals: Food security and sustainable environmental management	Corporate involvement has grown (value added activities are more important than farming). “Primary outcome of any food system is food security, although in specific contexts food security may not be achieved because actors have multiple objectives, or there are market and other institutional failures” → Other motives than food security are part of the problem; → Pervasive problems require policy intervention. Still open question which decisions need to be made where (public or private actors) (Ericksen et al., 2009, p. 376)
Ingram (2011)	Frames food security as explicitly political and social problem, not technical. Framework is a general map, description. Not an assessment tool, but facilitates the formulation of hypotheses to be further explored ('checklist' of what needs to be discussed)	Identifies need to shift focus away from production. Ingram develops a framework to analyze the consequences of interventions, also those in private sector production, processing and distribution activities. Dependent variables are food security and environmental degradation. Recommends to use food systems framework to include necessary issues in dialogue, and identify the range of actors and other interested parties who would be involved (open question).
Hussein and Miller (2014) TEEBAF schematic	Outlines links between the food system, human systems, and ecosystems. Economic perspective: outcomes as externalities, behavior within constraints and incentive structure. Towards evidence-based recommendations on lowering the costs of externalities and sharing	“Externalizing the costs of production [to society] is associated with rational, self-interested behavior [...] but individuals may also degrade privately-owned natural capital. Self-inflicted harm may be irrational but is prevalent” → Private sector needs assistance to balance long/short term concerns; → Importance of information and education; → Incentives posed by markets and policies. Considers technology and innovations as inputs in agricultural - and food systems.

Framework	Description	Role of private value chain actors
UNEP (2016)	<p>them more equitably to ensure access to healthy food for all.</p> <p>Uses own food systems framework to investigate natural resource use. "The food system approach helps both identify and map [sustainable development] goals, as well as organize and systematically structure the conversations needed."</p>	<p>Framework includes options for the supply side (regional and global). It is in the interest of business as well to reduce resource use.</p> <p>"Many business are now striving to improve the management of natural resources [...] the opportunity to bring about positive change [...] often best falls to resource managers and other non-state actors on the ground"</p> <ul style="list-style-type: none"> ➔ FS approaches helps actors to understand where interventions can have best impact, and consider unforeseen consequences. <p>Report provides definitions and operationalizations of efficient use of natural resources in food systems activities (p. 38).</p> <p>Important role for private actors (retailers, wholesalers, input providers, processors) in coordination in value chain:</p> <ul style="list-style-type: none"> ➔ Contracts, standards; ➔ Power balance shifts to small number of large firms. <p>Suggests several options to improve the efficiency of use of natural resources and reduce environmental impacts (Fig. 26), including synergies and tradeoffs (Table 12).</p>
Global Panel on Agriculture and Food Systems for Nutrition (2016)	<p>Diet quality, rather than food security as outcome.</p> <p>Conceptual model is considerably different than others. Consumer behavior and food environment are more central, and food supply systems are underpinning.</p> <p>Less attention for environmental and social impact.</p>	<p>Framework can be used for targeted improvements in food chain activities:</p> <ul style="list-style-type: none"> - Agricultural production; - Storage transport and trade; - Transformation (processing); - Retail and provisioning; <p>in order to enhance food and diet quality.</p> <p>Report provides definition of performance and structured overview of areas for improvement (Ch. 6).</p> <p>Not as clear as others (UNEP (2016) about mutual benefit (public and private) of suggested interventions.</p>
HLPE (2017)	<p>Considers widest variety of outcomes: environmental, social, food security, and health.</p>	<p>Strong policy focus.</p> <p>Provides incidental examples of challenges arising in the food chain and potential solutions.</p> <p>Generic recommendations of the role of the private sector (trust building, best practices, independent evaluations, open discourse, partnering, ethical viewpoint, understanding etc.)</p>
Van Berkum et al. (2018)	<p>Synthesis of the earlier work listed in this table, stronger focus on interactions and feedback mechanisms.</p>	<p>The food system activities:</p> <ul style="list-style-type: none"> - Food supply (value chain); - Enabling environment (transport, regulation, institutions, research infrastructure); - Business services (training, inputs, technical support, financial services); - Food environment (context around consumers' decision making); - Consumer characteristics; <p>Private sector contributes to socio-economic drivers:</p> <ul style="list-style-type: none"> - Markets: product development, distribution systems; - Science and technology: R&D; <p>Policies: standard setting, certification (not limited to policymakers).</p>
SUSFANS (Zurek et al., 2018)	<p>Conceptual framework based on earlier work listed above in this table, wide range of outcomes (including productivity, profit, and competitiveness). Specific for EU context and EU policy.</p> <p>Part of project with also a participatory component:</p> <ol style="list-style-type: none"> 1. Creating participatory space; 2. Framework; 3. Define metrics; 4. Modeling strategy for quantifying performance metrics; 	<p>Analysis and visualization strongly based on policy interventions and goals.</p> <p>Industry consulted as part of participatory space and framework and metric formulation.</p> <p>Modeling and metrics toolbox may be flexible enough to also model effects of chain level interventions.</p>

Framework	Description	Role of private value chain actors
	Visualize change in the system based on actions and decisions.	
Woodhill et al. (2020)	Based on earlier work (FAO, 2018; Ingram, 2011; van Berkum et al., 2018). Considers the food system with particular focus on small-scale agriculture. Strong focus on socio-economic outcomes for rural communities in developing countries.	Calls to integrate small producers into global value chains to improve rural incomes and increase productivity. Aspects include <ul style="list-style-type: none"> - Investments in smallholders value chain participation; - Integration and coordination, building capacity for smallholders to meet safety, quality and quantity standards; Develop processing sector close to smallholders in developing markets.

This overview illustrates the currently predominant perspective and purpose of food system approaches: They are strongly descriptive, serving as a mapping exercise of issues and actors (Ingram 2011), that can serve to inform and structure conversation (UNEP 2016). Through their descriptiveness, they provide more insight in the interactions and consequences of value chain activities (Ingram 2011) than supporting a priori decision-making. As a result however, the focus remains more on identifying problems than on formulating and supporting solutions (Bene et al. 2019).

In cases where FS approach-based recommendations are made, these reflect the main audience for which such approaches are developed, namely policymakers, researchers and development practitioners. The recommendations are policy-focused and should be implemented at the macro level (national government), and are often formulated so generally that the approaches provide little perspective on which concrete actions should be taken by which specific actors (Ericksen 2008). Where more specific interventions for value chain actors at the meso (chain) or micro (organization) levels (as defined by HLPE (2014)) are recommended, it provides limited perspective on how they can be incentivized or otherwise supported. If the food system frameworks and their author are unanimous in their observation that too little is being done to make the desired progress towards food system transformation and outcome improvement, as a corollary we should address this issue of supporting actors to take the right course of action.

UNEP (2016) recognizes the importance of the public sector as user of resources and decision-maker in value chains, and frames food system change as mutually beneficial: furthering public goals while businesses improve their efficiency and performance. However, considering the current issues identified, this mutual benefit is apparently not enough to motivate action. Hussein and Miller (2014) take an economic perspective and consider the lack of progress on food system outcome improvement and the detrimental role of private activities as a market failure, stemming from private actors not bearing the full cost of their activities – with part of the social and environmental costs being imposed elsewhere – and lack of incentives to align public and private goals.

While a comparison of these frameworks and how they address private sector involvement paints a more comprehensive picture of how this can be achieved, several open issues remain that should be addressed in order to leverage value chain actors' action for food system change. We briefly identify and discuss these below. These (sometimes overlapping) issues and their description give a general overview of how food systems thinking can be leveraged to effectuate substantive change in the food system and food value chain.

1. **Public and private goal alignment.** Private goals of value chain actors diverge too much from public goals embodied in food system outcomes for private action to – of their own accord – contribute sufficiently to progress. This can be approached from the bottom up as well as top-down. Regarding the former, this raises the question how private organizations can derive added value from contributing to positive food system outcomes. Regarding the latter, this raises the question how policy can set the right conditions to incentivize private contribution to positive food system outcomes.

-
2. **The mismatch between macro-level food system approaches and recommendations, and actionable recommendations targeting meso- and micro level interventions appropriate for value chain actors.** While food systems approaches have been proven useful to formulate high-level recommendations for policy and governance, they provide little guidance on how food systems thinking can support decision-making within value chains regarding which interventions to implement and how to go about this. There is considerable potential here, observing that interventions in value chains often fail due to insufficient attention being paid to the food system context (including commercial feasibility of interventions and 'fit' with socio-cultural contexts) and lack of prior evaluation on whether the proposed intervention is likely to be appropriate for this context (Ika 2012; Soethoudt et al. 2021).
 3. **Making food system approaches relevant for value chain actors.** There is undeniable value in all food system actors (whether policymakers, researchers, non-governmental organization (NGOs) or private companies) being cognizant of food system dynamics. However, in their current holistic form it is likely that private actors may take note but do not consider further implications for behaviour. There is need for a translation effort to make food systems thinking relevant and actionable for private actors, and to make this shift in mindset pervasive and lasting. This translation should not only address the question what actions they should take and the incentive structure that should support this, but also how comprehensive and complex food system approaches can be made relevant and digestible to inform day-to-day decision-making.

3 Leveraging value chain actors' potential for driving food system change

3.1 Change in food systems and navigating trade-offs

Before addressing how the issues identified in literature above can be addressed to leverage positive food system outcomes, first we have to understand how change in food systems takes place. This includes acknowledging and understanding trade-offs that occur, and how to navigate and mitigate these.

The added value of FS approach, according to one of the interview WUR FS approach developers, is that it allows for insights on potential trade-offs between economic, social and environmental objectives. With this, attention is directed from searching for perfect 'fixes' to what the implications of interventions are in various domains. This also pushes for a certain level of acceptance of that trade-offs are a fact of life. For example, interventions reducing Food Loss and Waste (FLW) likely have supply and demand effects on product markets and product prices. Solutions in one domain often create new problems in other domains. A FS approach helps to understand and better visualise which trade-offs are likely to occur in food system transitions, which are first essential steps in realising change in food systems (interview WUR researcher 25/10/21). Taking it further, a food systems perspective can not only help to identify the potential side-effects of any interventions, but also provide guidance on how to mitigate the negative aspects of trade-offs.

A large company (interview 21/07/21) also shared that acknowledging trade-offs is becoming increasingly important and more openly discussed. They share the example of evaluating the impact of application of plant protection substances via drone spraying instead of backpack spraying. They consider issues such as the CO₂ that can be saved by using drones instead of backpack spraying, and what the likely impact is on soil compression. On the other hand, the accuracy of the spraying may be reduced, with plant protection substances ending up where they shouldn't.

After acknowledging trade-offs in the form of effects from interventions in one place on other places, food system change can then be designed and realised through taking into consideration the implications of certain interventions in the food system in the different domains (economic, social, environmental). Interventions that reduce Food Loss and Waste (FLW) will for example also have (often positive) implications for Greenhouse Gas Emission reductions in the environmental domain. Negative implications can also be mapped, such as reduced availability of scarce resources such as water as a result of increasing production of a certain water-extracting crop. Further, the FS approach can help to map dynamics of inclusion and exclusion for groups of people based on certain interventions (interview WUR researcher 25/10/21).

Relatedly, for how to change food systems, just as acknowledging trade-offs instead of searching for unrealistic perfect fixes, it is relevant to understand that there is not one ideal starting point for a food system analysis. Instead, the power of a food system analysis is not about a starting point, but about reaching a certain width in terms of domains and associated actors, practices, objectives and implications that are considered (interview WUR researcher 25/10/21). An example of reaching a greater width than would be achieved without applying the FS approach is shared by another WUR researcher (interview 28/10/21) who applied the FS approach in a project on the circular economy in Europe. She explained how all domains of the food system were regularly discussed with the relevant stakeholders and researchers, particularly in the beginning and end of the project, but also throughout the whole project cycle. Towards the end of the project, there was an econometrist who also started mentioning animal welfare. This was the width and openness (to expertise and perspectives) she had hoped to achieve by applying a FS approach.

For realising change in food systems, public and private sector actors as well as supporting sectors such as civil society and research all play a role. Since the food system activities are typically conducted by private sector actors, they form the engine of the food system as a food supply chain. Private sector actors' core focus is on KPIs such as efficiency, competitiveness, and profitability, and the business models built around

this can have both positive to negative influences on the social and environmental domains. Simultaneously do the social and environmental domains influence the functioning of the food supply system and its actors. Private sector actors vary greatly in size and therefore also on their influences on and roles within the food system (interview WUR researcher 25/10/21).

3.2 Food system change – Policy drivers and the position of value chains

Food security and environment form the basis for stability and economic development in any country. Several developments that currently take place in most developing countries will have a severe impact on food security, population health and the environment, and therewith also on political stability. Apart from that, several of these developments seem to accelerate. It is therefore in governments' interest to try and influence food systems in such a way that sufficient and nutritious food is being produced and supplied to the population in a sustainable way. Due to the global scale, the interest concerns governments of developing and developed economies alike and there is quite some urgency to act.

Some of the developments that take place at accelerating rate are for example:

- Population growth;
- Urbanization;
- Growing middle class and demand for animal proteins and processed food;
- Demand for nutritious food like fresh fruits and vegetables;
- Pressure on land, water, and natural resources;
- Dependency on imported commodities and foreign supply chains, and accordingly the need for foreign currency and vulnerability to supply chain disruptions.

There is urgency to act indeed but understanding the wide variety of food systems, how they work and by what factors they are influenced is the first step to steer them into a direction to address above mentioned developments (and others) in a sustainable way. Always keeping in mind the demands and purchasing power of the final consumer.

The WUR institute "Wageningen Food & Biobased Research" (WFBR) has anticipated on how to contribute to solutions with regard to (postharvest) food loss reduction and Supply Chain issues and continues to do so. Also, other departments of WUR, like Wageningen Economic Research, the Center for Development Innovation and the Environmental Sciences Group have addressed the matter from their expertise. This combination of insights from different angles does not pretend to be complete but gives some interesting leads to a view on sustainable food system development and on pitfalls to prevent.

There are various reasons for policy makers to develop a strategy to change food systems in order to make them resilient to developments like the ones mentioned above. These strategies can include for example:

- Increasing local food production;
- Peri-urban food production;
- Food loss reduction;
- Protein transition (from animal to plant based);
- Enhancing food security and availability;
- Nutrient rich diets;
- Maintaining- or restoring rural landscapes and erosion prevention;
- Development of food processing;
- Circular agriculture objectives;
- Energy efficiency in production and post-harvest;
- Hygiene (waste handling, live animal slaughtering in urban areas);
- Enhancing resilience to climate change;
- Improving water use efficiency;
- Reducing vulnerability to international supply chain disruptions.

Many governments and development organizations are aware of the value of sustainable food systems. However, food systems are already in place, developed over centuries and embedded in society. These food systems are influenced by many factors including climate, seasons, demand, land, availability of infrastructure, competition from other areas etc.

When aiming for change in food systems, one should understand that there is a wide spectrum of aspects that will be influenced and need to be addressed. A value chain decision maker (business owner) depends on the food system he/she operates in to run a profitable business. Only if sustainability or other food system goals do not negatively interfere with the revenue model of the value chain, this decision maker is likely to act accordingly and only then these goals can be reached.

The value chain does for example depend on the food system for availability and price of inputs, availability of (cooled) transport, storage, international connections by air or reefer, extension, product markets etc. On the other hand, a food system depends on value chain actors to produce and handle the food. If a policy is to be developed to change food systems into productive, sustainable systems, it is necessary to understand the interdependency of food systems and value chains and the often-fragile balance between these. Any well-meant initiative that does not specifically suit the interest of both food system and the value chain is bound to fail in reaching the desired food system outcomes.

3.3 Value chain influences on food system changes

The role of private sector actors on food system changes is very diverse, most notably due to size and heterogeneity of types of private sector actors and geographies of where the actors operate. This section elaborates on the implications of this diversity along the dimension of firm size, namely for smallholders, diverse MSMEs and large companies.

3.3.1 Smallholders

Out of the 2.5 billion people in poor countries living directly from the food and agriculture sector, 1.5 billion people live in smallholder households. Many of those households are extremely poor: overall, the highest incidence of workers living with their families below the poverty line is associated with employment in agriculture (FAO, 2012). Most smallholder farmers are earning less than a living income, with production for own use, and surplus to sell at local markets. Poor (market) connectivity, low yields and profits, limited knowledge and social constraints make it hard for this group to invest in or adopt measures affecting food systems without targeted support from governments, NGOs or others.

Self-organization (e.g. in cooperatives) can create scale benefits and give voice for this large group in value chains. Creating and/or developing smallholders' organizations can help to strengthen agro-ecological practices, knowledge and representativeness in decision-making instances with buyers and suppliers.

3.3.2 Diverse MSMEs

When mentioning the importance of SMEs (Small and Medium sized Enterprises) we need to define what companies exactly are included in this group because the official definition includes a wide spectrum of companies with different interests, different market targets and possibilities to invest.

An often-used official definition (European Commission, 2003) of SME includes companies with less than 250 employees and less than €50 million annual turnover (OR less than €43 million balance sheet). This still is a wide range of companies. Very often the term SME is used without defining what type of company it concerns, and in many cases also the term MSME is used which refers to Micro, Small and Medium enterprises. For the purpose of financing companies in emerging economies, IFC classifies companies as Micro, Small, or Medium enterprises when they meet two out of three of the following criteria (see Table 2):

Table 2. Definition of MSMEs (IFC, 2022).

INDICATOR	EMPLOYEES	TOTAL ASSETS US\$	ANNUAL SALES US\$
Micro enterprise	< 10	<\$100,000	<\$100,000
Small enterprise	10 - 49	\$100,000 - < \$3 million	\$100,000 - < \$3 million
Medium enterprise	50-300	\$3 million - \$15 million	\$3 million - \$15 million

Some confusion is likely to arise in discussions of terms such as MSME and SME respectively. In LMICs it is the micro companies that make up a large part of MSME whereas they are outside the group defined as SME. The IFC-MSME definition is better suitable for emerging markets than the SME definition.

According to UNCTAD (2020), formal MSMEs contribute to 40% of GDP in emerging economies, and the number is considerably higher when informal ones are included (ILO, 2019). This group predominantly consists of Micro enterprises. One key observation regarding the role (or rather potential role) of SMEs in food system development in LMICs is that this group is very small in LMICs compared to high income countries (HICs, Verschoor et al. 2020). LMICs are characterized by a very large number of smallholders and Micro enterprises, and a considerable group of large companies, but a limited presence of companies on the spectrum of what we (from a European perspective) would consider SMEs (see Figure 3).

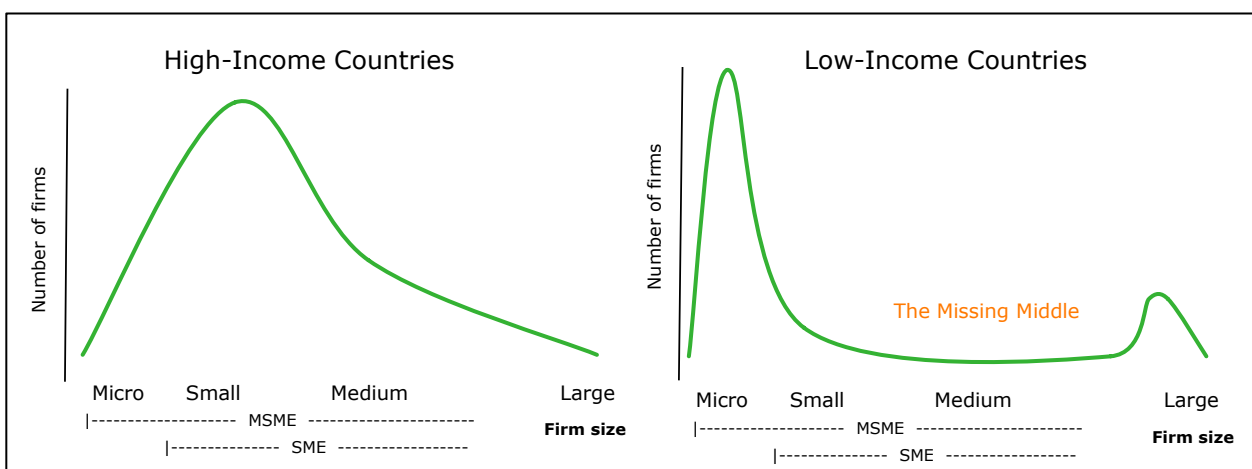


Figure 3. The size of companies and their share in contributing to GNP (Khan, 2014).

The line between what constitutes a Micro-, Small- or Medium enterprise is fluid, but we may nevertheless consider these definitions to be an indication of the type of company that is being discussed. The predominance of Micro enterprises in LMIC, and the relatively limited number of Small and Medium enterprises, is an indication that there is potential for small operators to professionalize and grow (IFAD, 2021). When Micro enterprises can grow to SME status, this signifies a professionalization of the organization, and expansion of their innovative capacity and financial capacity. When doing so, the technology level and market focus adapt accordingly. This step does however require facilitation, importantly in the form of financing (Laub & Overton, 2022; World Bank, 2017a).

Another definition that is being used often is Midstream SME (Reardon et al., 2021). Its official definition refers to the midstream of value chains in developing countries, i.e., the actors between the primary agricultural production and food consumption stages (wholesalers, traders, wholesale markets, logistics service providers and processors). In these value chain stages, there is potential for streamlining chain activities and increasing added value, and the growth and professionalization of Micro enterprises can help unlock that potential.

The missing middle in food production, processing and handling in emerging markets, especially those Micro enterprises that are able and willing to progress from Micro- to the Small enterprise segment, are potentially a key to food system transitions. This type of company is small enough to be flexible, but large enough to have more resources and capabilities to drive value chain upgrading.

The midstream SME category can already be seen developing significantly in many countries and sectors. The 2021 IFAD Rural development report mentions the importance of the role of mid-stream SME in the development of food systems. This group of enterprises is indeed developing. It concerns mostly the small enterprises as described above.

If midstream companies grow in size and professionalize, their demands in terms of quantity, quality and consistency in supply become more stringent. This means that their value chain partners (specifically small primary producers) also have an incentive to scale up and improve production practices to meet these elevated demands. From these considerations and Verschoor et al. (2020), it follows that food system level development must be in line with market level (purchasing power), and the technology level must be adapted so that economic drivers decide the actions of companies as well as the feasible technology choice.

Due to developments already taking place with regard to the development of midstream SME that mainly concern small SME companies, and the fact that transition pathways that anticipate on the needs of existing developments are most likely to succeed, micro enterprises that can grow and professionalize are the group that are most likely to contribute to growth, innovation, and food supply to the cities (IFAD, 2021; World Bank, 2017b).

3.3.3 Large companies

Large companies have an influential role in the food system due to their size and position in the food system – global and locally. They usually have more capabilities, capital, knowledge and organizational power than smaller private sector actors, which makes them powerful players in the food system (interview public sector actor 8/9/21). A main influence companies have on FS outcomes is in how they design their own business model, value chain and supply and distribution systems. The greater the company and organizational power of the company, the greater the potential influences on FS outcomes, both positive and negative (interview WUR researcher 7/9/21).

Furthermore, in relation to steering large companies towards positive food system outcomes, from the interviews the following pathways could be distinguished:

- A Confrontation with resource limitations and societal consequences
- B Corporate Social Responsibility (CSR) strategies
- C Partnerships and collaboration
- D Role of banks
- E Struggles and needs

A: Confrontation with resource limitations and societal consequences

A motivation for large companies to adjust their business models towards (more) positive food system outcomes is when their current business model is threatened either by resource limitations or by growing societal concerns expressed about the current way of working. Once large companies adjust their operations towards more positive influences on FS outcomes, they tend to also influence smaller companies in their sector or in their supply chain to make positive changes. This has for example been observed for sectors such as soy, cocoa, tea and coffee (interview WUR researcher 25/10/21). This confrontation is ongoing and all interviewed companies realise that the world is changing with big challenges ahead such as population growth, increasing CO₂ emissions, climate change and the effects of the latter on production. These developments typically change their previously dominant way of doing business, and relatedly they recognize the need for viewing their business operations as part of larger system.

B: CSR strategies

Where researchers and policy makers speak of FS approaches, large companies refer to (social and environmental) guidelines which are described in their CSR strategies. Usually, there is no explicit food systems approach that informs private-sector CSR strategies. For two of the interviewed companies, the SDGs are their main drivers, and new developments must contribute to innovations in relation to sustainability. Food system elements are – though implicit – incorporated in CSR strategies (interviews private sector actors 21/7/21, 7/9/21). This is driven by growing demands – from investors, banks as well as other stakeholders – for such strategies as well as for sustainability reporting. Related to CSR strategies, the

SDGs and sustainability reporting, all companies have targets that are often aligned with the SDGs. Sustainability reporting also requires more partnerships and collaboration as issues of sustainability often extend beyond one company and addressing them requires cooperation.

C: Partnerships and collaboration

Because the food system is complex, companies also search for partnerships that can help strengthen the companies where they are less influential or knowledgeable. These can be partnerships with NGOs for example, which are favoured by one of the companies interviewed because they are helping the company to view their operations more from a holistic systems perspective (interview private sector actor 21/7/21).

Concerns about being confronted with resource limitations in the future are also increasingly being addressed by companies in partnerships, for example through sector collaborations making inventories of the biggest future challenges, and associated discussions about target setting to tackle these (interview private sector actor 7/9/21). One company explained that this can also lead to the identification of products and practices that are labelled as 'show-stoppers': products and practices which compromise the environment too much for the company to proceed with them, e.g. a high acute bee toxicity or long-lasting residues in the soil. The impact of new products is compared always to existing products in the market; only if a new product has a good efficacy combined with a better environmental profile, the product will be developed (interview private sector actor 21/07/21).

The interviewed companies stressed the need for such partnerships and pre-competitive roundtables, where companies discuss together and come to joint solutions not based on the aspect that they compete on but on shared (future) challenges for their sector or even broader.

D: Role of banks

The role of banks as financers of all goods (foods) that are moved around the world is of importance in food systems, although often glanced over (interview WUR researcher 25/10/21). One company described engagement with FS elements such as the environment and societal aspects as their 'license to operate.' Banks increasingly evaluate companies based on their sustainability performance; companies who have sustainability not at the core of their operations risk their access to finance (interview private sector actor 21/7/21). Of course risking the loss of access to finance is also a strong influence on companies' motivations to adjust their operations.

E: Struggles and needs

With the implementation of a broader system view of their business, large companies face challenges because:

- This is often outside the direct scope of their core product and direct area of influence;
- It needs long term chain partnerships;
- It needs business-oriented sector collaboration (e.g. World Business Council For Sustainable Development WBCSD), ideally towards binding business declarations on food systems transformation;
- It can lead to extra costs and price increases, which could make their product less competitive compared to others;
- It needs roundtables to agree on sector standards (or top-down legislation) and create a level playing field;
- It needs not only understanding the need but also a good knowledge for the selection of the most impactful activities.

Possible interventions that could contribute to positive food systems change from a (large company) private sector perspective include:

- Better understanding and harmonization of definitions (not mentioned by large companies, but conclusions based on feedback);
- A simple and practical toolkit, as it is complex to integrate all FS aspects comprehensively in decision-making. It is also complex as for example improvements that increase harvests do not directly mean more income, improved food and nutrition security, or better living conditions (output versus outcome);
- More evidence-based approaches, informed by scientific evidence, matched to the practical reality of the private sector;

- Methodology to identify 'game changing' or impactful activities and selection of the most beneficial actions;
- Bringing others along on the journey to collaborate in public-private partnerships;
- Building consensus on the approach and standards and building of accounting and monitoring frameworks;
- Banks to realize that they can play a key role in boosting responsible investments by including it in their finance conditions;
- Government to realize that they need to provide the instruments (e.g. policies, subsidies, tax benefits, harmonization, standards) for the transition.

3.3.4 Concluding

Value chain influences on food systems are many, and particularly large companies have great influence across their entire supply chain. From various directions (investors, governments, civil society, NGOs), they face more pressure to take responsibility for issues in their supply chains. As such, they are driven towards changing their businesses by being confronted with resource limitations (e.g. threat of lower production due to climate change) and expressed societal concerns (e.g. company then risking bad reputation). Guidance for this is welcomed, but food systems approaches alone are perceived as too complex and not sufficiently actionable.

3.4 Creating an enabling environment for food value chains to contribute to food system outcomes

To bring about change, an understanding of the enabling and constraining factors that condition the functioning of value chains and their actors in food systems is essential. What private sector actors need to positively contribute to food system transitions, and how that can be effectuated, can partly be addressed in the value chain, and partly needs to be addressed outside the value chain in the wider food system. An example of a socio-economic aspect that can have enabling or constraining effects on private sector actors are the markets they operate in (e.g. 'push' or 'pull' markets, in Low and Middle Income Countries (LMICs) or High Income Countries (HICs)). Other aspects are the level of social organization in communities, and the policy environment. Examples of environmental drivers or barriers in the enabling environment are the impact of the climate on value chain functioning, the quality of soils, and water availability (van Berkum et al. 2018). Figure 1 at the beginning of this report illustrates the enabling environment domains in orange and blue.

3.4.1 Smallholders

Smallholders have very limited means and capacity to invest in interventions related to FS changes. They focus on survival through subsistence farming and limited income generation rather than specific FS outcomes. In order to change the role of smallholders in FS, other actors (including other actors in the value chain, governments or NGOs) can stimulate interventions at smallholder level. From the side of the government this usually takes the form of policies and regulations, but can also include stimulating cooperation to improve market access. Also their direct and indirect chain partners (traders, processors, retailers) can support smallholder farmers to produce more efficiently and more sustainably – with a shared interest across the chain when better production practices result in higher-quality food, fewer losses, better market opportunities, and better fulfilment of consumers' demands. Ultimately, supporting smallholder farmers to improve their production practices impacts positively on several food system outcomes – including more sustainable production, more efficient resource use, improved food quality, and improved farmer livelihoods. This last aspect can also set in motion a virtuous cycle of increased incomes and further improvement of production practices, for example when increased incomes make this group much more interesting for (technology) suppliers and service providers.

With regard to the enabling environment, particularly the influence of policies on smallholders can be large in societies with a (historically) socialist or communist policy model, since these then also largely influence domestic market dynamics. In these societies the effects of the policy environment on (smallholder) producers can at least be more explicitly visible compared to democratic and more capitalist societies where the influence of large companies within the value chain is likely more influential than the policy paradigm.

An example of an enabling environment that arguably constrained as well as enabled certain smallholder farming practices and positive food system outcomes is during the socialist experiment of the late Julius Nyerere, the first president of Tanzania in 1964. Under his rule, in the agricultural sector, Ujamaa villages were established which meant the establishment of cooperatives and communal farming. An estimated 70% of the population had been moved from their homes for this purpose by 1976; the Ujamaa period lasted until 1985 (Haug 2016). Some consequences of this initiative affected food system outcomes. E.g. the state control over natural resources such as water were reinforced, which potentially disrupted traditional practices related to water conservation, managing irrigation systems, and ownership of water resources (Kajembe et al. 2016). This affected food availability and security. Whether this was affected positively or negatively with regard to food system outcomes is difficult to attribute to only the Ujamaa period, and remains conditional to local contexts within Tanzania.

Other enabling or constraining elements in the policy domain that support or disrupt value chain actors' – and specifically smallholders' – contributions to positive food system outcomes are national import and export bans. In Ethiopia, for example, there is an export ban on the staple crop teff (in raw form) to protect local food security in response to global food price volatility (Sankaranarayanan et al. 2020).

3.4.2 Diverse MSMEs

As discussed above, the Small and Medium companies within the group of MSME are not as prevalent in LMIC as they are in HIC, as the majority of companies in the MSME segment consists of Micro enterprises. Some SMEs in developing countries focus on high demanding export markets. However, due to a rapidly increasing domestic population in combination with a growing middle class, an increasingly large local market is developing in the main urban areas of emerging economies. This middle class has increasing demands regarding food and are important drivers for developments in the supply chain. Besides buying vegetables on street markets, the middle class increasingly shops in supermarkets, and become more demanding on consistency in availability, packing and quality. The middle class buys processed food and visits restaurants, thus enabling opportunities for processors supplying half-fabricates like fresh fried potatoes, peeled onions or fresh juices. But the middle class is also very diverse and developing. They include people that are still price-buyers as well as the upper middle class with higher demands.

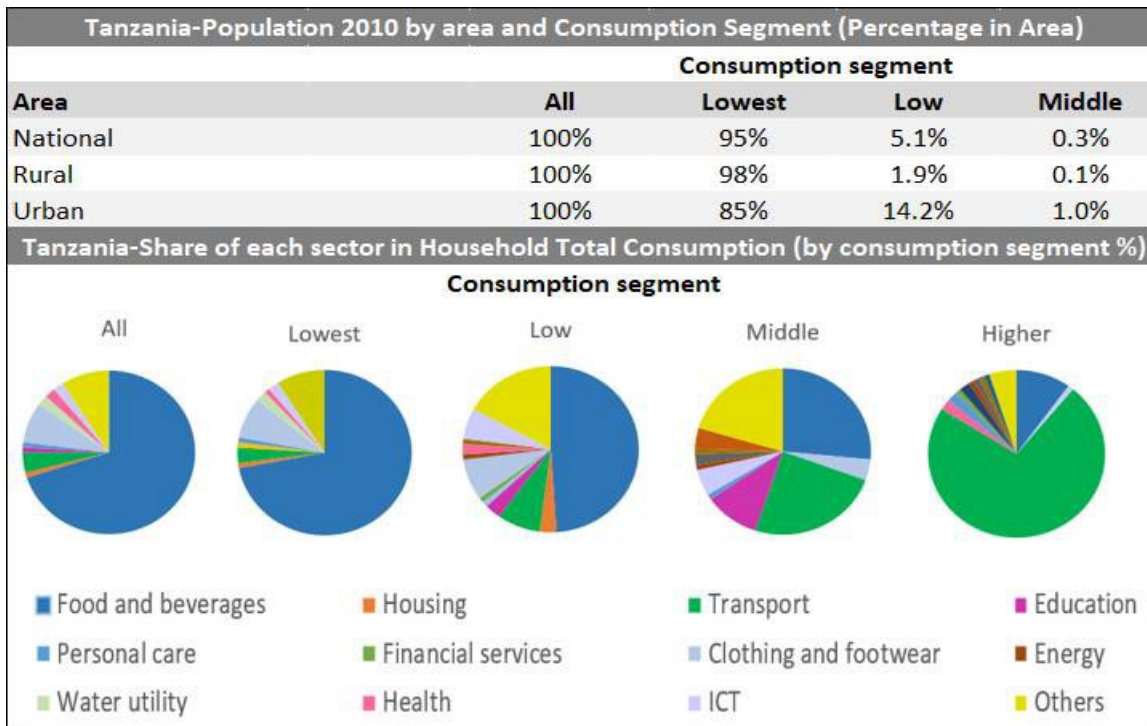


Figure 4. Household expenditure percentage on food per income group Tanzania (World Bank, 2022).

As can be derived from the figure above with Tanzania as an example, in many developing countries most consumers are still in the lowest consumption segment (84% of urban population). From the same figure can be derived that this group spends almost 70% of their income on food. This means their purchasing power is very low and they therefore first seek cheap food with enough calories and are less demanding on quality. This group does not primarily seek healthy, vitamin-rich food. Only when incomes grow, demands on food quality and nutritious value increase with it. And only when the number of people in a higher consumption segment increases, the demand for better-quality and processed foods increases – a market demand that SMEs can meet better than smallholders or Micro enterprises. The value chain actors can only successfully operate if their level of development is in balance with the level of development of the food system as visualized in the below Figure.

Food system level development related to market and technology development

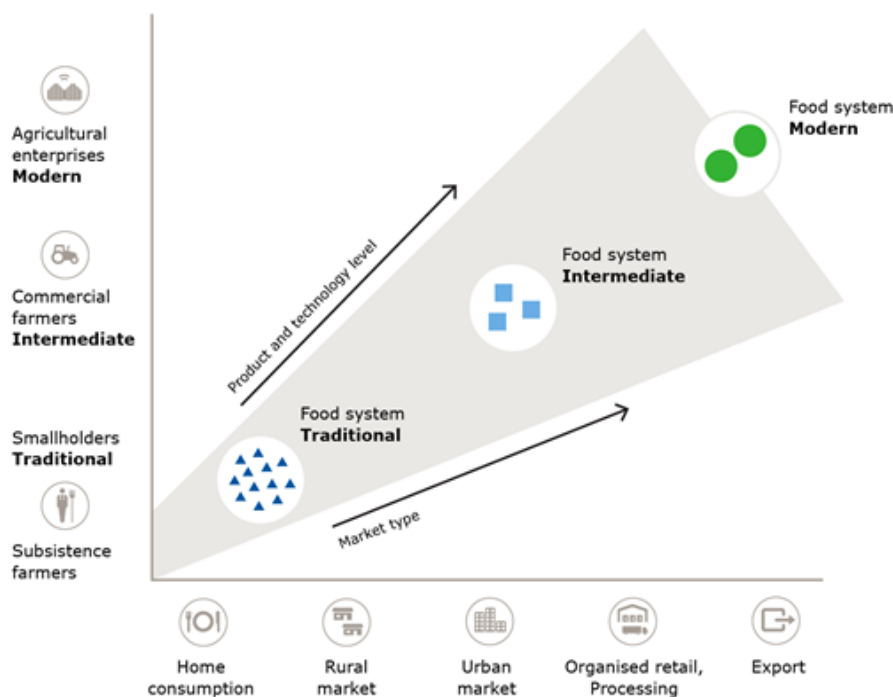


Figure 5. Food system level development related to market and technology development (Verschoor et al., 2020).

Specifically in the transition segment from lowest- to low food system development and from low-income to middle class consumers, the small enterprises segment of SME has good possibilities for development and growth because these are the companies that fit best to the market segment or food system development stage that dominates the market.

3.4.2.1 Not every intervention is successful – an example

Noble initiatives do not necessarily lead to positive results. An example of a mistake that can be seen often is based on the fact that a food system approach does not (sufficiently) account for supply chain implications. Policy makers are for example aware that cooling perishables helps to prevent losses. Some cold storage infrastructure is being realized to address this issue, sometimes in combination with marketing cooperative development. However, in many cases the investment is wasted and stands idle because some basic mistakes were made mostly related to assessing the economic suitability for its intended users and location. Examples of reasons for these types of mismatches are:

- The quality of the fruits and vegetables when entering the cold chain is not good enough to start with;
- The intended (local or regional) market is not willing nor able to pay the premium that is needed to cover the investment- and operational cost of cooling and packing;
- Cold storage is established in the producer area but absent in the rest of the chain, minimizing effectiveness or even worsening it;
- Lack of awareness of difference in mid- and long-term storage and conditioning to extend shelf life;
- Lack of awareness of different cooling needs in specific product / market combinations
- Insufficient produce or peak demand for storage during too short a period to make the investment feasible;
- Lack of thorough business plan and calculations, including risks assessment, to justify the investment.

Any mistake here can lead to the investment going to waste and another so called 'White elephant' – almost all such mistakes are economically based. When addressing the aspect of cooling of perishables, it should be realized that first of all the aim of what is to be achieved needs to be clear. Is there a deficiency of fresh fruits and vegetables during parts of the year or are losses in the chain high and is quality poor? There is a difference in conditioning fresh produce like fruits and vegetables in order to prolong their shelf-life, improve

quality and reduce losses on the one hand, and store them for several months to supply the market in a different season on the other. In all cases however, the market (consumers) must be willing and able to pay for the added value (better quality or off-season availability) including the consideration of losses (reduction).

For this reason, it is important prior to interventions, to realize an assessment that differentiates between questions at the country level (food system issues) and the company level (value chain issues).

3.4.2.2 Assessment of the food system as a basis for policy development

Assessment on the company level as a basis for concrete investments should be based on a feasible business plan and business calculations that include a risk assessment. Based on the work of WUR Water Resources Management and Environmental Sciences, the World bank published a Development Guide on the what, why and how for intervention design (Denison & Veldwisch, 2021). It is based on efficient design of irrigation schemes by taking existing farmer initiatives as a starting point and designing the infrastructure they need, in this case irrigation, based on that. The concept is recognized as highly effective. We believe that the same approach as taken in the World bank irrigation intervention design should be chosen for changing food systems with focus on Micro, Small- and Medium Enterprises (MSME) and their needs.

3.4.2.3 Leveraging the value chain

In order to create an enabling environment for value chains to contribute to FS outcomes, it is important to understand following basics:

- The value chain is the centre of the food system;
- Economic motives and incentives are the main drivers that determine how a value chain operates;
- Several actors have the power to indirectly influence the economic drivers for the value chain: most importantly policymakers, financial organizations, and large private companies.

The business owners in midstream SMEs are the main decision makers on what is going to happen: what investment decisions are made, what products are being produced, how much, and where these are to be supplied. Apart from the basic condition that there must be a market for the products (consumers willing and able to pay), a government also has the possibility to influence these decisions up to a certain level. They can do so for example by investing in infrastructure (like roads, wholesale markets, extension, food safety control etc.) or developing legislation on prices, import quota, tax, subsidies, inputs availability, etc.

The actions of governments factor into business case calculations and thereby influence the decision of the farmer/ business owner. Governments can be advised to take the proper measures to influence the choice of value chain decision makers towards specific outcomes. In many cases, influencing the small enterprise segment of SME, is likely to be the most successful policy due to their numbers and therewith their potential impact.

3.4.3 Large companies

Due to their global scale, also large private sector actors become increasingly involved in representing their customers' real- or perceived demands and expectations regarding the footprint of the products and services they purchase. Examples are multinationals demanding GlobalGap or other certification that include labor- and environmental rules for produce supplied to major organized retail chains. Or a Social and Environmental Impact Assessment (SEIA) as a pre-requisite to acquire external financing of investments. Both examples are not used as a marketing tool by retailers or banks but rather serve as an 'insurance policy' to avoid potential negative publicity in the future. These demands are not only to be seen as meeting the costumers' wishes but are also part of a mechanism and policy to avoid liability by transferring the liability to a link further down the chain, towards direct supplier as well as their suppliers. When large companies respond to these demands by controlling risks and impacts in their supply chains, also their suppliers face the pressure to take responsibility for the wider effects of their operations.

A business owner may not include the impact of their plans on the food system in their consideration at first instance but will do so when their consumers or bank demand this. Responsible conduct, decent working

conditions and social acceptance are in the business' interest, especially in the long run. The same applies for environmental issues. Companies with well-developed CSR policies may use this to gain a marketing advantage over competitors. Large multinationals are the first to address this in a professionalized way, but these demands are passed down their value chains to suppliers as well. Upgrading of small businesses to more streamlined SMEs is a key contributor to meeting these demands.

For large companies, the main factors that influence their enabling environment are markets and (national) policies in the countries of their operations. Further, as identified in under 'Struggles and needs' regarding creating a favourable enabling environment the following three aspects are key:

1. Partnerships and collaboration, for example in the form of public-private partnerships, with the main aim of building consensus on the approach and standards, and building of commonly agreed accounting and monitoring frameworks;
2. Financers of large companies should realise they can play a key role in strengthening food systems by including aspects of FS into their finance conditions;
3. Governments should realise that they need to provide the instruments for the transition towards stronger food systems, in form of policies, subsidies, tax benefits, harmonization, standard setting, since these can positively influence not only directly the companies' operations but also stimulate certain market developments.

4 Practical examples of value chain steering

Some practical examples on how value chains can be steered by measures in the wider food system are given below. We give a short description of the example policy, business model, or initiative, and indicate what the most important takeaway of the example is when considering leveraging value chain action for the improvement of food system outcomes.

4.1 Stimulating investments in local production in Senegal

Senegal is a major importer of potatoes and especially onions. It is a main export destination for Dutch onions and some companies have a huge interest in this trade that involves many shiploads full of produce. This is the case for exporters and importers alike. In 2018 the government of Senegal wanted to stimulate local production to reduce these ever-increasing imports. However, yield levels for both onion and potato are higher in the Netherlands than in Senegal, amongst others because there is more daylight during the Dutch summer growing season, compared to the Senegalese winter growing season (the summer being too hot). These higher yields result in a lower cost price per ton, even including the transport.



Figure 6. *Open-air onion storage near Richard Toll, North Senegal (R. Oostewechel).*

The incentive to invest in local production of potatoes and especially onions even at a somewhat higher cost price was created by the government by connecting import-quota to local production. This forced importers to set up Joint Ventures with their exporters, to invest in local production in order to keep their profitable business model in place. At the same time, the government facilitated investments by providing irrigation infrastructure and legislation aimed at a stable investment climate attracting foreign investments. International financing institutions demanded a Social and Environmental Impact Assessment (SEIA) of intended developments as a pre-requisite for financing these.

Takeaway: If large quantities of food are being imported in a country, it may in some cases be possible to (partly) replace these imports by local production. Conditions may be designed that make it interesting for the current importers to get involved in local production, assisted financially, and supplied with knowledge by the exporter. A SEIA demand, related to financing, assures that also ecological and social aspects are included in business models.

4.2 Processing industry in Argentina helping their suppliers to improve

Argentina has a favourable climate to produce raw material for the potato processing industry like French fries and crisps. Therefore, global players in this industry like Frito-Lay /PepsiCo, McCain and Farm Frites (now Lamb Weston) have invested in production facilities in South Buenos Aires province (Balcarce, Mar del Plata). However, although the climate and soils are favourable, farmer yields were below average and suitable varieties were missing. In this example, the processing industry served as pivot for improvements. They had an interest in their suppliers achieving high yields because that translated into low-cost price and a strong competitive position related to low (or at least competitive) raw material prices. The processing industry invested in extension workers, invited leasing companies to become active in leasing soil preparation- and harvesting equipment and negotiated with the government to allow import of suitable varieties. These large companies have strict and transparent CSR policies that include their suppliers. In the case of pre-fried frozen potatoes, establishment of production facilities is usually based on pre-agreed purchase contracts by large fast food chains like McDonald's as part of the conditions to obtain financing for the required investments. These buyers do interfere in even the primary production of their suppliers in terms of varieties that are accepted and chemical use, but also regarding social- and hygienic aspects.

Takeaway: An advanced value chain has an interest in consistency, transparency, quality and high yields for its suppliers/ chain partners. A powerful chain director can organize investments in seeds, equipment and knowledge by organizing lease constructions and own consultancy. In the high-end market where large international companies are involved, long-term relations are a condition to mitigate marketing risks and as such a pre-condition for financing. These chain relations at the same time demand transparency and meeting CSR standards to comply with their CSR policy, and mitigate any possible negative publicity regarding the company's sourcing.



Figure 7. Center Pivot irrigation system, 52 ha potatoes, San Feli, Mendoza, Arg. (R. Oostewechel).

4.3 Stimulating farmer cooperation in marketing in the EU

Due to changing market structures leading to large purchase organizations to supply organized retail and concentrated power with processing industries, the EU wanted to stimulate the 11 million farmers in the EU to cooperate in marketing. Main objective was to strengthen farmers' collective bargaining power. Therefore regulation (EU) No 1308/2013 on Producer Organizations (POs) was adopted. Under this regulation, farmers could get subsidies for investments in joint marketing, but only via a recognised PO. As per 2017 there were 3,400 recognized POs in the EU.

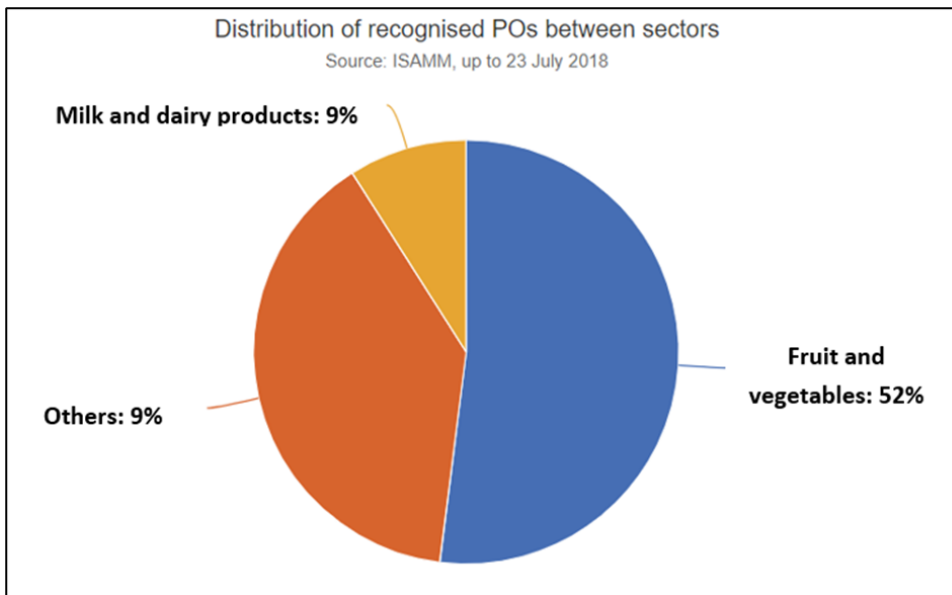


Figure 8. Distribution of recognized POs in EU (European Commission, 2017).

In order to be recognised, a PO in any agricultural sector must:

- Have been set up on the initiative of producers;
- Be made up of and controlled by producers of a specific agricultural sector;
- File a request with the EU-country it is based in;
- Carry out at least one of the activities listed by EU law, such as joint processing, distribution, transportation or packaging;
- Follow at least one of the specific aims mentioned in agricultural legislation, such as optimising production costs or developing initiatives in the area of promotion and marketing.

In addition, POs need to meet some additional criteria such as having a minimum number of members and/or covering a minimum volume or value of products. There are also certain requirements regarding their statutes. These must enable their members to scrutinise the organization democratically.

Takeaway: making subsidies available, in support of a policy objective to influence behaviour is a well-known measure. It can be used directly to influence investments or indirectly, to influence consumption.

Producer organizations strengthen the collective bargaining power of farmers by:

- Concentrating supply;
- Improving marketing;
- Providing technical and logistical assistance to their members;
- Helping with quality management;
- Transferring knowledge.

4.4 Covenants, roundtables, and other organizational solutions

Various types of organizational and institutional arrangements can help companies to become accountable, take responsibility, and act on it. A couple of examples:

-
1. The covenant of food and drinks products in the Netherlands (SER, 2022) is an organization that brings together industry partners operating in the food and drinks sector, societal organizations, labor organizations and government. These organizations have signed the covenant, which means they oblige themselves to address the issues they find important as a sector, such as fair wages, abolition of child labor in chains, and minimizing environmental impact.
 2. The Roundtable on Sustainable Palm Oil (RSPO, 2022) unites various types of stakeholders operating in the palm oil industry, such as oil palm producers, retailers, but also environmental – and social NGOs. Together they have developed a set of social and environmental criteria which companies must comply with in order to produce certified sustainable palm oil. Typically this is strived for by large companies, but recently (2021) the first group of independent smallholders became certified by RSPO in Sierra Leone, followed this year (2022) by a group of independent Ghanaian smallholder farmers.
 3. The Sustainability Consortium was established in 2009 to address issues of increasing consumer demand for sustainable products and lack of transparency in supply chains, and confusion among businesses on how to precisely go about this (Sustainability Consortium, 2022). They offers tools and services to help companies address product sustainability in their supply chains, focusing on consumer products (not only food). Currently they have a significant portion of large US based companies listed as their members and they are growing in membership in Europe as well
 4. The Dutch organization Food Waste Free United (Stichting Samen Tegen Voedselverspilling, 2022) is bringing together companies, public institutions, expertise and promising initiatives to halve food losses and waste by 2030, directly contributing to SDG 12.3: Global Food Loss and Waste. They currently have around 70 member companies and organizations that are together committing to achieving this goal.

Takeaway: (Large) companies that want to take their responsibility to positively contribute to food system transformations need to know how, which is not always evident. Organization and collaboration between companies and alignment with other supporting institutes and platforms can help clarify how and offer support towards contributing to positive food system outcomes, e.g. via creating a platform for discussing and sharing pre-competitive knowledge to help support the creation of a level playing field, or by helping companies with their sustainability measuring and reporting.

5 Discussion and conclusions

As relevant drivers of the food value chain activities within food systems, private sector actors are a major contributor to food system outcomes either in positive or negative direction. Food system frameworks as they are currently available offer limited guidance for users (policy level) to leverage private sector action in the food chain itself, and are hardly used by the private sector due to their descriptive, rather than actionable and solution-driven perspective. In this paper we addressed the question how food system approaches can support private sector action and specifically reflected on the two following questions:

1. A value chain perspective question: how can value chain actors utilize food systems thinking in their decision-making? And;
2. A policy perspective question: how can policy stimulate value chain actors to contribute towards the desired food system outcomes?

Based on a review of existing food system approaches, we identified three issues that we argue are central to explain why transformation in value chains (in order to improve food system outcomes) is difficult to achieve with food system approaches: 1) dissonating private and public goals; 2) mismatch between specific interventions at value chain level and the wider, more complex food system and 3) lack of relevance of food system approaches for the private sector. Furthermore, we argued that the relevance of different types of food chain actors – and therefore also the best way to leverage their potential to contribute to improved food system outcomes – differs most importantly with company size and capabilities. Our general conclusions and some perspectives on how to bridge the issues are summarized in Table 3 below.

Table 3. Summary of conclusions and perspectives.

	Smallholders	MSMEs	Large corporates
Public and private goal alignment	Smallholders require support to upgrade their practices, but do have a strong interest in addressing system outcomes such as environmental degradation and improving rural livelihoods	With the predominance of smallholders and micro enterprises, SMEs have limited presence in LMIC food systems, but their potential for innovation and value added can be leveraged to address system-level issues	Large companies are likely to be more sensitive to public opinion pressure to take responsibility for outcomes of practices in their value chains
Macro-level FS approaches versus meso- and micro- level VC interventions	Meso- or micro-level intervention should match macro-level food system characteristics (e.g. technology level, market characteristics)		
Making FS approaches relevant for VC actors	FS approaches should inform support for smallholders by governments, NGOs and chain partners; smallholders can organize and partner with other actors (including other smallholders) to initiate change	The appropriate support and incentives can help Micro enterprises professionalize and upgrade to SME status	Relevance lies in confrontation with resource limitations, societal pressures, demands for CSR strategies, partnerships and collaboration, ensuring access to finance and their struggle to address issues in their own supply chains

We posed the question how value chain actors can possibly utilize food systems thinking in their decision-making. Smallholders themselves are often directly confronted with negative food system outcomes (environmental degradation, and limited incomes and opportunities), but initiating change on their own is not a realistic option – smallholders generally have negligible resources and capabilities and their influence on food systems outcomes is limited. However, being aware of their position in the food system can stimulate smallholders to organize and partner with other actors (e.g. other smallholders, chain partners, NGOs etc.) to initiate food system change to ultimately also improve their own position. In addition to the need for partnerships, smallholders often require specific support for their actions to contribute to improvement of

food system outcomes. Efforts from governments, NGOs and other actors initiating support for smallholder farmers can also positively impact on food system outcomes.

In LMICs, the Small and Medium enterprises in the group MSMEs are few in number compared to HICs. We argue that there is considerable unmet potential here, especially in the part of MSME where Micro companies can develop to SME status and especially in markets with a growing middle class, where SMEs – though their capabilities, innovative capacity and potential for value added – can contribute to addressing food system issues and improve outcomes. Implicitly, elements of system thinking are reflected in CSR strategies and ESG reporting of large (multinational) companies. These companies have considerable resources and capabilities, but actions taken differ. Increasingly however, they face pressure from consumers, NGOs, banks and governments for due diligence in their value chains, sustainability reporting and other accountability mechanisms that require them to take more responsibility for what is happening in their (global) value chains. Despite the potential power of this incentive to steer private sector action towards contributing to improved food system outcomes, there is the risk that companies can pass responsibility (liability) to other parts in the chain. On the one hand this is a risk, but can also be seen more positively in the sense that suppliers are also forced to respect demands made by powerful actors downstream in the chain.

In addition to these general observations on how support and incentives can steer (private) value chain actors, the examples provided in section 4 show more concretely what value chain steering for food system outcomes can look like in practice. The examples show that involvement and action by value chain actors can indeed be steered through policy that sets the appropriate conditions. In doing so, aligning incentives to stimulate cooperation (and preventing perverse incentives) is key. What the appropriate incentives are depends critically on interests and priorities of the actors involved. When resources are always limited, as is the case for smallholder farmers, priorities will be more short-term and related to simple survival, with little attention for the broader and long term interest. On the other end of the spectrum, large companies also have their own interests and priorities, but are also sensitive to pressure they may face from consumers, banks, NGOs and others to be accountable for their actions and what is happening in their value chains. Large companies, but also financing institutions involved in project investments, are very sensitive to negative publicity. Bluntly stated, their reputation, goodwill, and access to financing are also part of their interests, and this is where public and private goal alignment can be achieved.

To activate private actors who are not yet engaged to contribute to positive food system outcomes, food system approaches can be used to develop recommendations for policy and practice to facilitate and effectuate implementation (i.e. bridging the gap between systems thinking and value chain intervention or – in other words – address the persistent market failures that misalign private and public goals within the food system). Organizational decision-making in the food supply system is not by definition incompatible with the outcomes perspective in food systems thinking, but other outcomes often take precedence in day-to-day decision making. To tap into the full potential for system change, also actionable recommendations and the appropriate incentives for actors at the meso and micro (chain, process, firm, and individual) levels should be a part of food systems thinking – and importantly the proper matches between interventions and food system and actor characteristics and goals. For the latter it is important to recognize diversity also within the private sector, from smallholders to large multinationals, in diverse geographies. The main challenge for future food systems research is to formulate a robust process of identifying, selecting and implementing the proper value chain interventions for food system change, all the while recognizing complex tradeoffs, systemic effects, and diversity of actors and contexts.

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Annex 1 Interview guide private sector parties

To share beforehand: this interview guide

Opening

Thanks for your time, we do this interview to answer the following research question:
How can we better help private sector actors with food chain optimization through a 'Food Systems' approach?

A Food Systems (FS) approach includes social, economic and environmental aspects that food chains interact with. Namely, in addition to processes in chains themselves, attention is paid to causes and consequences that take place outside the food chain, for example in policy or the climate. A FS approach is different from more linear value chain analyses through its, as the name already implicates, systemic lense.

Your answers will be processed anonymously.

Introduction

1. Can you introduce yourself briefly by introducing yourself, your organization and function?

If familiar with FS approach:

2. You have work experience with a FS approach, can you tell us something about that? E.g.:
 - a. (Since) when have you used a FS approach?
 - b. Why did you start applying a FS approach?
 - c. How did/do you use a FS approach?

Choose 1 project where a FS approach was used for further questions:

[name of project, start – end year:

3. What was your experience with FS approach before this project started?
4. How has FS approach been applied practically within this project? Think of:
 - a. How was FS approach defined in this project?
5. How would you describe your experience with the application of FS approach in this project? Specifically:
 - a. Has a FS approach contributed to the project process/outcomes? If yes, how?
 - b. Has a FS approach complicated the project process/outcomes? If yes, how?
 - c. To what extent has a FS approach provided a different project process than if a FS approach had not been applied?
 - d. What challenges came with a FS approach?

FS approach and companies more general

6. To what extent does a FS approach fit with the current CSR strategy?
7. Has (extra) budget been made available for chain optimization through a FS approach?
8. Are there direct commercial benefits from the use of a FS approach? If not:
 - a. How to close the gap between direct commercial focus and the less direct (financially) visible goals that play a role in a FS approach?

Support customer and user of FS approach

9. Based on your experiences, do you find FS approaches useful and/or important? Yes/no, please elaborate:
10. Based on your experiences, what do you miss in a FS approach? What does it take to make it usable?
11. Based on your experiences, what do you think private sector actors need from public sector actors in the practical application of a FS approach?

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12. Based on your experiences, what do you think private sector actors need from researchers/consultants/WR in the practical application of a FS approach?
 13. In what form(s) would researchers/consultants/WR with private sector actors best apply the FS approach practically within projects? E.g. toolbox, checklist, etc.

Closing

14. Can we contact you again in case we have some further enquiries? If yes, add contact details:
 - a. Email:
 - b. Telephone number:

Thank you very much, notes will be prepared and shared to confirm/supplement by you where necessary.

If not familiar with FS approach:

Explanation FS approach from us (see above), then:

1. Do you work with some kind of FS approach? Yes/No
If so, can you tell us a little bit more about that? Specifically:
 - a. Can you describe the approach?
 - b. What do you call this approach?
 - c. Since when do you use this approach?
 - d. Why did you start applying this approach?
 - e. Do you take social, economic and environmental aspects into account?
Yes/no, tell which (not), why (not):

After explanation from us about FS approach

2. What do you think a FS approach can contribute to current approaches?
3. Does a FS approach seem useful and/or important to you? Yes/no, why?
4. As a private sector actor, is there anything you need from public sector actors in the practical application of a FS approach? If so, what, why?
5. As a private sector actor, is there anything you need from WR/researchers/consultants in the practical application of a FS approach? If so, what, why?
6. In what form(s) could WR/researchers/consultants with private sector actors apply the FS approach practically within projects? E.g. toolbox, checklist, etc.

Closing

7. Can we contact you again in case we have some further enquiries? If yes, add contact details:
 - a. Email:
 - b. Telephone number:

Thank you very much, notes are elaborated and shared to confirm/supplement where necessary.

Annex 2 Interview guide public sector parties

To share beforehand: this interview guide

Opening

Thanks for your time, we do this interview to answer the following research question:
How can we better help private sector actors with food chain optimization through a 'Food Systems' approach?

A Food Systems (FS) approach includes social, economic and environmental aspects that food chains interact with. Namely, in addition to processes in chains themselves, attention is paid to causes and consequences that take place outside the food chain, for example in policy or the climate. A FS approach is different from more linear value chain analyses through its, as the name already implicates, systemic lense.

Your answers will be processed anonymously.

Introduction

1. Can you introduce yourself briefly by introducing yourself, your organization and function?

If familiar with FS approach:

2. You have work experience with a FS approach, can you tell us something about that? E.g.:
 - a. (Since) when have you used a FS approach?
 - b. Why did you start applying a FS approach?
 - c. How did/do you use a FS approach?

Choose 1 project where a FS approach was used for further questions:

[name of project, start – end year:

3. What was your experience with FS approach before this project started?
4. How has FS approach been applied practically within this project? Think of:
 - a. How was FS approach defined in this project?
5. How would you describe your experience with the application of FS approach in this project? Specifically:
 - a. Has a FS approach contributed to the project process/outcomes? If yes, how?
 - b. Has a FS approach complicated the project process/outcomes? If yes, how?
 - c. To what extent has a FS approach provided a different project process than if a FS approach had not been applied?
 - d. What challenges came with a FS approach?

Support customer and user of FS approach

6. Based on your experiences, do you find FS approaches useful and/or important? Yes/no, please elaborate:
7. Based on your experiences, what do you miss in a FS approach? What does it take to make it usable?
8. Based on your experiences, what do you think public sector actors need from private sector actors in the practical application of a FS approach?
9. Based on your experiences, what do you think public sector actors need from researchers/consultants/WR in the practical application of a FS approach?
10. In what form(s) would researchers/consultants/WR with private sector actors best apply the FS approach practically within projects? E.g. toolbox, checklist, etc.

Closing

11. Can we contact you again in case we have some further enquiries? If yes, add contact details:

-
- a. Email:
 - b. Telephone number:

Thank you very much, notes will be prepared and shared to confirm/supplement by you where necessary.

If not familiar with FS approach:

Explanation FS approach from us (see above), then:

1. Do you work with some kind of FS approach? Yes/No
If so, can you tell us a little bit more about that? Specifically:
 - a. Can you describe the approach?
 - b. What do you call this approach?
 - c. Since when do you use this approach?
 - d. Why did you start applying this approach?
 - e. Do you take social, economic and environmental aspects into account?
Yes/no, tell which (not), why (not):

After explanation from us about FS approach

2. What do you think a FS approach can contribute to current approaches?
3. Does a FS approach seem useful and/or important to you? Yes/no, why?
4. As a private sector actor, is there anything you need from public sector actors in the practical application of a FS approach? If so, what, why?
5. As a private sector actor, is there anything you need from WR/researchers/consultants in the practical application of a FS approach? If so, what, why?
6. In what form(s) could WR/researchers/consultants with private sector actors apply the FS approach practically within projects? E.g. toolbox, checklist, etc.

Closing

7. Can we contact you again in case we have some further enquiries? If yes, add contact details:
 - a. Email:
 - b. Telephone number:

Thank you very much, notes are elaborated and shared to confirm/supplement where necessary.

Annex 3 Interview guide researchers/client support

To share beforehand: this interview guide

Prerequisite for participation: experience with Food Systems approaches

Opening

Thanks for your time, we do this interview to answer the following research question:

How can we better help private sector actors with food chain optimization through a 'Food Systems' approach?

A Food Systems (FS) approach includes social, economic and environmental aspects that food chains interact with. Namely, in addition to processes in chains themselves, attention is paid to causes and consequences that take place outside the food chain, for example in policy or the climate. A FS approach is different from more linear value chain analyses through its, as the name already implicates, systemic lense.

Your answers will be processed anonymously.

Introduction

1. Can you introduce yourself briefly by introducing yourself, your organization and function?
2. You have work experience with a FS approach, can you tell us something about that? E.g.:
 - a. (Since) when have you used a FS approach?
 - b. Why did you start applying a FS approach?
 - c. How did/do you use a FS approach?

Choose 1 project where a FS approach was used for further questions:

[name of project, start – end year:

3. What was your experience with FS approach before this project started?
4. How has FS approach been applied practically within this project? Think of:
 - a. How was FS approach defined in this project?
5. How would you describe your experience with the application of FS approach in this project? Specifically:
 - a. Has a FS approach contributed to the project process/outcomes? If yes, how?
 - b. Has a FS approach complicated the project process/outcomes? If yes, how?
 - c. To what extent has a FS approach provided a different project process than if a FS approach had not been applied?
 - d. What challenges came with a FS approach?

Customer and project

1. Can you tell us about the customer's experience with FS approach before you started working together? If not, possibly ask for contact.
2. Can you tell us anything about your interpretation of the customer's experience with FS approach during your project? If not, possibly ask for contact.

Support customer and user of FS approach

6. Based on your experiences, do you find FS approaches useful and/or important? Yes/no, please elaborate:
7. Based on your experiences, what do you miss in a FS approach? What does it take to make it usable?
8. Based on your experiences, what do you think researchers/consultants/WR need from private sector actors in the practical application of a FS approach?

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9. Based on your experiences, what do you think researchers/consultants/WR need from public sector actors in the practical application of a FS approach?
 10. In what form(s) would researchers/consultants/WR with private sector actors best apply the FS approach practically within projects? E.g. toolbox, checklist, etc.

Closing

11. Can we contact you again in case we have some further enquiries? If yes, add contact details:
 - a. Email:
 - b. Telephone number:

Thank you very much, notes will be prepared and shared to confirm/supplement by you where necessary.

To explore
the potential
of nature to
improve the
quality of life



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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, 6,800 employees (6,000 fte) and 12,900 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.

