Case study analysis Transition Pathways 2020

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Introduction

1 Introduction

Food system transitions are needed for food & nutrition security

Food systems around the world face challenges in providing enough, healthy and nutritious food for all. Food system transitions are needed for these food systems to achieve the necessary food & nutrition security within environmental boundaries. The 'Transition Pathways and Integral Findings' project (motif) from the KB programme Food and Water Security (KB-35) of Wageningen University & Research, hereafter called the 'Trans Path' project, aims to develop an analytical framework to study these food system transitions to guide future policy food policy making. The 'Trans Path' project runs from 2019 until 2022.

Transition is not synonym for change

Food system transitions relate to encompassing changes that affect the entire food system. Hence, changes that affect not only food production but also consumption and governance arrangements, as well as power and politics—as these dynamics may support or constrain transitions. Hence, a transition consists of a range of interlinked changes on multiple levels of the food system. A change for example in food production, then, can be a part of a transition, but is never a transition by itself.

Transition processes are non-linear and develop at a different pace at different levels in the food system. This also means that transitions encompass technical elements such as new machinery and non-technical elements such as changing norms and human behaviour. Another important aspect of transitions is that they involve/imply many parties (actors) at the same time. This all together makes transitions difficult to predict, let alone to predict them in detail. Controlling the process of a transition as a whole is impossible, even if someone would want to (Grin et al., 2010).

Some food system changes are based on optimising the existing practices, products and processes or reorganising them. In comparison, transitions are more radical. Hence, instead of optimising the sustainability practices on farms, a transition would mean changing the entire way of farming to become more sustainable, for example by a switch to re-generative farming. Transitions address root causes of experienced or anticipated challenges, instead of redressing them.

Some examples of historical transitions are the industrial revolution and the rise of capitalism. More recent examples of on-going transitions are the energy transition (in the Netherlands) or the modernisation of agriculture in many low- and middle-income countries, including mono-cropping and market integration.

In 2020 the Trans Path team worked on selected motif cases

In 2020, the Transition Pathways project worked closely with seven motifs on their case studies/research question within the KB programme Food and Water Security of Wageningen University & Research. On the one hand our team supported the motifs with transition thinking and certain aspects as stakeholder participation which are crucial for transitions. On the other hand, our team collected data from the motifs and observed the processes of transition thinking. This paper is an analysis of the gathered information of the motifs.

To bridge information gaps among the Trans Path project and the seven cases used as base for the project itself, a group of researchers that were collecting information to feed into the Trans Path project and were simultaneously involved in the seven cases was established. These were called 'linking pins'. This report builds on the report produced by Dengerink et al. (2019) within the same project context.

The goal of the analysis in this paper is threefold: (1) to see how the cases are developing and what we can already learn (2) examine if these cases are fitting our learning goals (3) understand if we are missing certain aspects for our learning.

The analysis is divided in two parts. In the first descriptive part we analyse what the motifs are actually doing. In the second part we examine more closely how the activities of the motifs relate to a transition and to different aspects of transition thinking. The outcome of this analysis feeds the collaboration between the Transition Pathway project and the motifs.

Seven different cases, seven different approaches

As will become clear in this analysis, transition thinking has a different meaning in all the seven research groups we worked with. The goals of the studies differ, their own role as researchers differs, their approach to food system analyses differs, and their way of thinking about transition and change differs. This makes it both challenging and interesting to compare the cases. It especially shows that there is no single standard approach of incorporating transition thinking in research projects. The analysis of these cases is a start to understanding the range on varieties in the approaches, what implicit and explicit choices there are and how they affect the process and the outcomes of the projects.

To shed light on the approaches we analysed the processes and plans within the research groups amongst themes that we found crucial to transition thinking in the literature and the experiences within the research groups.

Outline of the paper

Section 2 of this report presents the first descriptive analysis of the case studies. It provides information on the focus and the scope of the case studies, which stakeholders are part of the study, the sustainability challenges that the case studies are coping with, a map of the key food system elements that are part of the case study and lastly, which food system transition is envisaged in the study.

Section 3 is based on the analytical framework that was written by the Transition Pathways project in 2019 (Elzen et al., 2019). The relevant concepts will be explained in this chapter. An in-depth application of the analytical framework for the case studies is portrayed. It shows to what extent food systems and transition theories have played a role in the case study, identifies different visions on and contributions to food systems change, describes relevant niches, landscapes and regimes, interesting transitions dynamics and important drivers and barriers to food system change.

Finally, Section 4 presents reflections on the usefulness of the analytical framework for understanding food system transitions and outlines possible ways forward.

2

Case study descriptions

2 Case study descriptions

Focus & scope of cases

Within the KB programme Food and Water Security, there are seven motifs, besides the motif on transition pathways. Of each motif we tried to select one case or research question that aims to contribute to a transition, or at least a large-scale change.[1] In Table 1 we give an overview of the selected cases per motif. The icons in this overview will function throughout the analysis as a reference to the motif cases.

The differences between the cases are significant. There are differences in the topics they address, the level of demarcation of the case, project area and approach. In this overview the cases are introduced. The order of the cases is random. The titles of the motifs are not the official titles, but a reflection of the thematic topics.

Table 1 *An overview of selected cases per motif of the KB programme Food and Water Security.*

Biodiversity

No specific location (yet)

The project Food Systems and Biodiversity aims to develop an assessment framework which informs policy decision-making processes. This project is currently not yet linked to a specific geographical area. The framework is meant to support policy makers, industry management, NGO staff, farmers and other relevant stakeholders to:

- Assess transition pathways for more sustainable and resilient food systems that make use of and value the contribution of biodiversity for resilient food systems and food and nutrition security;
- Allow them to address and minimise the impact of food systems on biodiversity, or improve the positive effects of the food systems on biodiversity;
- Understand feedbacks and trade-offs between food systems and biodiversity. This assessment framework will be applied to some cases in 2021.

Nature-based solutions

Ghana, Bono East region

The Bono East region is Ghana's food basket. Climate change has made farming in this region more difficult and riskier because farmers are no longer able to predict the onset of the rainy season, and experience prolonged dry spells and erratic rainfall, making agriculture an unreliable and unprofitable investment. WUR collaborates with Ghanaian partners in the Bono-East region to work on nature-based solutions to overcome water shortages and to preserve food production as well as nature areas in the region. Moreover, the nature-based solutions should improve circularity. The smallholders in Bono East will benefit from the agro-forestry and rainwater harvesting for irrigation to overcome the impacts of climate change (Climate action; SDG 13), which will ensure their yields, revenues and income (No poverty; SDG 1), as well as their food consumption (Zero Hunger; SDG 2). Maintaining food production in Bono East will provide food to a growing population in urban centres (Zero Hunger; SDG 2). The case uses a participatory approach, so that the most urgent challenges and related solutions are addressed by local stakeholders.

[1] The challenges in relation to the difference between change and transition are discussed in multiple places within this analysis. In the fourth section of this document we provide an in-depth reflection on this difference and what it means for the work of the motif transition pathways.

Rural areas

Uganda, Arua

The case focuses on the food and nutrition security issue in Arua, a Ugandan region. Even though the region seems fertile, many inhabitants are food and nutrition insecure. Due to population growth, the issue of Food and Nutrition Security (FNS) will only increase, accelerated by the influx of refugees caused by conflicts across the border. The goal of the case study is to study different transition pathways to increase food security; specifically, a focus on local production, a focus on the market and a combination of the two. A large variety of analytical components are considered, including insecurity management of refugees, policy arrangements, nutrition data and environmental data. Together with a local knowledge partner, the motif is planning to start a locally organised multi-stakeholder partnership (MSP).

Cities

Bangladesh, Dhaka

The case study called 'Support for modelling, planning and improving Dhaka's Food System' aims at applying the food system approach to urban areas and drawing lessons from this application. The study identifies entry points for policies that build on rural-urban interdependencies and synergies to foster an enabling environment for smallholder farmers to participate more equitably in food chains while providing all residents within the metropolitan area with greater access to safe, healthy and nutritious food. FAO and WUR formed a consortium to work on this project, in which FAO is the local representative and WUR the knowledge institute, supporting FAO with advice. The project explicitly takes a food systems approach and it is inter-disciplinary, involving several aspects of the food system such as consumer behaviour, availability of healthy food, as well as waste management and governance aspects. The project takes place at a city-region level and is policy oriented. It focuses on policies (the city council) and supportive technologies, and less on production practices (farmers) and citizens.

Aquatics

Indonesia

The motif studies the possibilities of seaweed cultivation in Indonesia (both offshore and in pond systems). Additionally, there is an aim of extrapolating relevant knowledge for a global yield gap analysis (to better understand the potential for food production). The project is specifically linked to the UN sustainable development goal of zero hunger, resulting in the following research question:
What seaweed cultivation could contribute to global food security?

Deltas

Bangladesh

The case focuses on three districts in south-west Bangladesh. These districts suffer from increased salination, due to a combination of sea level rise and a decreasing influx of fresh water caused by a damming of a river in neighbouring India. Farming traditionally builds on growing rice, but this is becoming increasingly difficult. Some farmers are therefore exploring new crops (including shrimp, dairy, mango) that are also associated with new business models and new value chains. There are also various macro-level developments like increasing urbanisation and the Bangladesh national Delta plan that affects many aspects of local development. To provide local farmers with a longer-term viable perspective requires an encompassing transition. The motif studies possibilities that could provide new options for farmers to make them resilient to the salination effects. This entails exploring new crops, while addressing farming methods and farmers' needs, as well as markets and value chains.

Multiple scales

No specific location

The case explores how modelling and simulations can inform concrete multi-stakeholder processes, and the other way around.
The work of this motif is divided in two workstreams (MSX): multiple scales (MS) and extreme events (XE). The first workstream focuses on developing models, which connect different scales in relation to food systems research. The second focuses on modelling the impact of extreme events on food system performance while also paying attention to the concept of resilience in food systems research. Although both workstreams clearly connect to transition/sustainability perspectives, they are not organised directly around cases in particular countries, and are not involved in interventions related to food system transition cases in the way that some other KB motifs are. The MS workstream, though, does apply its work in particular countries. Due to the scope of this project team, the case will not be included in many of the analytical parts in this paper. General learnings, however, coming from this research group are adopted.

The cases involve at least four types of stakeholders

Table 2 shows which stakeholders are most involved in the case objectives. This is different than stakeholder engagement in the case, which is discussed later in Section 3. Involving a variety of stakeholders in the objective is important, as transitions involve/imply many parties at the same time (Elzen et al., 2019). The stakeholders were identified among six major groups: rural community, companies, consumers, government, NGOs and knowledge institutes (other than WUR). All cases describe at least four types of stakeholders. We see that in the category of consumers there are multiple regional levels, as it ranged from the local level to the national and global level depending on the scope of reach of the project. For governmental bodies, especially local (urban/district), regional and national levels are addressed. International and overseas governments are however not mentioned. Universities are mostly included as knowledge institutes.

Table 2 *Case objectives and their most involved stakeholders.*

	Rural community	Companies2	Consumers	Government	NGOs	Knowledge institutes3
	Host community Refugee community	Possible companies for implementing market scenario.	Host community Refugee community	Regional government National government	Food & aid organisations	Muni University (partner)
	Seaweed farmers	Aquaculture companies	Indonesian consumers Consumers globally	Local government National government	NA	Universities in Indonesia
	Individual farmers	Food companies (retailers) Banks	NA	Local government National governments	NGOs that influence biodiversity policy (lobby & policy)	NA
	Farmers	NA	NA	Forestry Commission; responsible for landscape restauration Regional and district government (planning offices)	Solidaridad World bank Tropenbos	University of Energy and Natural Resources, Sunyani, Ghana
	Smallholder farmers	Various companies in the food chain	Local consumers Wider national consumers for different produce	National: delta plan Regional: urbanisation	Solidaridad	National university
	NA	Water companies Local value chain actors in onion, beef, mango value chains Wet market actors	Citizens in Dhaka	City corporations	NA	FAO

[2] Companies included financial actors, such as banks.
[3] Knowledge institutes other than Wageningen University & Research.

Sustainability challenges are interlinked and in all macro-areas

In our research project we only focus on transitions towards sustainable agro-food systems. In the analytical framework (Elzen et al., 2019) it is explained how this always is a combination of issues emerging on different areas in the food system. Table 3 presents the various sustainability challenges per macro-area (economic, environmental and social) for the different cases. It is interesting to note that challenges in each case were found for every area.

This shows that simple interventions will not be enough to address the issues within the cases. Hence, food system transitions are needed to tackle challenges that are this complicated. Plus, it shows that the issues within the cases are interlinked. This will be further discussed in the upcoming page in which we map the cases in a food system framework.

Table 3 *The various sustainability challenges per macro-area (economic, environmental and social) for the different cases.*

	Economic	Environmental	Social
	Lack of a fully functioning market system Availability of financial resources to increase the market and/or production	Inefficient and unsustainable land use Efficient and sustainable farming practices	Insecurity and its effect on choices of both host and refugee community Food security amongst all social, due to population growth.
	Socio-economic position of small-scale farmers Poor origin quality Many losses in the chain Unfair pricing	Environmental risks are not explicitly identified. The residual flows that rot on land may have a climate impact, or the discharges into the sea from settlements along the coast have a eutrophic effect on the marine environment.	Working conditions Socio-economic position of small-scale farmers Risk of microbiological contamination Risks related to CSR: image, legal requirements
	Need for more nature inclusive economy where biodiversity is included as a boundary condition for the economy.	Absence of a new bio food system in which biodiversity is included.	Challenge for the occurrence of a cultural shift among key players in the agri-food system towards more attention to the effects of their practices on nature.
	Difficulty for farmers to produce food (secure income) due to climate change	Difficulty in predicting the rainy season, thus making farming difficult and risky Depletion of forest for charcoal production supplied to urban centres	Unsustainable and illegal activities inhibit a conflict of interest Pressure on the resources in Bono East caused by migrants.
	Creation of viable business models for small farmers for new types of produce: shrimp, dairy, mango	Salination of the delta Occasional flooding	Various conflicts of interest Urbanisation – farmer conflicts Dealing with flooding consequences
	Extreme and multi-facetted poverty; limited employment Rural-urban migration; unplanned expansion of the city. Largely informal, unregulated food market having consequences for the food safety.	Degraded environment, bad housing and sanitation. Threats of floods, droughts, landslides Huge waste disposal problems in Dhaka	Inequality prevails persistently (sex, religion, ethnicity, caste) High levels of chronic and acute under-nutrition as well as poor food safety, increasing obesity (especially among women) Gender issues (combining work outside the home with care giving)

The cases include all parts of the food system

The conceptual model of the food system as developed by van Berkum et al., 2018 played a central role in the analytical framework that has been developed in the KB 'Transition Pathways and Integral Findings' project. This conceptual model was based on the core elements of food systems conceptualisations from recent key food systems publications (Ericksen, 2008; Ingram, 2011; Scott, 2016; UNEP, 2016; HLPE, 2016).

In line with these key publications, the model identified three key elements of the food system: (1) the drivers of the food system (socio-economic and environmental); (2) the food system activities (the value chain and its surroundings) and (3) the outcomes of the food system (including food security, socio-economic and environmental outcomes).

In line with the identified sustainability challenges, we observe that the cases address a large variety of the food system, as indicated by the icons in the food system model, figure 1. There is a concentration regarding food system activities at the side of the drivers and food security at the side of the outcomes. All cases address an environmental driver, but only four out of the six cases in this overview address socio-economic driver.

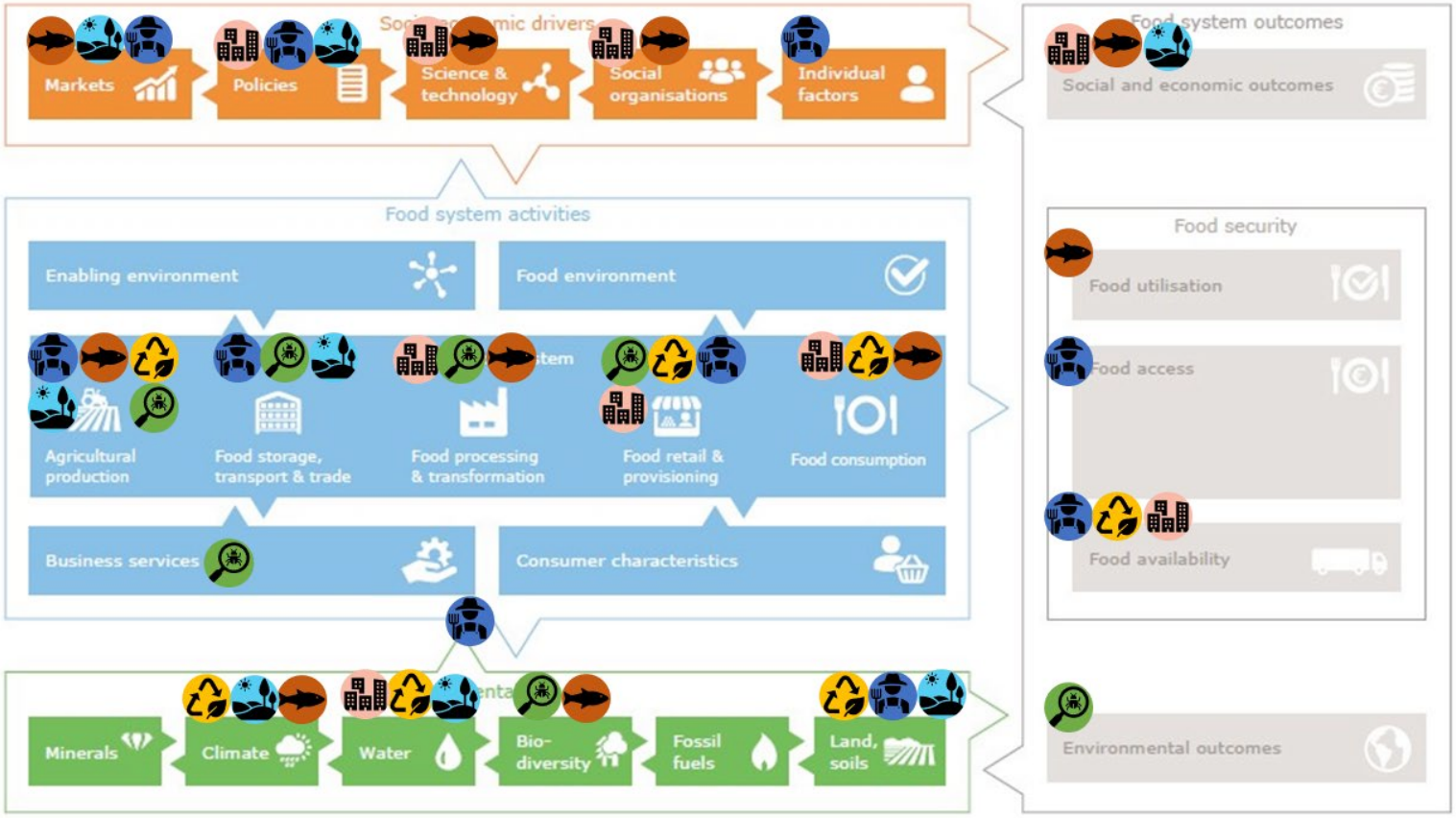


Figure 1 *The contribution of each case to the food system model of van Berkum et al., 2018 indicated by the case icons.*

The cases aim for change, but not always transitions

Transitions relate to encompassing and structural forms of change of food systems. For projects it is therefore important to understand which transition is envisioned (transition perspective); and what roads(s) will lead to this transition (transition pathways). In the overview, Table 4, we describe how the transition perspective is formulated in the cases we analyse, to what degree this is a real structural change, what pathways to achieve the transition are part of the project and how concrete both the envisioned transition and the pathways are.

We noticed significant differences between the cases in terms of transition perspective and envisioned pathways. Some cases have a very clear idea of what the transition should entail, how the imagined future will look like and what steps are needed to get there. In the case of rural areas for example, the group has a clear transition in mind, and are developing concrete scenarios for the transition pathways. In other research groups, there is still analysis being done to decide if, how and which transition is needed.

For traditional transition thinking, a clear perspective for a structural change and related transition pathways is key. However, we see that in reality it is very difficult for projects to adopt this approach. Often, researchers within the cases work on improvements instead of structural changes for example. In Section 4 we discuss what the implications of this might be for our work in the coming years.

Table 4 *Description of how the transition perspective is formulated in the cases, to what degree this is a real structural change, what pathways to achieve the transition are part of the project and how concrete both the envisioned transition and the pathways are.*

	Transition perspective	Level of transition in the cases
	Increase of local food availability for healthy and nutritious diets. There should be enough food in the future – even when the population keeps growing. Based on a nutrition gap analysis, population analysis, environmental analysis and market analysis the needs for the transition are made concrete.	Structural changes in use of land, farming practices and doing business
	Improvement of the production chain might require structural reorientation, but this is not clear yet.	- There is no transition identified yet
	The transition at stake is the transition to a biodiverse food system. Many aspects of biodiversity (genetic, species, functional) are important components in the transition to more sustainable and resilient food systems. Biodiversity is the basis (natural capital) for food production systems and will play an important role in improving the resilience of food production systems in multiple ways.	The project, in form of a knowledge institute stakeholder, can play a role in a structural change, which is not explicitly described.
	Improve sustainable land use and increase food production as well. Food production in the region is threatened by both climate change/extreme weather as well as illegal activities in the region. Nature-based solutions cope with these challenges, but additional interventions are required to deal with impacts beyond the borders of the region due to changing exports of cash crops and supplies of starches to urban centres.	The nature-based solutions imply a structural change in terms of making farmers more climate resilient, and secure food production in the region. However, which structural change is not explicit.
	Provide new options for farmers for crops that are resilient against salination effects, addressing farming methods and farmers' needs, as well as markets and value chains.	Encompassing transition that will affect local communities, as well as various stakeholders in different value chains
	The vision in the Theory of Change of the project states that 'in 2041 Greater Dhaka is a city where everyone can consume safe, affordable, and nutritious food and lead a health life'.	The case approaches transition in terms of value chain interventions, waste management technologies introduced and improved governance mechanisms.

	Transition pathways	Concreteness transition perspective & pathways
	Via increase in local food production. From subsistence farming to commercial farming Via increase in market food availability The two pathways combined in various ways form different scenarios for this team. Together with the local partner(s), the pathway will be decided.	Concrete
	Synergistical combinations of biodiversity restauration and seaweed aquaculture (e.g. mangrove forests); or polycultures (like shrimps and seaweed) New use cases for seaweed: for direct human consumption, for pharmaceutical purposes, or as a bulk ingredient for animal feed (fish, pork, chicken etc).	Not yet defined
	The process of transition, which is implied by this project, is a process in which actors in key positions in the system are increasingly considering the aspect of biodiversity, assisted by tools that show the impact of their activities on biodiversity. This will be a development partly enforced by (inter)national legislation and agreements, but is also part of a general shift of culture among key players. Tooling will support both bio accountability and a bio-oriented culture.	Not concrete. If decision makers use the tool that are developed in this case study, they can avoid actions which lead to further deterioration of biodiversity. However, how the ideal world after the transition looks like and how to exactly get there are both still not concrete.
	Rainwater harvesting for irrigation seems a promising route to take, but not in all cases. Ecosystem restoration will be explored as well.	Not very concrete yet. First quickscan is adjusted to include nature-based solutions. Then, quickscan can produce feasibility maps so that transition pathways can be developed in the future collaboration with local stakeholders.
	Transition will require tuning of activities of a range of stakeholders. Will require a complex process with struggles based on differences of interest and considerable top-down political pressure (e.g. related to the national delta plan)	Both concrete and not concrete. Looking at the farmer, it is rather concrete by focusing on three types of alternative crops. Regarding wider required changes it is less clear.
	5 pillars are defined in the ToC, namely; - Safe food for all - Strengthening inclusive urban food system governance; - Sustainable & resilient value chains; - Reducing food waste; - FNS for resource-poor urban population.	On the one hand the project is concrete in the transition perspective and what could attribute. On the other hand, still much is left open and is rather vague.

3

Food system transitions

3 Food system transitions

Transition theories only explicitly used in a few cases

As indicated in the previous section, both conceptual thinking around food systems and transition theory are central to the analytical framework (Elzen et al., 2019), as together they form a systemic approach to structural change.

We see that in three cases both food system and transition theories are used (Table 5). This (partly) influenced the research. In general, we see that it makes the studies more multidisciplinary in their approach and more impact driven. On the other hand, other cases do not use any of the conceptual frameworks. For some cases this was a motivated choice as for the biodiversity research group, as they see that food system theories mainly consider nature as external driver which is considered an incomplete image of food systems. For some other research groups it was too early in their process to incorporate the transition theory or the benefits are not (yet) seen.

Table 5 *Cases and their use of food system, transition theory and influence in research.*

	Use food systems	Use transition theory	Influence in research
	Yes. Food systems approach is used explicitly Different aspects of the system are studied in a multidisciplinary way.	Yes. Transition pathways are used, but without using explicit theory.	Yes. The use of scenario was studied in order to reach a real impact. Plus, the food systems theory makes the study broad, incorporating a variety of disciplines.
	Partly. Food system approach is used within one subproject (review of knowledge gaps in different parts of the seaweed food system), but not as a guiding framework for the whole project.	NA	NA
	No. Involved stakeholders consider value chain perspectives, but not the food system approach. As many food system models consider nature as external driver which is considered an incomplete image of food systems.	No.	No.
	Yes. The food system approach is being used as the Ghanaian partners consider impacts of changes in the region being also beyond the boundaries of the region (export or supply to urban areas).	Yes. However, the project is currently only at the beginning of the conceptual transition process.	Yes. The food system approach is recently introduced to partners in the Bono East region. Currently, field work is conducted to look for existing examples, although there will not be many. For transition thinking, this project is at an early phase.
	Partly. Used a bit loosely by identifying the various aspects of the food systems (for different produce) relevant to the case.	Partly. Used to identify the stakeholders in the various relevant food chains, the roles they play, and the opportunities and barriers they may create for transitions.	Not applied yet but intended to be used in exploration of transition pathways.
	Yes. The food system approach is used explicitly in the Dhaka Project.	Yes. Not explicitly, but during the inception phase of the project a ToC workshop was done where the ambition was set, the change trajectory was identified, as well as pathways to achieve this.	Yes and no. The scope of the project was much broader by choosing the FSA. But the actual activities are sub-divided and managed by single units and still quite mono-disciplinary.

Cases address different scopes and different depths of change

The next analysis is to get a better grip on the scope of change that is envisioned by the cases, plus the depth of the changes. This is based on the model of Wigboldus et al. (2020). Regarding the scope of the changes we make a distinction between four categories:

- Products & practices, e.g. consumed goods and farming practices
- Capabilities & relationships, e.g. knowledge of policy makers and exchanging knowledge between stakeholders
- System dynamics & configurations, e.g. food market systems
- Cross-scale interactions, e.g. connections between geographical scales as international policy and local practices.

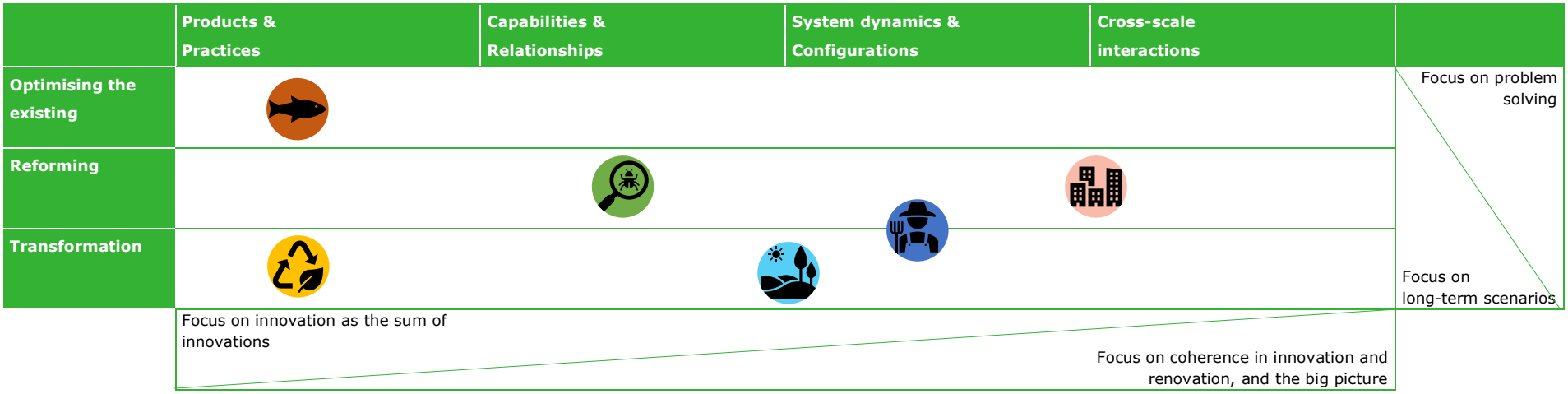
On the depth of change we differentiate between three levels. The first one is the least deep, which is optimising the existing situation. This type of change is looking for ways to improve the situation, without challenging the current 'rules of the game'. The second depth of change refers to reforming the current situation in order to improve. This means that the rules of the game are challenged, but what is considered improvement or 'the right thing' remains the same. The third depth of change is transformation. This type of change does not only challenge the rules of the game, but also what is considered as the right thing. This type of change is accompanied by introducing alternative norms and values.

We recognised that for many cases it was difficult to place them in this framework (Table 6). This is because the projects are often not fully defined yet, such as in the case of aquatics. In this case there is currently not yet a clear vision within the motif whether a transition is desired and, if so, what kind of transition. In the current stage, we would argue that the case is working on optimising existing products and practices related to seaweed cultivation.

Another example is the case on food security in the metropolitan area Dhaka. This project is quite broad and ambitious. It aims to integrate different levels of change, namely technical (e.g. waste management technologies), organisational-institutional (new governance mechanisms). The project also involves capacity enhancing strategies. The project is not only optimising, but also aiming to change existing practices and ways of organising city planning. However, in practice (reality) the project faces challenges to implement the more complex levels of change.

Interesting to see is that none of the projects mainly focuses on change within cross-scale interactions. There is however an even divide over the different depths of change.

Table 6 *Visions for and contributions to food systems change (Wigboldus et al, 2020). Cases are indicated by icons.*



While the landscapes are often the same, the regimes and niches differ

For the following analysis, three concepts of the transition theory are used: regime, niches and landscape. The regime represents the main features of the system itself organised among technologies (including infrastructures), institutions and actors. Niches describe alternatives to (parts of) the present system that are still under development or used only on a small scale and are identified among new technologies, new and changing institutions and new and changing roles of actors. Finally, the landscape is the wider context of a system that can put pressure on the system to change. This can be broad political or societal pressure on issues like climate change, pollution, equity, public health, national economic policy objectives, etc.

Table 7 show an overview of the niches, landscapes and regimes relevant to the case studies.

It shows how some regimes were covering a whole food system and some only certain parts of a food system. For each case other aspects were important to the landscape driving the system. However, the most common ones are population growth and the risks posed by climate change. Finally, the type of niches varied. Although most are farm/fishery-level innovations, others are related to waste management, new market mechanisms and policies with an eye for biodiversity. However, we currently do not see any niches that focus on alternative financial models for example.

Table 7 *An overview of the niches, landscapes and regimes relevant to the case studies.*

	Regime	Niches	Landscape
	- Subsistence farming - Insufficient land use - Minimal market	- Improved land use - New farming practices - Introducing more sustainable, nutritious crops - New market mechanisms	- Influx of migrants, including insecurity for the future it creates - Population growth in general - Climate change - Increasing land pressure
	- Seaweed as additive in food industry - Large production in Indonesia - Cultivation in Philippines - Farmers are not engaged in other parts of the value chain	- Combined fish and seaweed cultivation - Development of seaweed products (e.g. burgers, pasta)	- Increased demand for food worldwide - On a local scale: large population growth - Soy under pressure as feed source for livestock - Climate change
	- Often policy decisions in which biodiversity is not sufficiently considered - Large companies and organisations which play a key role in the food system - Bio accountancy, worldwide monitoring systems, legislation on biodiversity - The doughnut economy, patterns of food consumption	- Policies that take biodiversity into account. e.g. in the Netherlands the so-called 'experimenteergebieden' policy, which is aimed at the facilitation of experiments with biodiverse circular agriculture - The tool can be perceived as a niche activity, to foster niche policies	- Biodiversity is declining globally at an unprecedented rate in human history (IPBES 2019) with current food systems among the dominant causes of deforestation and declining biodiversity

	- People increase their dependence on natural resources, through:
	  ○ Intensifying agricultural and animal husbandry activities
	  ○ Increasing use of naturally occurring trees for charcoal production in forest reserves, and encroachment into forest reserves
		- Agro-forestry
		- Rainwater harvesting for irrigation as mitigation alternative for water shortage
		- Climate-smart practices to restore degraded landscapes
			- Climate change
			- Increased pressure on land is increasingly leading to conflict between stakeholders, especially farmers, pastoralists and forest dependent communities
			- Productive lands are being destroyed by bush fires, illegal mining and logging activities

	Regime	Niches	Landscape
	- The existing farming system, which suffers from salination and flooding - Rice as the traditional crop (although declining)	- The 'alternative' farming systems related to shrimp, dairy and mango – to be more resilient against salination and flooding risks	- National policies, e.g. the national delta plan and wider development policies - Urbanisation in the region could have a big impact by increasing local demand for food, by competing for soil, by bringing in new values and regulation, and by being accompanied by new infrastructures for transportation of crops and food. This could partly improve opportunities for farmer, partly worsen them - Climate change, including flooding risks
	- High urban population growth - Increasing demand for differentiated, healthy and safe food. Especially shortage amongst the urban poor - Food and nutrition securities are concerns in urban areas. - In the 2015 Dhaka Capital Development Plan, food and nutrition security was hardly addressed or differentiated to the urban environment - Lack of evidence of any coordinated strategy or policy to address the challenges associated with assuring urban residents of a reliable and sufficient supply of safe, healthy and nutritious food - High rate if unplan special urban expansion (illegal settlements) - Competing land claims	- New waste management and food preserving technologies - Capacity building of urban food planning of city corporations - Development of urban food agenda - Integrate food into urban planning - Consumer awareness on FNS - Development of markets towards more safe and nutritious food - Street food vendors formalisation, building on Indonesia strategy - Urban farming (policy) - Insect rearing on market food waste (pilot) - Bio-digesting on market food waste (pilot) - Capacity building – Market linkage training - Supply chain interventions transforming value chains (including food preservation)	- Urbanisation - Growing overpopulation - Climate change, including flood risks - Arable land used for urban expansion

Stakeholder mapping is not done within the cases

Transitions, and changes in general, do not happen by themselves. Actions by stakeholders, often on multiple levels, are a necessity. Therefore, knowing who the stakeholders are in relation to the envisioned change, is a key element of transition thinking. This forms the basis of partnerships, but can also show which networks are active and how power is distributed. Not only does a stakeholder mapping help to make strategic choices for collaboration, it also gives input for analysing how the food system is functioning. The following overview, Table 8, presents indicators related to stakeholder mappings: mapping of possible partners, mapping all stakeholders, mapping how stakeholders are related to each other in networks, mapping the stakes of all stakeholders and which forms of power they use in relation to the goal of the project.

We see that all cases have at least partly mapped possible partners. Also, most research groups have a full stakeholder mapping done or planned. Only in the case of aquatics this has not yet been planned, as the focus within the project is not yet fully defined.

It is interesting to see that all projects started with the plan for the project itself by WUR and in some cases one or a few partners – before there is an overview of the stakeholders.

Another interesting observation is that none of the cases have done a network- stakes- or power mapping yet. Also, most have not planned such a mapping yet. To understand what such mappings can bring to projects that are related to transitions in food systems, adding such cases to the portfolio can be helpful for our analysis. This is further discussed in Section 4.

Table 8 *Indicators related to stakeholder mappings.*

	Possible partners	Full stakeholder mapping	Network mapping	Stakes mapping	Power mapping
	Partly. Main partner known; others are still in process.	In the making, together with partner in Uganda.	Currently being discussed	Currently being discussed	Currently being discussed
	In the planning stage	NA	NA	NA	NA
	Yes	Ideas on important stakeholders but not a full mapping	NA	NA	NA
	Partly. Planning to involve more stakeholders in 2021. Ghanaian partner organisations take the lead.	Partly. Partner organisation in Ghana takes the lead.	NA	NA	NA
	Partly. Solidaridad; local networks still to develop.	Still needs to be carried out	NA	NA	NA
	Yes	Yes (by FAO)	NA	NA	NA

Stakeholder participation seen as key in all cases, but approached differently

Stakeholder participation is key to transitions. It does not only empower stakeholders and create local ownership, it also makes sure that the project reflects the needs, priorities, norms and values of stakeholders. All crucial elements for a transition to become implemented and successful.

In all cases we also see some form of stakeholder engagement. However, the way stakeholders are involved in projects differ. To understand these differences, we placed the cases on a participation ladder (figure 2). This ladder is based on the ladder of citizen participation by Arnstein (1969).

The ladder starts with the step-in which participation is based on stakeholders being informed by the researchers. The step on the right top, shows the level in which stakeholders take the lead in the project (instead of researchers at WUR).

This ladder also links to the two dimensions we describe in our toolbox. The first dimension being traditional science versus open science; the second dimension of the position towards stakeholders, doing the project with stakeholders versus doing the project for stakeholders. Traditional science in combination with research for stakeholders is on the bottom left step of this ladder, while open science and projects with stakeholders is on the top right step of the ladder.

In the cases we see a wide variety of ways that stakeholders are engaged in the projects. In the case of rural areas, the research team is aiming to start a multi-stakeholder partnership, with a local university to take a lead position. However, within the project itself it will have decision power especially concerning how to deal with the outcomes of the different scenarios.

In the case of cities, the way stakeholders are engaged differs within the project itself. On the one hand, in the project, a major stakeholder (city corporations) has decision-making power in the project. On the other hand, some other important stakeholders (such as citizens, NGOs, private sector) are less involved or not at all.

In both the projects of deltas and nature-based solutions, stakeholders are co-producers. For deltas, the ambition in the project is to let stakeholders co-produce new business models for farmers and value chains. In the project of nature-based solutions stakeholders co-produce the interventions considered. Moreover, their role of co-production will continue when developing the transition pathways.

In the other projects, stakeholders are only informed with the results of the study or being consulted for the analysis. In the case of biodiversity for example, stakeholders are considered the users of the future tool. These are consulted to define user requirements. In this case, the research approach is traditional, and it is based on developing a tool which others can apply.

As all the projects are still in a starting phase when it comes to stakeholder participation, our transition pathways team is in a good position to see how the projects evolve over the years and how different forms of engagement may yield different results. However, for the portfolio of cases, it might be educational to include cases that are already further in the participation process.

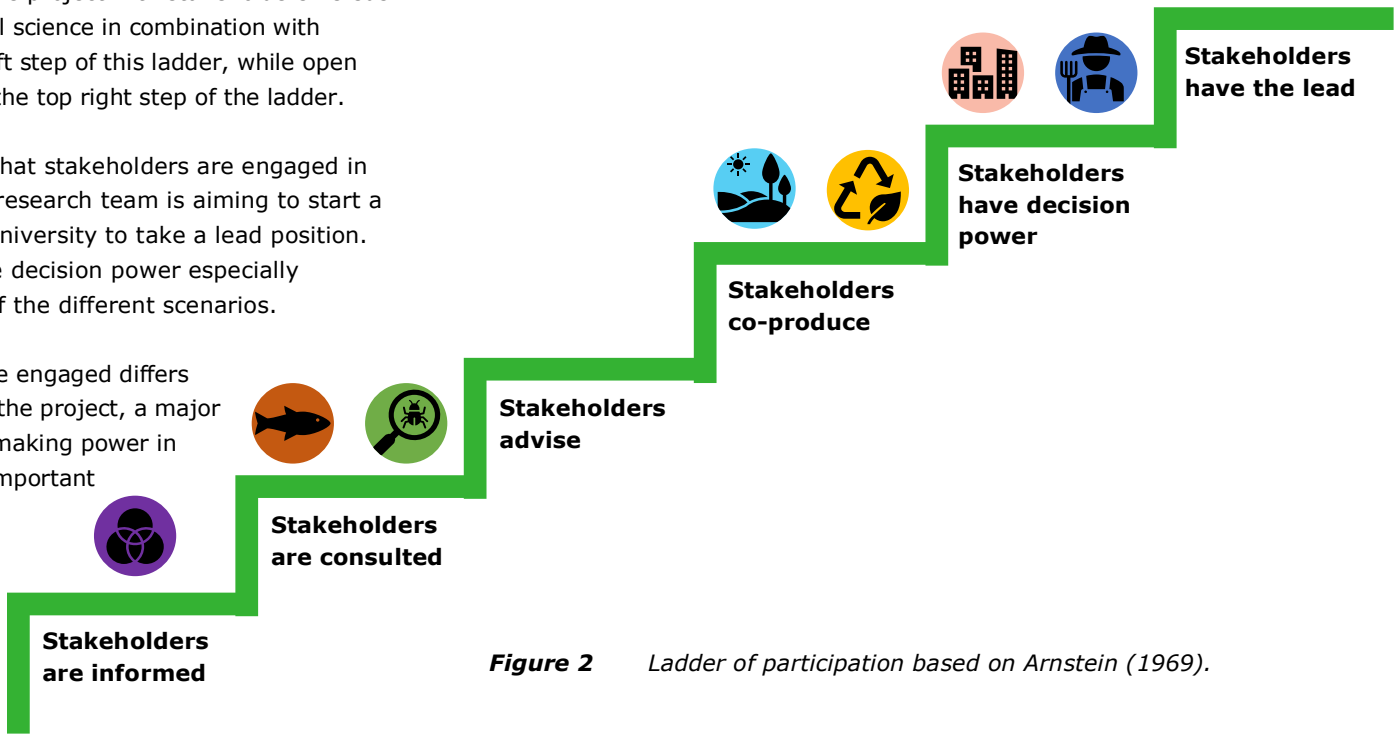


Figure 2 *Ladder of participation based on Arnstein (1969).*

Drivers and barriers, varying per case

The analysis of the cases is concluded with a SWOT analysis with internal drivers (strengths), external drivers (opportunities), internal barriers (weaknesses) and external barriers (threats).

As shown by the overview, Table 9, strengths ranged from issues related to the project itself (e.g. multidisciplinary approach, availability of funding, commitments and engagement of stakeholders) to issues related to the context in which the project is being conducted (local resilience). Weaknesses also included different problems ranging from need of investments, low and high involvement of other actors and conflicting interests and focuses. Opportunities mainly showed impact on a larger scale (national and world level), while threats presented barriers to food system change in terms of smooth transition and ease of transitions.

Table 9 *Analysis of strengths, weaknesses, opportunities and threats (SWOT).*

	Strengths	Weakness	Opportunities	Threats
	Stakeholder engagement by MSP Multidisciplinary approach Various scenarios to optimise impact	Large scale change requires much local cooperation No good overview of politics and power dimensions, while it is considered a delicate situation.	When MSP is being successfully set up, it can create effective partnership engagement.	Implementation of the scenarios being too ambitious for the project / MSP. Covid-19 can slow down or hinder local collaboration
	Multidisciplinary approach Clear view on goal of contributing to global zero hunger	Link between case in Indonesia and assessing global potential is not clearly articulated Weak integration of different subprojects	The diverse group of researchers could be able to thoroughly study potential transition pathways when combining scientific knowledge with societal goals	Covid-19 hinders field work, many researchers did not yet have the opportunity to perform field visits and understand the local situation
	An assessment tool is concrete and can be very communicative	Too much emphases on figures, less on practices and values.	If large key players (retailers, banks) use this tool it can be a real game changer.	Fear of the key player to use this assessment tool, because it can also show their negative impacts on biodiversity.
	The project contributes to the decision to implement nature-based solutions, not the implementation itself.	Interventions require investments, which are infeasible for farmers or communities Interventions might be applied for cash crop production only, so that a small share of the population will benefit, and there is no guarantee that food security will improve	Preserve/improve agricultural productivity. Improve food security with a balanced use of resources (freshwater, soils) Secured food production which is more climate resilient Reduced dependency on freshwater resources	Unsustainable, illegal activities (e.g. mining, logging, charcoal production) Focus on cash crops production which is promoted by governmental policy
	Resilient production in a risky environment	New networks needed to develop new value chains	National change policies (e.g. delta plan). But this may also create new barriers.	Urbanisation competing with agriculture. But this may also help create new markets.
	Enough funding. High commitment from city corporations to change the current situation.	Low involvement of other actors (NGO, companies, citizens). Tendency to prioritise short term urgent actions above longer term strategic actions, thereby risking ending up without a transition.	Availability and willingness of a wide array of experts (form WUR and FAO) to contribute; if facilitated well it could be an integrated effort	Covid-19 and other shocks making it difficult to work on longer term structural changes.

4

Reflections

4 Reflections

All cases took a different approach, all are aiming for sustainable change

Within the KB programme Food and Water Security, we analysed cases of the seven motifs (besides the motif of transition pathways). Of each motif one case or research question was selected that aims to contribute to transition, or at least to a large-scale change.

The differences between the cases are significant. These include differences in topics they address, the level of demarcation of the case and project area and their approach for analysing and contributing to a more sustainable world. One research group explores how modelling and simulations can inform concrete multi-stakeholder processes; another focuses on forming a multi-stakeholder partnership and working together towards a scenario for food security in the region; and a third is developing a decision support tool to promote policies in favour of biodiversity.

Even though all cases focus on low- and middle-income countries, they are spread over the world. Additionally, the geographical areas of the cases are diverse, including amongst others remote rural areas, deltas, coastal areas and metropolitan areas.

What all cases have in common is that they are all striving to have impact on a sustainable future, with a focus on food and water security, coping with challenges as land pressure, climate change and population growth.

The goal of this analysis is (1) to see how the cases are developing and what we can already learn (2) examine if these cases are fitting our learning goals (3) understand if we are missing certain aspects for our learning.

Some transition concepts are integrated in the projects, others are missing

Food system thinking, stakeholder engagement and in some cases even transition theories are integrated to some degree in the cases we analysed. Other concepts such as stakeholder mapping are currently missing in the cases. The transition pathway team will therefore work with the cases to make the research team aware of the integrated and missing concepts. This will enhance the capacity of these teams to cope with the transition thinking in their cases.

For the coming years, it will be interesting to see how the adopted concepts will be able to help the research teams. Moreover, concepts that currently receive less attention will be brought more to the attention to be integrated and analysed what they could possibly bring in terms of reaching the envisioned change.

A question for next year: does a case need to cover a 'traditional' transition?

One of the most striking observations of this analysis is that almost none of the cases followed a traditional way of transition thinking. The traditional way of transition thinking starts with visioning a concrete desired transition. The next step is to formulate one or multiple transition pathways on how to obtain this transition; by back casting these pathways, little steps can be created, steps that together form the path.

However, some of the cases are still working on their visioning, not being sure yet how the ideal future would look like. Other cases did not formulate a concrete transition but are working on a progress instead of full structural change. One of the motifs is working on the development of a decision support tool that helps others to decide what policies could bring along a change or transition in their situation with a focus on biodiversity.

Within the team, these diverse approaches towards change and transition fuelled quite some discussion. Questions for discussion are: does it mean that some of the cases we are currently working on are not suitable for an analysis in relation to transition pathways? Or, does it mean that our understanding of working towards a transition with projects within WUR needs to be more flexible, so that it can match with the current reality that we encounter in the cases? Could for example working on progress still be part of a larger transition process; do multiple small wins together make structural change?

This is a learning curve and discussion within the team that is far from over, and we expect to find more answers and questions in this regard over the year of 2021.

Possibly expanding our portfolio next year

Another point of exploration for the coming year is if our analysis could benefit form more cases – and if so, which ones. Based on this analysis, we see that our current portfolio contains a few gaps. Hence, including cases that fill these knowledge gaps can be beneficial.

The first type of cases that we miss in our analysis are cases that are further in the process of transition. All the research groups started in 2019 with defining their cases and their first analysis. This means that our team, starting in 2019 or 2020 with their involvement, has a good position for observing the process of transition thinking in the projects. This helps to answer questions such as: When do you start with transition thinking in your projects? And which uncertainties can you permit yourself as research team with envisioning a transition and defining pathways? However, it would be interesting to complement the portfolio of cases with cases that are further in their development.

A second type of cases that can complement our study are projects that are working on cross-scale interactions, as discussed in Analysis of the food systems change in Section 3. It would be interesting for the coming year, to see if it is possible to add such a case to our portfolio. A case on the intersection of transforming especially be interesting.

A last type of cases, based on the current analysis, that could benefit our analysis are projects with an elaborate network- stakes- or power mapping. This would help to understand what such mappings can bring to projects that are related to transitions in food systems, it would be educational to include a case that includes this analysis in our portfolio.

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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, 6,500 employees (5,500 fte) and 12,500 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.