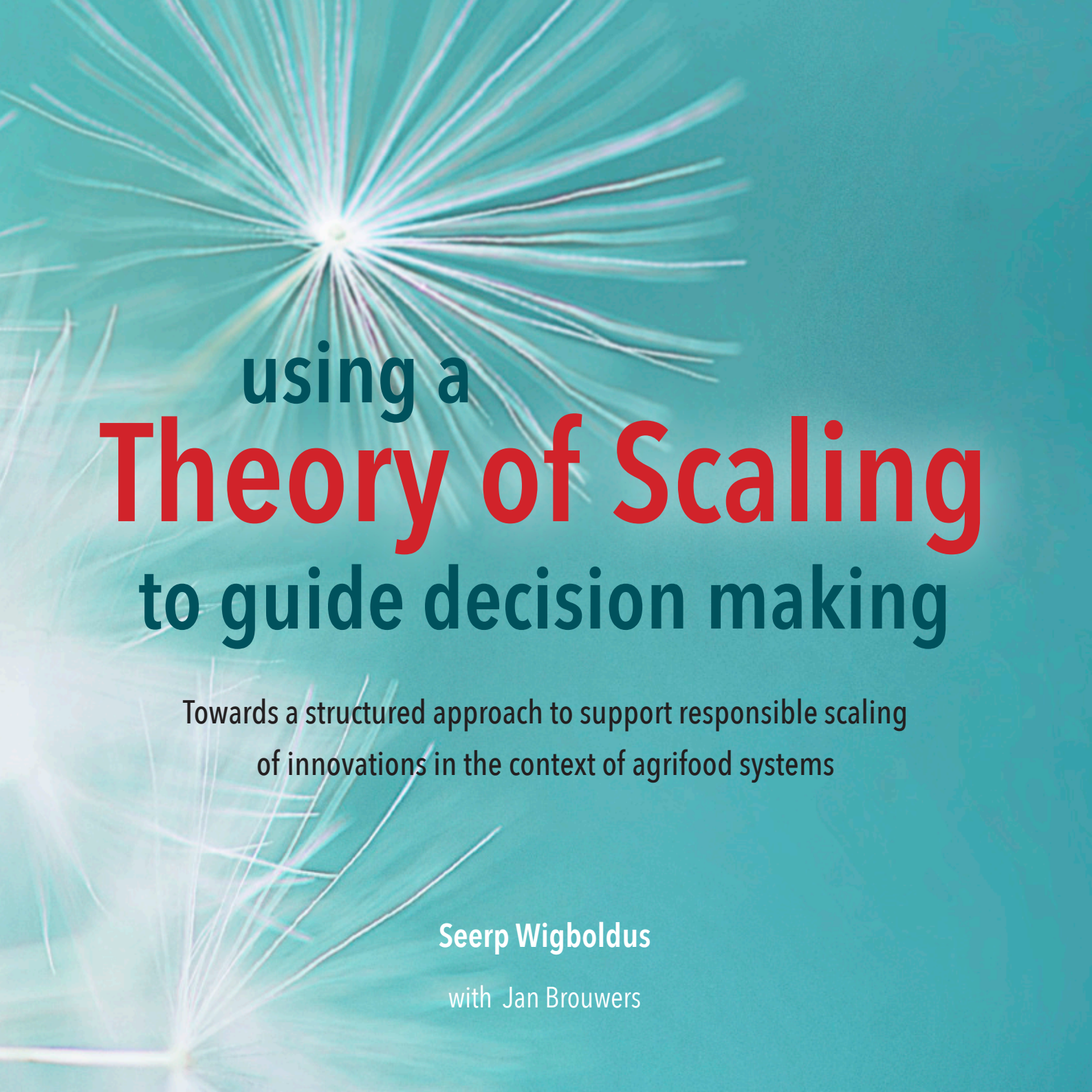

using a
Theory of Scaling
to guide decision making
Towards a structured approach to support responsible scaling
of innovations in the context of agrifood systems
Seerp Wigboldus
with Jan Brouwers

Using a Theory of Scaling to guide decision making

Towards a structured approach to support responsible scaling of innovations in the context of agrifood systems

Seerp Wigboldus

with Jan Brouwers

Wigboldus S, with Brouwers J (2016). *Using a Theory of Scaling to guide decision making. Towards a structured approach to support responsible scaling of innovations in the context of agrifood systems.* Wageningen University and Research, Wageningen.

Using a Theory of Scaling to guide decision making can be downloaded at
www.theoryofchange.nl/resource/using-theory-scaling-guide-decision-making

December 2016

Acknowledgement
The production of this booklet was made possible through the support of the CGIAR Research Program on Integrated Systems for the Humid Tropics.
https://humidtropics.cgiar.org

Production
Wageningen Centre for Development Innovation (CDI), Knowledge, Technology and Innovation Group (KTI), and Philosophy Group (PHI) of Wageningen University and Research.

Design
www.studiods.nl

Contact
seerp.wigboldus@wur.nl | www.wur.eu/cdi

Preface

This document is part of a series of legacy products of the CGIAR Research Program on Integrated Systems for the Humid Tropics (Humidtropics). It structures key findings from earlier research supported by Humidtropics towards an approach that connects a theory of change perspective specifically to the question of 'how scaling happens'. By doing so, it offers a way of thinking systemically and systematically about how scaling happens in the context of agrifood systems.

This guide is a first step towards using a theory of change approach in the design, implementation, and evaluation of change initiatives that include a significant scaling ambition. Initial experiences were gained in research on scaling agro-ecological practice in Nicaragua, on scaling 'green' rubber in Southwest China, and on scaling the practice of cocoa farmer field schools in Cameroon. We also benefit in this guide from research done by others in relation to scaling processes. There is, however, still a need to further refine and field-test this material and provide further illustrations from practice.

Although such further development is required, the approach suggested here focuses on ways in which complexities involved in scaling processes can be unpacked towards better understanding relevant considerations to be taken on board in policy- and decision making. Therefore, this guide does not attempt to arrive at statements like 'if this is the case, approach scaling this way, and if that is the case, approach scaling that way'.

In a recently published article on systemic perspectives on scaling agricultural innovations, we introduced the PROMIS approach: a Practice-Oriented Multi-level perspective on Innovation and Scaling (Wigboldus et al. 2016). In the article, we argue for an integrated perspective on innovation and scaling rather than considering scaling to be a mere next step after successful innovation. In this

guidance document, we build on perspectives presented in that article, while attempting to deliver something more practical this time.

Over the years, monitoring and evaluation (M&E) became so important that M&E experts were trained to support related processes. Scaling processes are both considered extremely important in the context of agrifood system innovation and relate to a multifaceted picture of dimensions and dynamics. Maybe it is therefore time to start training experts in the field of responsible scaling to advise and support scaling initiatives. If so, this booklet may provide initial ideas on how to strengthen capacity in this field through a curriculum along the lines of a Theory of Scaling.

As we discuss in this document, there is no one best way to engage in scaling processes. This guide is therefore first of all about helping stakeholders to be better prepared for deciding on the best or most appropriate way to engage in scaling processes in a particular setting. We welcome those who want to work with us in further developing and refining a Theory of Scaling (ToS) towards becoming more practical and more empirically supported guidance for policy- and decision making.

We thank Katharina Schiller and Onno Giller who experimented with an earlier version of this approach in relation to scaling agro-ecology practice in Nicaragua (partnering with CIAT). We also thank Jim Hammond of ICRAF-China who did the same in relation to scaling green rubber practice in Southwest China. We thank Cees Leeuwis, Laurens Klerkx, Marc Schut, and Henk Jochemsen who helped develop the PROMIS approach on which this work is based.

Wageningen, December 2016

Table of contents

Preface 3

PART 1: Theory of Scaling (ToS) as approach 7

1 Introduction 9
- 1.1 Why ToS and what it is about 9
- 1.2 What responsible scaling is about 12
- 1.3 Creating conceptual clarity 15
- 1.4 Supporting meaningful discourses on scaling 24
- 1.5 Rethinking scaling processes 24

2 Core premises of ToS 29
- 2.1 On theories of change 29
- 2.2 Extending the concept of theories of change to the context of scaling 33
- 2.3 Unpacking what is involved in scaling processes 35
- 2.4 Between 'look before you leap' and 'nothing ventured, nothing gained' 37

PART 2: Theory of Scaling (ToS) processes and tools 41

3 Readiness to connect ToS to practice 43
- 3.1 Institutional and organisational conditions 43
- 3.2 Individual and team competences and attitudes 47
- 3.3 Being wise in responsible scaling 48

4 Informing a ToS 51
- 4.1 Scoping 52
- 4.2 A quick-scan study 56
- 4.3 A focused in-depth study on selected topics 59
- 4.4 Consolidating a big-picture perspective 65

4.5 Exploring capacities and conditions for responsible scaling 67
4.6 Considering options for responsible scaling strategy 69

5 Framing, consolidating, and communicating a ToS 75
5.1 ToS as process 75
5.2 ToS as framework 79
5.3 Communicating a ToS 79

PART 3: Theory of Scaling (ToS) application 83

6 Using a ToS for responsible scaling **85**
6.1 Using ToS in policymaking 86
6.2 Using ToS in the design of scaling initiatives 88
6.3 Using ToS in the strategic guidance of scaling initiatives 89
6.4 Using ToS in the (ex-post) evaluation of scaling initiatives 90

7 Discussion and conclusion 93

References 97

Annex 1 Creating systemic perspectives on scaling in the context of agrifood systems 104
Annex 2 Informing a ToS from a systemic and systematic perspective 108
Annex 3 Systematically scanning (potential) implications of an envisaged scaling initiative 110
Annex 4 Diverse options for engaging in scaling processes 112
Annex 5 Developing a framework for articulating a ToS 116

PART 1
Theory of Scaling as approach

FIGURE 1 **ToS is about unpacking the black box of scaling in the context of wider innovation processes and impact aspirations.**

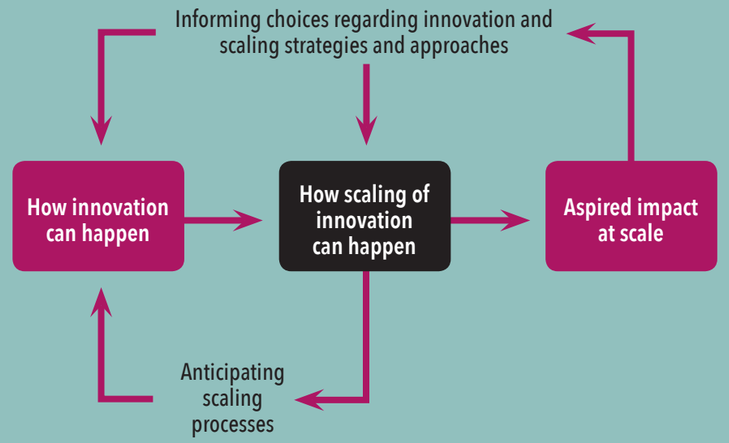
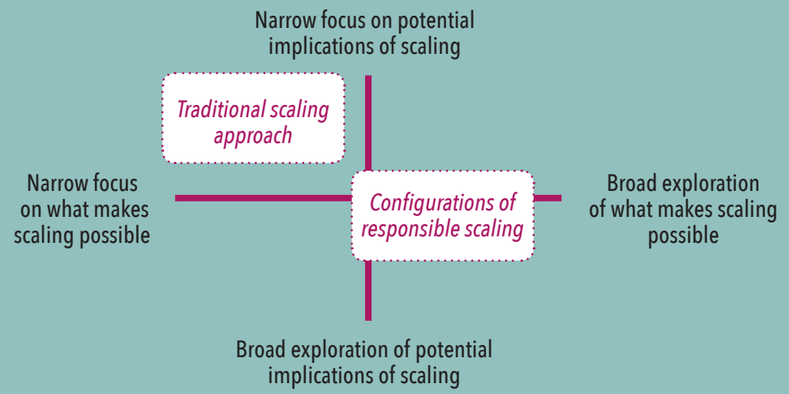


FIGURE 2 **Broadening perspectives on scaling**



1

Introduction

In this section, we explain the premises underpinning the Theory of Scaling (ToS) approach.

1.1 Why ToS and what it is about

This booklet has grown out of a study on what makes for responsible scaling in the context of agrifood systems, thinking along the same lines as ideas that gave rise to the concept of responsible research and innovation. In our initial explorations, we brought together a number of angles on the topic area (Wigboldus and Leeuwis 2013; Wigboldus et al. 2016).

It became clear, however, that we needed to make our philosophical and conceptual ideas more practical. At the same time, we were hesitant to provide stepwise plans because we felt that they would not do justice to the complex dimensions and dynamics involved in scaling. We thus found ourselves in need of something that provides guidance on the one hand, but on the other hand

leaves open specific choices and strategies. The idea and application of theories of change occurred to us as something that could bridge the two, as that is exactly what it is meant to do in wider change initiatives.

The theories of change approach is already part of design and planning practice in many organisations, and so we decided to build on this approach and specifically apply it to the question of how we think scaling happens/can happen. In fact, we found many organisations in need of guidance in this matter. The innovation part of development initiatives tends to be designed with much more care than the related scaling processes, which often remain more or less a black box of general thoughts on what/how scaling could happen. The approach presented in this booklet, the ToS, is about helping to unpack that box in a structured way so as to enhance stakeholders' readiness to engage in scaling processes both effectively and responsibly (Figure 1). The related processes and tools are meant to enrich systemic perspectives on what is involved in scaling agrifood innovations (Wigboldus et al. 2016) by providing frameworks that allow for structured analysis and sense-making. Here, we understand innovations to relate both to individual innovations, such as new technologies and their application, and to systems innovation, which usually also includes a role for individual innovations.

We use the systems concept in a loose way here. A systems' perspective in essence emphasises the interconnectedness of elements that make up systems. Such interconnectedness can be studied in layers: from smaller systems (e.g. a cropping system) in every increasing complexities right up to global systems. Hence, scaling up in this perspective requires understanding how scaling works in such interconnectedness (e.g. how practices hang together and influence one another). If we scale up one thing in a system, what happens to other system elements and how does this play out at those levels of system complexity? Such interconnectedness led Meadows (2009) to state that we should stop being blinded by the illusion of control, pointing to the irreducible uncertainty within system perspectives. 'We can't impose our will on a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone' (2009: 169-170). We think there is a truth in this that also applies to scaling processes.

ToS connects to the reality of many scaling initiatives that, as they progress, increasingly face implications and complications that were not anticipated and prepared for. Let us briefly explore what may be involved in scaling up the use of a new crop variety:

- Increased availability of and/or demand for seeds and their cultivation spreading out over a particular area may require different seed sector arrangements;
- Cultivation of other (nutritious) crops may be reduced (scale down);
- Other practices may be needed (at scale) such as the (correct!) application of fertiliser and pesticides;
- New knowledge and skills may be needed (at scale) to grow the hybrid seed in a way that allows its potential to materialise;
- New diseases may start to go to scale with the scaling of the application of that particular variety;
- Market prices may start to go down as a result of increased supply;
- And so on.

This simple example illustrates the need for timely unpacking of the interactive dimensions and dynamics involved in scaling initiatives and not waiting to see what happens in the scaling process. An implication may be that what started as an agrifood-related innovation and scaling process may also affect other domains such as the health and/or the energy sector. Or, what started as a local process may also affect national processes. And, what appeared to work out well on a small scale (few farmers involved) may work out quite differently at large scale when, for example, water sources are used beyond their carrying capacity. Policies and strategies therefore need to be informed by strategic foresight and anticipation. Moreover, the example given here relates to a particular mode of

What is a scaling initiative?

A scaling initiative refers to any project, programme, or partnership involving an objective to see particular innovations go to scale. The point of departure may be: we have something that we want to see going to scale to become a significant part of existing system properties; but it may also be: we have a vision for new system properties, and what we want to see going to scale specifically is that which supports a transition to such new system properties.

engaging in scaling processes (i.e. scaling strategies): we have something that we want to see going to scale and how can that happen? In this guide, we also discuss a number of quite different options in terms of scaling strategies.

1.2 What responsible scaling is about

Boundary issues in scaling

"While scaling processes originate from within particular system and domain boundaries (e.g. cropping system, value chain, sector), they tend to affect, and be affected by, factors that lie beyond the boundaries of the systems, domains, and levels that are the focus of a scaling initiative (…), and thus involve and impact stakeholders at different scales and levels in systems."
(Wigboldus et al. 2016:12)

One of the first things we want to clarify is what this guide is not about. It is not about identifying a particular standard of quality of scaling process to which all initiatives that aim for scaling should adhere. In this guide, responsible scaling is rather about being responsible for creating a well-informed basis for decision making in relation to scaling processes. We may also phrase this as responsible policy- and decision making in relation to scaling processes. Figure 2 illustrates the traditional way in which scaling initiatives tend to be approached and the more inclusive approach to which the responsible scaling approach relates. Table 1 illustrates what responsible may mean in the context of scaling. Figure 3 visualises the considerations that should be taken into account in responsible scaling.

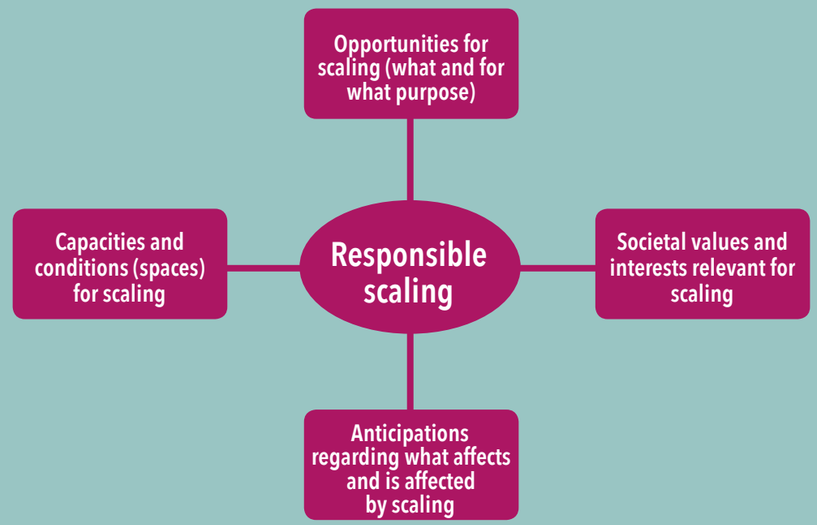
The implication of all this is that we do not argue for particular scaling strategies to be considered as being the best. Although we have concerns about scaling strategies that, for example, focus entirely on processes of technology adoption or transfer (Wigboldus et al. 2016), these may still be considered the most responsible scaling strategy given relevant conditions. Our concern therefore relates not so much to a particular approach as such, but to what does – and particularly what does not – inform such choice.

The idea of responsible scaling is not about ruling out all risks, but rather about enhancing the anticipation, inclusiveness, responsiveness, and reflexivity (Stilgoe et al. 2013) of what informs decision-making processes. These four identified dimensions of responsible innovation translate well to the context of scaling processes. Enhancing the capacity for responsible scaling in this perspective includes the following:

TABLE 1 Possible interpretations of what makes for responsible scaling.

The scaling process is aligned with agreed aspired outcomes
The scaling process considers long-term and cross-scale (dimension) effects
The scaling process takes into account interests of disadvantaged groups
It is a co-scaling process based on human-centred design principles
The scaling process is well-informed by an understanding about relevant change dimensions

FIGURE 3 Considerations informing responsible scaling.



Enhancing anticipation

- Scaling up is not a mere second stage after successfully finding out what works. From the beginning, the design of research and innovation projects needs to have future scaling-up in mind (Ghiron et al. 2014), not just in terms of objective, but also in terms of enhancing anticipation of implications of choices in research/innovation agendas. Not just their outputs, but also the way in which (preceding) innovation processes take place, will influence the success and the failure of subsequent scaling processes (Ghiron et al. 2014).
- From early on, 'what if' scenarios need to be explored in two ways: first, how will the envisaged scaling process connect to wider scaling processes (trends in nature and society) and, second, what if this innovation went to scale? What may affect this process and what effects may such scaling have both within target environments and beyond? This includes an ability to assess the compatibility of scaling processes with institutions, infrastructures, and networks in wider-use environments (Hounkonnou et al. 2012) and an ability to anticipate scenarios of (e.g. carrying capacity) overshoot, scale mismatches (e.g. between mandates of change agents and scale/level of change), and potential (negative) side effects outside defined system boundaries (e.g. outside a particular value chain) (Cumming et al. 2006; Wilbanks 2002).

Enhancing inclusiveness

- Scaling up is not a value-free process (Gee et al. 2013). Trade-offs and net benefit/value for society need to be considered from an inclusive perspective, including how scaling may work out for, for example, disadvantaged groups, such as women and children, and how negative effects may spill over to other geographical areas and the environment.
- Strategic decision making needs to be built on appropriate integrative analysis, not just applying a general situation/systems analysis, but also using analytical tools and processes that are specifically good at capturing and interpreting the multi-faceted dimensions and dynamics involved in scaling processes (e.g. Checkland and Scholes 1999; Jiggins 2012).

Enhancing responsiveness

- New competences (e.g. Schut et al. 2014) and new ways of partnering to achieve impact at scale may be needed. This may involve shared (communicative and discursive) spaces in support of scaling processes, such as innovation platforms/labs.
- Room for manoeuvre in terms of the flexibility required for adaptively treading on pathways to scale may need to be negotiated with, for example, funders and managers in order to effectively enhance space for scaling (Linn 2012).

Enhancing reflexivity

- To enhance reflexive capacity, ideas regarding envisaged scaling processes need to be made transparent by articulating an agreed theory of change (Stein and Valters 2012) regarding, for example, how innovation processes are expected to create a springboard for scaling, what exactly is meant by going to scale, how this is expected to happen, what wider scaling processes may be triggered, and so on, while making underlying assumptions explicit.
- As reality overtakes planning, Monitoring & Evaluation (M&E) needs to keep decision makers and stakeholders informed about how the scaling initiative is working out so that they can manage adaptively (Coe et al. 2014). M&E needs to include specific questions relating to conditions for scaling and unplanned (unwanted) effects of scaling processes.

So this is what ToS sets out to support by providing a number of suggested processes/tools intended to help systematically explore relevant dimensions and dynamics of engaging in scaling processes and prevent scaling dysfunctions (Table 2).

1.3 Conceptual understanding

The concept of scaling as an active verb is used widely in the context of innovation and development initiatives (see Table 3). Essentially, in this guide,

we understand such scaling as referring to strategies and approaches relating to the objective of seeing that the potential of relatively isolated inventions, innovations, and developments benefits people and situations more widely. This may be for reasons of self-interest, as in the case of business sales for example, but in this guide we focus on scaling initiatives that are indeed about seeing that people and situations benefit more widely.

It goes beyond the purpose of this guide to explain all the terminologies used in the literature to distinguish between different types of scaling processes. One may come across terms such as scaling up, scaling out, horizontal scaling, vertical scaling, functional scaling, and so on.

Taking complexities in scaling processes seriously

In the analysis, design, and strategic guidance of envisaged scaling initiatives, a transdisciplinary and multi-stakeholder approach needs to be considered.

First of all, we think that the term scaling is not always that helpful where the use of other terms such as institutionalisation, mainstreaming, expansion, or spreading may sometimes be more helpful to clarify what we are talking about. So first we need to check whether an alternative verb or its related noun would create a clearer image about the processes to which we are referring. Vertical scaling, for example, is more about creating institutional conditions that allow the scaling of particular innovations to happen.

Secondly, we propose to connect to a more systematic distinction between scaling processes, making use of the theory of modal aspects (as we did in Wigboldus et al. 2016). Table 4 presents its essence in relation to dimensions of what makes for responsible scaling. Each subsequent aspect adds a dimension to any one aspect. Thus, the aspects are connected, but cannot be reduced to any of the other aspects. Entities can be characterised by the way they relate to/function in these aspects. Aspects are also called modalities or spheres (Basden 2013).

Introducing a new technology and wanting to see that go to scale is affected by, and affects, a range of other conditions and related scaling processes. Responsible innovation and scaling therefore relates to paying due attention to

TABLE 2 Preventing scaling dysfunctions.

Tunnel-vision scaling Ignoring that the scaling ambition is influenced by, and has an impact on, a range of other (scaling) processes
Monorail scaling Putting all eggs in one basket in terms of focus of scaling and agent of change
Rollercoaster scaling Jumping on new opportunities for scaling, then jumping out when no longer considered good or feasible, then jumping on new opportunities, and so on

TABLE 3 Suggested distinction between the concepts of development, innovation, and scaling.

Development New configurations of (interactions between) products, practices, and processes
Innovation Reconfiguration of (interactions between) existing products, practices, and processes
Scaling More/less (numbers), bigger/smaller (size), more/less spread (space), faster/slower, more/less frequent (movement), more/less encompassing (energy)
Innovation in the context of scaling processes is a relative concept. What is common practice in one place may be introduced in (scaled to) other places as an innovation because it is not common practice there. Also, what is common today may have been an innovation at some point in time.

such multifaceted implications, and consequently a particular scaling initiative itself may also be assessed in terms of how it functions in the different modal aspects.

The first four aspects also provide a useful basis for distinguishing between four main types of scaling processes:

Quantitative scaling

Towards more/less in terms of numbers: for example, towards more farmers using a particular technology.

Spatial scaling

Towards more/less spread geographically: for example, towards spreading practice across borders.

Kinematic scaling

Towards being faster/slower or more/less frequent: for example, towards enhanced mobility or faster transactions.

Physical scaling

Towards being more/less encompassing: for example, towards more encompassing projects/initiatives, including the joining of efforts.

Most, if not all, scaling processes can be characterised using this typology. In Annex 1, we further illustrate the application of these distinctions to different domains of change.

The tendency of scaling initiatives to focus on quantities puts quality at risk in such processes. If the quantity of one thing increases or decreases, we need to find out what ratios/balances have changed as a result. If the number of cows per farm increases, and income of those farmers (sale of milk) increases, we cannot come to a full stop there. What happens to market prices as a result?

Preventing reductionisms

Development and innovation tends to be driven by reductionist agendas. We observe this in scientism (reducing knowledge to what is empirically verifiable and quantifiable, neglecting all forms of non-scientific knowing), technicism (reducing the essence of development and progress to technological advances), and economism (reducing care and management to achieving efficiency and economies of scale). All isms are about a tendency to neglect other aspects (e.g. materialism, capitalism, legalism, liberalism, socialism). The theory of modal aspects alerts researchers and decision makers to such tendencies and the implications they may have in other spheres of experienced reality.

TABLE 4 **Theory of modal aspects used to create systemic perspectives.**

Aspect Hierarchy of aspects of experienced reality	**Its kernel (in brief)** What it pertains to in essence	**Related dimensions of 'responsible'** What anticipation, inclusiveness, responsiveness, and reflexivity need to take as objects (e.g. what scaling may lead to)	**What happens if it** becomes the sole focus (examples only)
Numeric	Discrete quantity	Proportionate vs. disproportionate	
Spatial	Continuous (spatial) extension	Spacious vs. confined	
Kinematic	Motion	Dynamic vs. inactive/inert	Liberalism
Physical	Energy and matter	Energy vs. incapacity	Materialism
Biotic	Life and vitality	Vitality vs. life threatening	Individualism
Sensitive	Sensing and feeling	Awareness vs. ignorance	Emotionalism
Analytic	Distinction	Clarity vs. confusion	Scientism, intellectualism
Formative	Formative/creative power	Construction vs. destruction	Technicism, capitalism
Lingual	Symbolic representation	Truth/understanding vs. deceit/ misunderstanding	Symbolicism
Social	Social interaction and institutions	Friendship vs. enmity/discord; participation vs. isolation	Socialism
Economic	Frugality	Care vs. neglect; management vs. mismanagement; sustainability vs. unsustainability	Economism
Aesthetic	Harmony	Harmony vs. incompatibility/imbalance	Aestheticism
Juridical	What is due	Justice vs. injustice	Legalism
Ethical	What is 'right' to do; love (self-giving)	Love vs. taking advantage of others; Generosity vs. selfishness	Moralism
Certitudinal	Faith, vision, commitment	Trust vs. distrust; faith vs. fear	Idealism

Adapted from Brandon and Lombardi (2011) and Basden (2013).

What happens to resource management as a result? This means that a view on scaling in terms of quantity needs always to be coupled with a view on the effect of scaling in terms of quality.

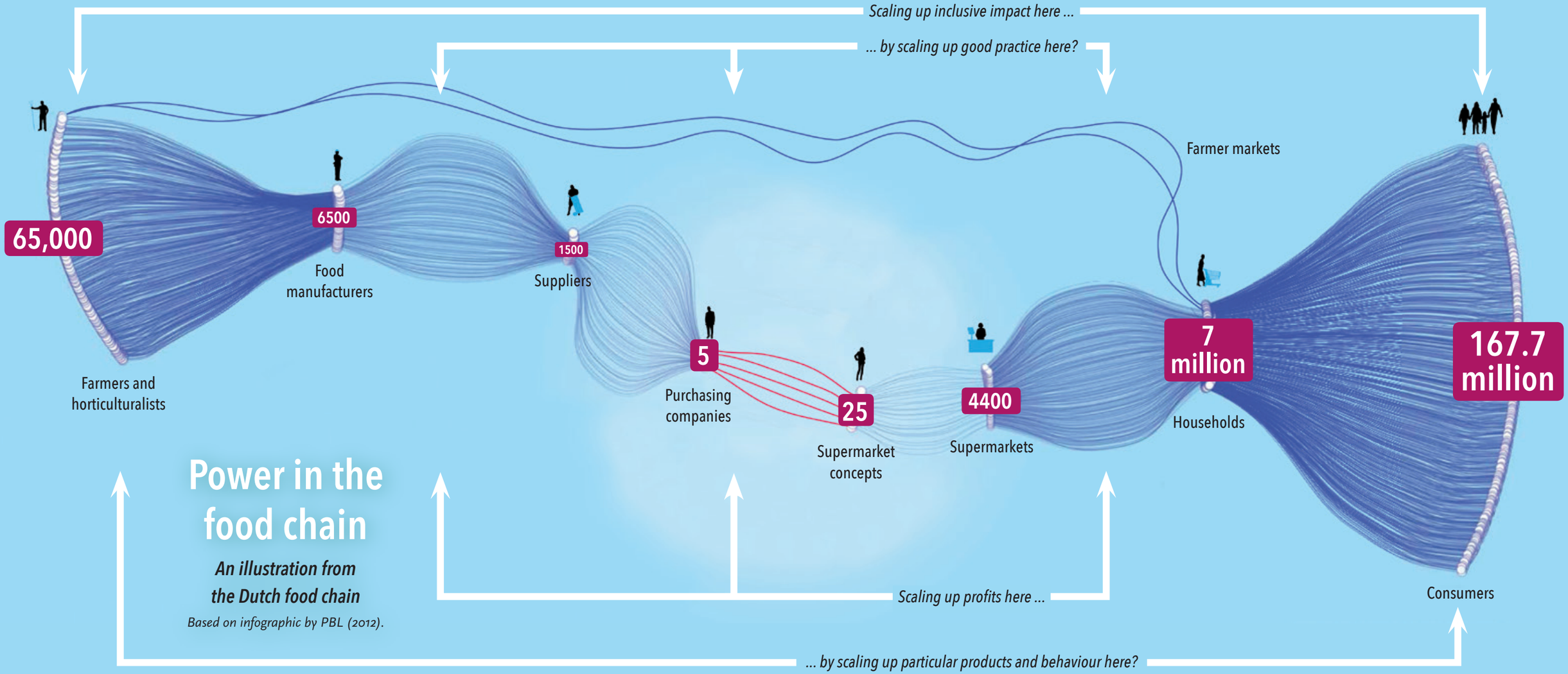
All products, practices, relationships, systems, and so on can be characterised along the lines of how they function in these aspects. Seeds can be characterised by the biotic aspect. However, if it is a genetically modified organism (GMO), it connects to the formative aspect; legislation related to it connects it to the juridical aspect; certain groups organise protests against those seeds, thereby connecting the seed to the social aspect; debates take place to establish the truth about benefits or threats, thereby connecting the seed to the analytical aspect; and so on. This illustrates that scaling processes are rarely, if ever, isolated entities in terms of types of processes and foci involved.

The framework is helpful for systematically considering what affects, and what is affected by, a particular scaling process and how scaling in one aspect may involve multiple other aspects in a quite different domain of change and may therefore be easily overlooked and left unaccounted for. By facilitating such considerations, the framework alerts researchers and decision makers to a systemic perspective on scaling innovations (a more detailed discussion can be found in Brandon and Lombardi 2011 and Wigboldus et al. 2016). The framework goes a step further, or rather deeper, than defining general principles such as in relation to sustainable development (e.g. FAO 2014). Sustainability here relates to simultaneously paying due attention to all aspects when considering and/or assessing implications of innovation and scaling processes. This poses the same challenge as those faced in achieving the Sustainable Development Goals (SDGs), which is that it may be doable to contribute to goals separately, but harder to do so in ways that do not negatively affect achievements in relation to other goals.

TABLE 5 **Framing matters: stimulating creative thinking about scaling by connecting to metaphors.**

Agriculture is particularly rich in providing metaphors for scaling, e.g. in terms of the type of scaling:
Seeding (spread by wind, water, animals, birds, or people) – allows for variability
Grafting – leaves one element the same (graft) while rootstock (other elements) can be different
Multiplying through cuttings, runners/stolons/rhizomes, and tissue culture – producing identical offspring
Suckering – slow-moving expansion of the same plant
Unplanned spread of exotic species: e.g. seeds that came with other plant material
Unplanned favouring of undesired weeds because fields are fertilised
The (changing of) conditions for scaling, e.g.:
Soil properties
Climate and weather properties
Vegetation properties
And the change of conditions for scaling, e.g.:
The way in which seeds, seedlings, bulbs, cuttings, etc. are spread or planted (e.g. broadcasting seeds, sowing in rows)
The timing in which seeds, seedlings, bulbs, cuttings, etc. are spread or planted (e.g. in winter/dry season, or in spring/wet season)
Ploughing the soil
Use of greenhouses
Watering, weeding, fertilising crops

FIGURE 4 **Example of a discourse on drivers underpinning scaling ambitions in relation to food-chain configurations.**



1.4 Supporting meaningful discourses on scaling

Finally, apart from using concepts to distinguish between scaling processes, it is useful to communicate through metaphors to enrich conversations on scaling. Metaphors and analogies are powerful tools for getting to grips with complexity. Responsible scaling is very much about creating discursive spaces that allow for discussing potential implications and complications of scaling without much use of conceptual baggage. This creates narratives such as, 'what we want to see is like...' In fact, the context of agrifood systems is very rich in providing good metaphors for scaling (Table 5).

Given the contested nature of certain agrifood system dynamics, meaningful narratives on scaling sometimes need to involve public discourses to consider potential implications, complications, and trade-offs, as well as underpinning grand narratives on progress and developments. Visualisation including infographics can be useful to support informed debate (Figure 4).

1.5 Rethinking scaling processes

We close this section with a brief reflection on the need to reconsider how we think about scaling. That is what this whole document is about: thinking seriously about how scaling happens and about what would be good (ways for) scaling to happen. Wilson et al.'s (2011) report on Oxfam's new thinking on scale provides some useful clues for finding ways forward in developing policy and strategy in relation to scaling aspirations (Table 6).

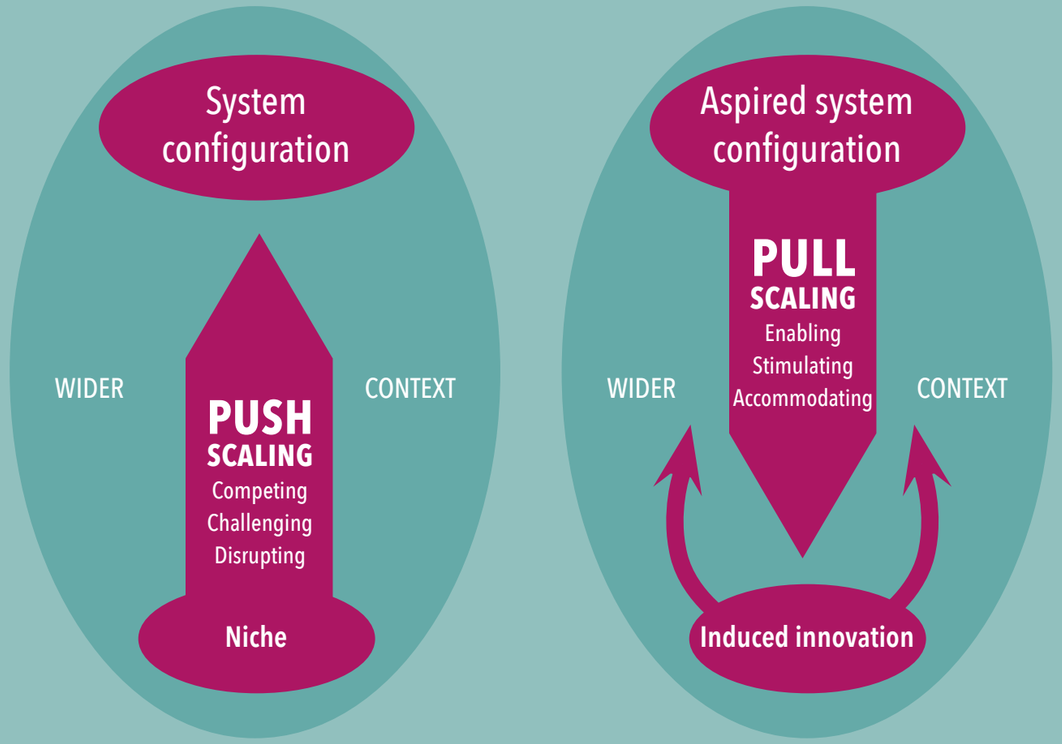
Thinking about scaling processes has moved forwards and backwards over time. UNDP (2011) provides a useful interpretation of the evolution of the concept of scaling up over the past few decades. Some old ideas have returned (e.g. value-for-money thinking as well as an increased focus on controlling development

TABLE 6 Reconsidering how we think about scale and scaling.

Original thinking on scale	New thinking on scale	Implication/interpretation
Scale achieved through increasing programme numbers: countries, companies, projects, beneficiaries	Scale achieved through increasing influence through innovation, strategic partnerships, alliances, knowledge sharing	Less direct, less steering, less control-seeking, more as part of network/ alliance
Scale increases proportionally to size of programme	Scale achieved exponentially through self-spreading of ideas, practices, services beyond the initiative's direct reach	More catalysing, more 'trusting emergence', more capitalising on existing innovation capacity of e.g. social innovators
Scale is reached by increasing programme funding	Scale reached by leveraging wider investment resources by and to smallholders and supporting service providers	Don't try to make things happen by yourself: connect and take up your role as part of a kind of non-formal development team (network, alliance)
Ad hoc, opportunistic market and company engagement	Systematisation of analysis, tools, and processes for identification of markets, products, companies based on potential for scale, value added, inclusion, and specifically women's economic leadership	Try to understand on-going dynamics, including on-going scaling dimensions and connect to such dynamics rather than trying to induce such dynamics

Adapted from Wilson et al. (2011).

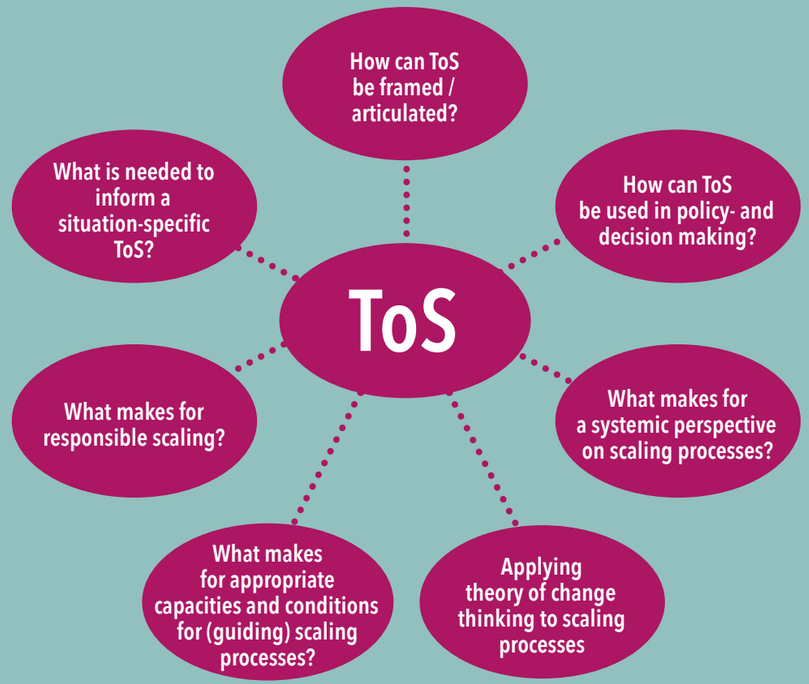
FIGURE 5 **The difference between a push and a pull approach to scaling.**



processes), but a new focus has emerged in which scaling is becoming more directed towards impact (scaling impact) than on scaling projects or technologies. The scaling impact approach takes desired impact as the point of departure and aims to scale up whatever helps to get more of that impact.

This relates to the distinction made earlier (Wigboldus et al. 2016) between a push and a pull approach (Figure 5). The push approach relates to the more common understanding: we have something that we would like to see going to scale. The pull approach relates to common practice, which is often not recognised as an effective (indirect) approach to scaling. This relates, for example, to agenda setting and policymaking, such as in relation to sustainable food systems (e.g. Searchinger et al. 2013: 20-23; iPES, 2015).

FIGURE 6 What a ToS approach seeks to address.



2

Core premises of ToS

This section clarifies our key building blocks for approaching the idea and practice of a Theory of Scaling. See Figure 6.

2.1 On theories of change

The field of causality (how and why change happens) is not uncontested. There are a number of theories regarding the existence and nature of causal relationships. Agricultural research and development planning is based on assumptions about causal relationships and how they are expected to play out, but this is often not made explicit. As research project proposals and, even more, development project proposals are trying to make a case for making a certain investment (similar to a business case), many plans incorporate a significant amount of wishful thinking to make the argument sound. Some plans are even based on misconceptions about scaling processes (Table 7). There is no reason to expect that this would be different in plans for scaling initiatives.

TABLE 7 Potential misconceptions about scaling processes.

The ecological (inference) fallacy (or cross-level fallacy): what works at one level will work at another
The composition (inference) fallacy: what is good for one person is good for everyone (if one village was able to increase income through growing a new crop, all villages in the region could do the same)
The exception fallacy, which is sort of the reverse of the ecological fallacy, such as in stereotyping: if one farmer does something, all farmers are assumed to be like that

Adapted from Menter et al. (2004).

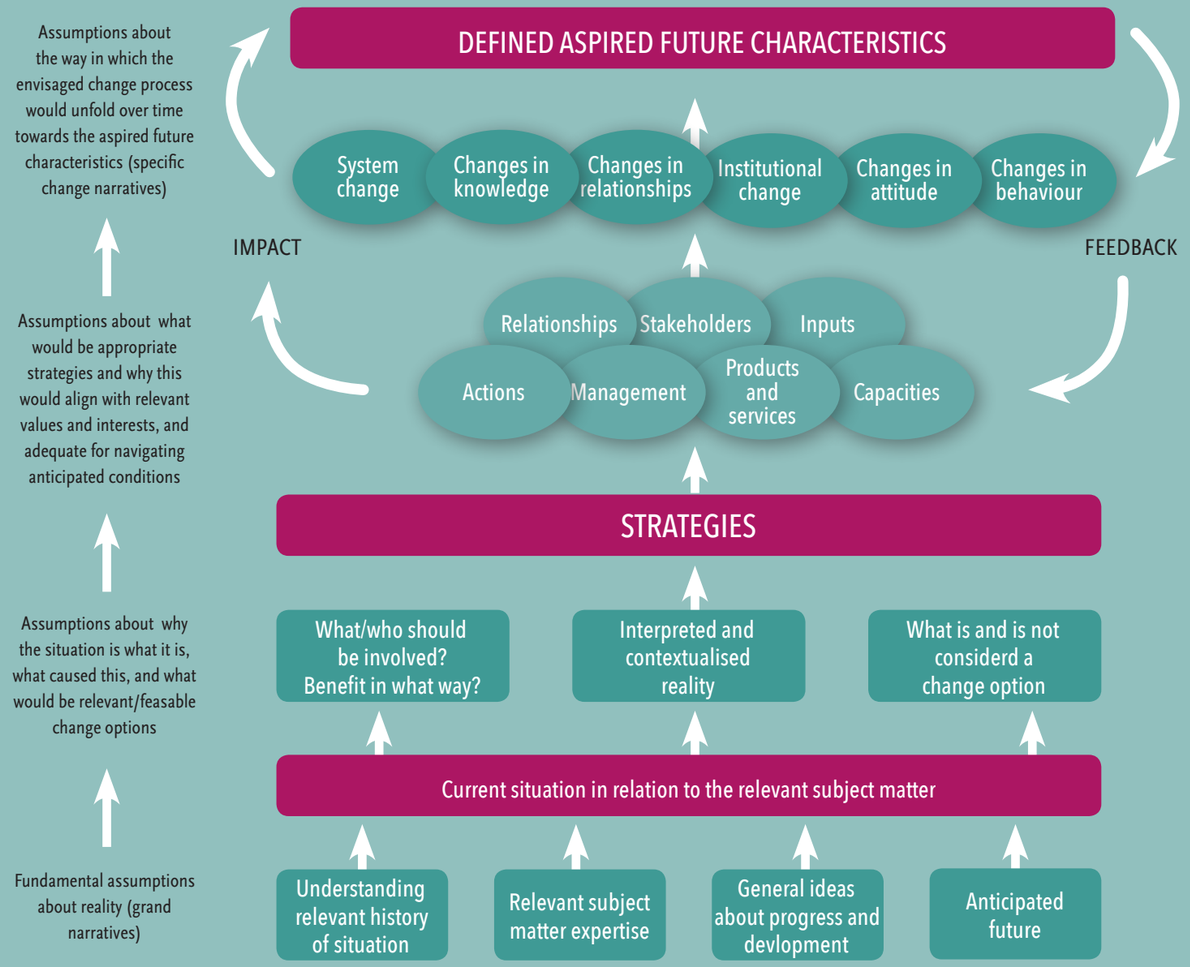
Causation is context dependent, and there may not be a single objective way to determine which causal claim is true of a given situation. This makes it problematic to understand causal mechanisms and mechanism-centred explanations, which may in fact mean something different to different people (Gerring 2009). Thus, models in the context of development and progress tend to become more politically than scientifically evidenced. Some of this may be difficult or even undesirable to change, but at least we can make assumptions about change (and in this case, scaling in particular) more transparent in order to open them up for discussion and debate, after which an agreed plausible theory of change can be drafted (see Figure 7 for a generic outline).

Our daily lives are based on how we think change happens. That is (usually) why we do what we do. Similarly, in our work practice, ideas on how we think change happens form the basis for our plans and actions. However, we often do not make the underlying assumptions explicit, and we are often not even aware that much of our thinking and acting is based on a complex set of interrelated assumptions about the nature of reality and about what makes change happen in different contexts. When we get stuck and change does not happen the way we expected it to happen, we become more aware of such assumptions. Even in development planning, many of the underlying ideas on how change happens (theories of change) are not made explicit. This may result in wishful thinking (dreaming into the future) and conflict during implementation when differences between stakeholders' theories of change become apparent. Partly for this reason, we have seen an increased interest in the subject of theories of change over the past decade, with development financiers increasingly requiring proposals to contain an articulated theory of change that includes descriptions of important assumptions about envisaged change processes. Books such as What Works in Development (Cohen and Easterly 2009) and Roger's theory on the diffusion of innovations idea (Rogers 2003) are examples of broader theories of change.

Why theories of change?

One of the key reasons for the introduction of the idea and practice of theories of change was to overcome the limited focus on objectives and related results in common planning tools such as logic models, which did not help in thinking through core processes that can enable or prevent the achievement of those results.

FIGURE 7 **The essence of theories of change: making assumptions about how change is expected to happen explicit and open for discussion.**



Articulated theories of change allow for learning about assumptions regarding how change happens in particular situations. There is a threefold benefit:

1. Readiness to engage effectively and responsibly: better knowledge of what needs to be taken into account allows for better preparation;
2. Strategic guidance: monitoring the validity of assumptions on an on-going basis provides opportunities for quick adjustments if certain assumptions concerning the envisaged change processes turn out to be invalid; and
3. Strategic learning: systematic capture of the validity of assumptions helps learning and the adjustment of plans for future efforts. Many development plans along the lines of logic models will spell out a hierarchy of objectives with related indicators for measuring change in relation to these objectives. This provides an opportunity for understanding whether or not change happened, but it does not explain much about why and how change happened or not. Articulated theories of change can complement such understanding.

Having studied various perspectives on how change happens, Krznaric (2007) concludes that there are no generally applicable models of how social change happens, every context has its own history and its own particularities, and the past is not a definitive guide to the future. This underscores the usefulness of situation-specific theories of change to guide decision making.

2.2 Extending the theories of change concept to the scaling context

We may summarise the following considerations for understanding scaling processes:

- Causal relationships are often so complex and even largely unknown in terms of any kind of mechanisms that we need to beware of making shortcuts on assumptions on why something would go to scale;
- Scaling in the context of agrifood systems involves causal mechanisms across

dimensions and is not limited to natural factors and conditions;
- Scaling initiatives need to be approached as a kind of search. In retrospect, we may be able to determine causal relationships, but projecting those into the future is tricky, because it is often hard to extrapolate. A map (theory of change), even if imperfect, provides an adaptable basis for navigating and learning into the future;
- Fundamental principles about causation and correlation need to be taken into account in plans for scaling to strengthen the basis for making assumptions and to reduce the measure of wishful thinking about how scaling happens.

Scaling affects proportions

Scaling laws in nature are about that which governs, amongst other things, particular dimensions and proportions of e.g. organisms (West and Brown 2004). Some apply this to the understanding of e.g. urban systems. Scaling initiatives affect proportions (e.g. when one crop is cultivated more, consequently other land use and related practices will change as well). Articulating a ToS includes considering what proportions are affected by a particular scaling initiative, and what its (possible) implications could be, e.g. in terms of distorting or bringing harmony/ balance.

To make resources, practices, and systems work together towards addressing (grand) challenges such as food security, a variety of factors need to be fine-tuned to serve that common purpose (Minang et al. 2015). However, variables (for example, population numbers, demand for resources) change over time, requiring adaptation of practices. Scaling initiatives are often part of a wider adjustment to such on-going scaling processes. This means that a perspective on scaling up food security needs to connect to continuously scaling numbers, demands, and changing distribution patterns (see Schut and Florin 2015, who discuss this in relation to a set of global principles, criteria, and indicators for food security). At household level, this involves the optimisation of the application of assets in view of context conditions, which is what livelihood strategies are about (Bebbington 1999). That same type of continuous optimisation takes place at higher levels, for example at sector or societal (global) level.

Complications regarding optimisation (German et al. 2006) relate, for example, to the fact that at sector or societal level this relates to averages. Food security at sector/societal level may improve but certain (for example disadvantaged) groups of individuals may not benefit; this means that what is a success at one scale level will not necessarily be a success at another scale level. Some will focus more on optimisation at societal or even global level (e.g. Bindraban and Rabbinge 2012), whereas others will focus more on (individual) farmer level optimisation and food sovereignty at lower levels (e.g. Altieri and Toledo 2011). Another complication relates to optimisation across systems and domains. For example, what is optimal for agricultural production may not be optimal for nutrition. Yet another complication relates to a 'return on scaling': for how long will doing more of the same continue adding value and spread benefits (Figure 8)?

2.3 Unpacking what is involved in scaling processes

When a product, practice, or process is considered worth scaling up, the question is what (part) exactly makes it good or a success. What does it connect to so well? What conditions allow it to be considered a success? The answers to such questions will provide more handles on assessing what may happen if this goes to different locations and different people, as well as what may happen if this becomes more, bigger, faster, more encompassing, and so on. We may need to strip non-essentials from candidate products/processes/practices for scaling and allow them to be 'repackaged' to match other conditions (Coe et al. 2014; Garb and Friedlander 2014) (Figure 9). This involves creating opportunities for variations on a success theme. The N2Africa project illustrates this. It took nitrogen fixation in soils as a kernel of promise. Rather than focusing on one or a few Nitrogen fixation crops and related practices, research pointed to the need to diversify options in terms of nitrogen-fixing crops/vegetation and related cultivation practices. Nitrogen fixation remains the principle to be scaled up, but the packaging is diversified into baskets of options (Giller et al. 2013). Such packaging allows for connecting to a wider variety of target conditions and a wider variety of stakeholder identities, interests, and preferences. This is not about a choice between specialisation and diversification. Diversification at landscape level may still involve specialisation at local level. Adaptation leads to more diversity, but in effect implies specialisation in a specific context. The diversification of specialisation will enhance resilience because it retains more fall-back options (Stirling 2011).

FIGURE 8 **A theory of scaling also relates to projected of scaling trajectories in view of a 'return on scaling': up to what scale level will scaling add value?**

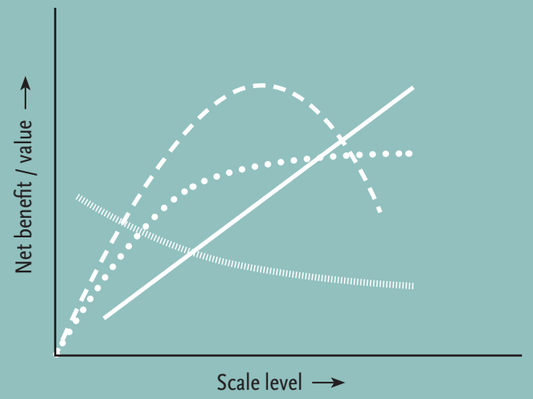
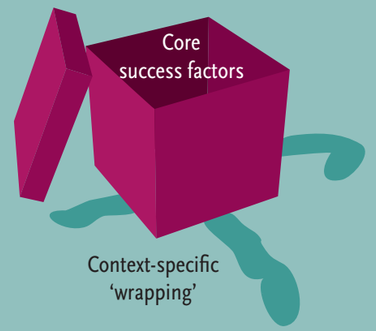


FIGURE 9 **From scaling full packages to unpacking the essential benefits and repackaging in the scaling process.**



2.4 Between 'look before you leap' and 'nothing ventured, nothing gained'

Scaling happens all the time, not just through intentional change processes. It is also a very natural process and associated with such fundamental processes in agriculture as production, growth, cultivation, and harvest. Many of the things we benefit from on a daily basis involve scaling processes. We may think of food security because of scaled-up use of high-yielding crop varieties and because of scaled-up application of crop protection. Another example is improved market exchange consequent to scaled-up infrastructure. In the field of communication, most of us benefit from the scaled-up application of mobile technologies. This has led many to believe that solutions to many of the world's problems are actually at our fingertips and need only to be identified, funded, and scaled so that those problems will be addressed at scale. The focus, in this view, would therefore need to be on such identification and subsequent scaling processes. In effect, such a call for scaling 'what works' may take us back to the blueprint approaches that were heavily criticised around the turn of the century.

Scaling processes have posed and continue to pose, great challenges to the world such as increasing claims on, and exploitation of, natural resources, climate change, increasing population pressure, massive environmental degradation and pollution, extremely uneven distribution of wealth, loss of biodiversity, economic benefits overriding social and ecological concerns, and, finally, innovation speeds that exceed the speed of our ability to foresee long-term impacts. This has led many to call for caution regarding what some have called a technocratic scale-up narrative (Bloom and Ainsworth 2010), which allegedly minimises the changes entailed in introducing and implementing an innovation, and allegedly edits out political, social, and cultural realities and rivalries, or views them as mere hurdles that can be overcome with good planning (Bloom and Ainsworth 2010).

As iron sharpens iron, so one person sharpens another

Proverbs 27:17

Responsible scaling requires actors to keep one another sharp, where 'responsible' is the outcome of that interaction and not the victory of one approach (e.g. being venturesome) over the other (e.g. being cautious). This involves not mere compromise, but seeking to get the best out of different roles.

These two different takes on the topic do, of course, relate to different worldviews and different grand narratives about progress and development. However, they may also be seen as necessary complements: we need those who approach the world from a mentality of ‘nothing ventured, nothing gained’, but we also need those who want to ‘look before they leap’. If the whole world jumped on the accelerator of (scaling) innovations in the name of progress and development, resource management (amongst other things) would fly out the window. If the whole world jumped on the brakes in the name of culture and caution, pressing problems would not be addressed.

We explore this part of the ToS approach further in the next section in relation to a team approach to responsible innovation and scaling.

PART 2

Theory of Scaling processes and tools

3

Readiness to connect ToS to practice

This section provides ideas on what makes for a conducive environment in terms of 1) effective articulation of a situation-specific ToS and 2) readiness to effectively follow up on a situation-specific ToS in the strategic design and guidance of a scaling initiative.

3.1 Institutional and organisational conditions

A situation-specific ToS enhances preparedness for engaging effectively and responsibly in scaling processes. However, this assumes readiness to first of all develop a ToS that is accepted by key actors in the scaling initiative (including donors). This requires time and energy, and one needs to be prepared to invest in this. Secondly, a fantastic ToS can only guide strategically if conditions for working under the guidance of such ToS are conducive.

In terms of the readiness of key actors to assess, design, and agree on a ToS and act on it, Middleton et al. (2005) provide useful advice based on lessons learnt

in case studies on scaling in Bolivia, Nepal, and Uganda. The following is an adapted checklist for strategic planning of scaling initiatives:

- Do not limit understanding to the horizontal dimension of scaling up (technology transfer, dissemination), also consider conditions for scaling;
- Look at institutional roles to be played in the scaling initiative and possible capacity building that it would need to involve;
- Accountability in the process needs to be defined appropriately and needs also to involve accountability to those who are meant to benefit;
- Timeframes need to be appropriate in view of the anticipated scaling initiative;
- Funding needs to be secured for the appropriate timespan, and budgets need to be realistic;
- The external environment needs to be carefully mapped in terms of the political, the biophysical, the cultural, the institutional, and the social environment so as to understand innovation–environment configurations that will determine how an envisaged scaling initiative may unfold;
- Not everything can be planned for. Build in flexibility and sense-making processes for adaptive management of the scaling initiative;
- Collaboration, networking, and strategic alliances increase impact and sustainability;
- Consider which capacities will need to be in place to make the scaling initiative successful and include a capacity-building component for scaling in the strategy, as appropriate;
- Participatory processes (e.g. planning with farmers and communities) will often be crucial to the success of the scaling initiative;
- Consider what will be involved in making the scaling initiative sustainable, but also what scaling may affect in terms of, for example, environmental sustainability (such as carrying capacity issues);
- Build in sound monitoring and evaluation processes for the purpose of strategic guidance, effective implementation, and engaging stakeholders in sense-making (including accountability processes).

Activating foresight is a key competency in responsible scaling

Foresight is the capacity to think systematically about the future to inform today's decision making. It is a capacity that we need to develop as individuals, as organisations, and as a society.

Futures refers to the research, methods, and tools that are available for us to use to develop a foresight capacity.

TABLE 8 What creates space (conditions) for responsible scaling?

Space (conditions) for responsible scaling	Description
Fiscal/financial space	Extent to which fiscal and financial resources can be mobilised to support the scaling initiative; and/or extent to which the costs of the initiative can be adapted to fit into the available fiscal/financial space
Natural resource / environmental space	Extent to which the impact of the scaling initiative on natural resources and the environment must be considered, harmful effects mitigated, or beneficial impacts promoted
Social space	Extent to which the scaling initiative is embedded in conducive (multi-stakeholder) relationships and interactions; extent to which appropriate leadership and facilitation can support this
Institutions/policy space	Extent to which relevant institutions and policy (and legal) frameworks allow for supporting, or can be adapted to support, the scaling initiative
Analytical space	Extent to which appropriate analysis informs decision making regarding the scaling initiative
Capacity/competency space	Extent to which appropriate capacities and competences can carry the scaling initiative forward
Political space	Extent to which important stakeholders, both those in support and those against, in the intervention can be attended to through outreach and suitable safeguards to ensure political support for a scaling initiative
Cultural space	Extent to which there are cultural obstacles; and extent to which the scaling initiative can be suitably adapted to support responsible scaling in culturally diverse environments
Partnership space	Extent to which partners can be mobilised to coordinate efforts relevant for the initiative effort to scale up
Legitimacy space	Extent to which the scaling initiative has a recognised mandate from relevant stakeholders to guide collaborative efforts (e.g. mandate for multi-stakeholder partnership)

TABLE 8 What creates space (conditions) for responsible scaling? (continued)

Space (conditions) for responsible scaling	Description
Learning space	Extent to which knowledge about what does and does not work in scaling can be harnessed through monitoring and evaluation, knowledge sharing, and training; and extent to which the scaling approach is dynamic and adapts to an evolving process (no blueprint)
Management space	Extent to which there is a match between the scale of management (institutions) and the scale(s) of the (social, economic, and ecological) processes being targeted through the scaling initiative
Facilitation space	Extent to which multi-stakeholder processes relating to the scaling initiative can be facilitated through agents such as brokers, intermediaries, and interlocutors, and whether conducive functions can be put in place such as innovation and scaling platforms, hubs, labs, networks, and alliances

Adapted from IFAD 2011, Gillespie (2004), UNDP 2011, Cummings et al. (2006).

TABLE 9 Responsible scaling involves a team approach to innovation and scaling.

Personas	Description
Learning personas	Constantly gather information from new sources, keep the team from becoming too internally focused, question their own worldview
Organising personas	Savvy about the counterintuitive process of how organisations move ideas forward
Building personas	Apply insights from the learning personas and channel the empowerment from the organising personas to make innovation and scaling happen
Reflecting personas	Probe for deeper understanding about processes, weighing pros and cons with an eye on long-term and out-of-view implications of decision making

Adapted from Kelley (2005).

Conditions for scaling will partly need to be addressed as a dimension of the scaling initiative, but also partly involve capacities for responsible scaling. Table 8 summarises key spaces (conditions) for responsible scaling.

3.2 Individual and team competences

Guiding a scaling initiative requires different competences than managing a pilot or a project (Muilerman and Wigboldus, 2016). Because of the cross-boundary implications and complications, single-discipline expertise will not suffice. A team approach to expertise, experience, and competence is needed in scaling initiatives. This also applies to societal actors in terms of government, NGOs, the private sector, and knowledge institutions (Brouwer and Woodhill 2015). They will often need to act as a team with different roles to play in a scaling initiative. Readiness to engage effectively in scaling initiatives does not come just from subject matter expertise and will often involve new competences and accepting the role of non-scientific knowledge and processes (Polk 2015).

'Far more useful than considering a theory of change to be a "roadmap" is the idea of a "compass for helping us find our way through the fog of complex systems, discovering a path as we go along"'
(Valters 2015: 12, quoting Green 2015).

This will often involve competences in the field of institutional entrepreneurship and networking. There is a need to strengthen partnership and alliance building or, in other words, to scale up partnerships and alliances with associated social capital and social skills (Horton et al. 2009). GEO (2011) highlights the role of networks in scaling processes/network approach to scaling. Learning to become effective in partnership-building and networking is critical in scaling (up) strategies and associated competences. Partnership development and maintenance requires appropriate skills, attitude, and behaviour. For example, what type of partnership, informal, less formal, formal? What dynamics to work with? Partnering roles (e.g. a champion, broker/intermediary, donor, manager, facilitator, promotor). What is the purpose of the partnership and what does this mean for interaction (Tennyson 2005)?

The required expertise, experience, and complications also depend on the way in which the scaling initiative envisions its role in scaling. We discuss this in more detail in the next section when we explore options for scaling strategies.

As discussed in section 2, we need to capitalise on differences rather than playing them against one another. It is helpful to bring in ideas from Kolb (e.g. Kolb 1981) on learning styles and from Belbin on team roles (Belbin 2016) to consider how we can build effective scaling initiative teams (Table 9).

3.3 Being wise in responsible scaling

There will always remain a tension in the 'responsible-ness' of strategies and approaches, or rather a tension between what may be considered as 'responsible' and what as 'responsive'. A president may, for instance, demand quick and visible large-scale roll-out of particular products and/or services. Such pressing political and/or economic realities may call for compromise. Rather than ignoring this, the issue then becomes to what extent a view on responsible scaling may still influence further policy- and decision making, rather than causing the entire perspective on responsible scaling to become side-lined because of insistence on the strict application of certain standards. This relates to considering short-term and long-term agendas in enhancing capabilities and attitudes geared towards responsible scaling.

This can easily lead to opportunism. However, we do not argue that there is no place for normative frameworks and no need for an ethical compass in relation to what may be considered as responsible scaling. Our focus here, however, is on helping to identify relevant dimensions (including ethical) and leaving particular (actor and situation-specific) choices to those working with this guide.

In section 1.3, we discussed tendencies towards reductionism in policy and planning and introduced the theory of modal aspects as a way of alerting researchers and policy/decision makers to such realities. This will, however, involve more than mere scientific assessment. Fundamental qualities, such as equity and sharing, sustainability and resilience, care and service, respect and reverence for life, need to be considered with all faculties that we have at our disposal to inform wise decision making.

4

Informing a ToS

What informs a ToS is the ways in which different types of information can be connected as pieces of a puzzle to create a rich perspective on how the scaling initiative intends to engage in scaling processes and how it expects responsible scaling to happen in relation to the initiative's aspirations. Developing a ToS from an integrative perspective does not mean that a scaling initiative could not focus on just part of a bigger picture. Rather, it implies thinking carefully about positioning and navigating the initiative in a relevant multi-faceted context and in view of relevant anticipated futures.

We suggest a number of iterations to this end (not as a one-way process):

Phase 1: Focus on developing understanding

Scoping: forming a first impression about what a scaling initiative would be about

- A quick-scan study: creating an initial broad-based understanding
- Consolidating a big-picture perspective: prevent no longer seeing the forest for the trees

- A focused in-depth study on selected topics: zoom in on specific topics and issues

Phase 2: Focus on interpretation

- Exploring conditions for responsible scaling
- Considering options for responsible scaling strategies

Phase 3: Framing, consolidating, and communicating the situation-specific ToS

(section 5).

Tweaking existing methods to scaling processes

Rather than devising specific methods and tools for assessing scaling processes, we propose using suitable existing methods and applying those to questions that are specific to scaling processes.

4.1 Scoping

Purpose

Initial low-resolution exploration of what the envisaged scaling initiative relates to. This will help to 1) consider whether it is worth further investigating initial plans and, if so, 2) understand what kind of further analysis and preparation will be needed to develop an appropriate ToS (Figure 10).

Useful methods

Interviews with experts, literature research, discussion meetings/workshops, rich picture, mind maps, consequence mapping.

First of all, it is useful to consider whether the envisaged scaling initiative is closer to push scaling or to pull scaling. This helps distinguish between often quite different categories of scaling initiatives.

Next, the initial exploration is about assessing levels of complexity and potential complications and implications involved. Scaling that does not imply many changes for stakeholders is different than scaling that will cost stakeholders money (e.g. in order to achieve environmental sustainability) or that conflicts with deep-rooted convictions.

FIGURE 10 Choosing appropriate depth of further analysis and preparation on the basis of the scoping assessment.

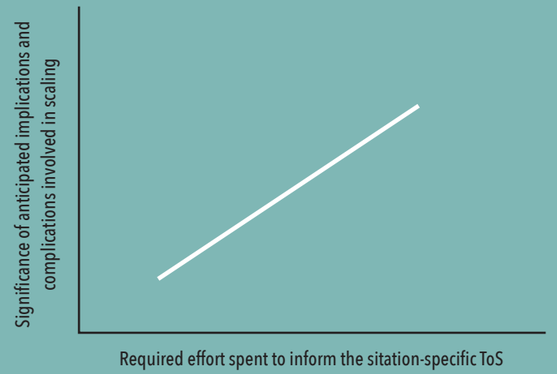


PHOTO 1 Workshop exploring opportunities for transition to sustainable rubber cultivation in SW China.

Asking as many questions as possible is often a good start to explore potential complications and implications, especially if questions are asked that are not commonly asked (see Table 10 for some suggested questions to get a feel for what is involved in the envisaged scaling process).

Another element in the initial exploration could focus on the issue of in-principle scalability. If this is about a scaling initiative that already has a clear idea about what it would like to see going to scale, the exploration can benefit from ideas on scalability (chances that something will go to scale), as a number of authors have suggested. Not every innovation can be easily scaled up, and each innovation should be understood well in terms of what would be involved in making it scalable. Rogers (2003) and later Cooley and Kohl (2006) identified a number of variables in relation to scalability of innovations (see Tables 11 and 12).

This may be further elaborated on from a pull scaling perspective (Table 13).

Finally, initial ideas on potential scaling mechanisms may be explored. This is about identifying means that help innovations to go to scale. This is where silver bullets are often sought, such as extension services, innovation platforms, farmer field schools, campaigns, marketing, and so on. Each type of scaling mechanism will spell out specific potential implications and complications for the envisaged scaling initiative.

The initial scoping will lead to a decision regarding how deeply and broadly further analysis needs to go (Figure 10) to appropriately inform a situation-specific ToS. This can, of course, be very much a political choice, for which reason the initial scoping needs to be based on more than one perspective and more than one source of information.

TABLE 10 Brainstorming possible questions to sensitise stakeholders as to what makes for responsible scaling.

What exactly is meant by going to scale and how do we expect this to happen?
In unpacking the scaling process, what are all the specific interactive scaling processes involved in seeing the core innovation going to scale? For example, to see new crop varieties going to scale, what else needs to scale up or down? Or in scaling down food loss or food waste, what would need to be scaled up?
Why would it be plausible to expect that the innovation would go to scale given the characteristics of the area and the expected users of the innovation?
What could be anticipated if this goes to scale, at different scale levels? For example, if 100 farmers practised this, what would happen? And if 10,000 practised this, what then?
How would this interact with past, current, and future other scaling processes (trends)? Includes ideas about path dependence
What domains of change affect, and could be affected by, the scaling processes?
What capacities and competences are needed to 1) plan for responsible scaling in view of the above and 2) monitor and manage processes relating to scaling the initiative responsibly?

TABLE 11 Scalability as in-principle scalability.

Scalability in terms of could this in principle be used/applied more widely. The chance of an innovation going to scale increases if the innovation is:
Feasible, in terms of working
Credible, based on sound evidence or espoused by respected persons or institutions
Observable, potential users can see the result in practice; this may involve trialling (on a limited basis)
Easy to transfer and adopt, relating to simplicity and ease of use
Able to be tested or tried without committing the potential user to complete adoption when results have not yet been seen
Suitable for reinvention in terms of modification/adaptation to create ownership and fit-for-purpose

4.2 A broad-based quick-scan study

Purpose

An integrative analysis looking right through the range of aspects, cross-scale, cross-domain, and other complex dynamics will in most cases be impossible to do as an in-depth study. A quick-scan exploratory analysis is meant to provide a low-resolution integrative perspective on complexities that are relevant for the scaling initiative. It can also help identify what does require deeper analysis.

Useful methods

Rich picture, semi-structured interviews, literature research, multi-stakeholder analysis, other rapid appraisal methods, including horizon scanning (foresight analysis). This element resembles the rapid appraisal methodologies.

Scalability from a responsible scaling perspective

Will the good that comes out of an innovation persist when it is used more (and more), by more and other actors, and in more/other geographic locations, under different social (political), economic, and/or environmental conditions?

The initial literature scan and the interactions with informants could then be compared systematically, using outlines such as Tables 14 and 15, to create an initial impression of how scaling could happen and what would need to be navigated in the process (more suggested questions in Annex 2 and Annex 3).

We used this approach in a study on scaling green rubber cultivation practice in Southwest China (Wigboldus et al. submitted). We used the framework of the theory of modal aspects (Table 4) to structure the quick scan in terms of:

- focusing the literature study so as to identify how the relevant range of factors and related dynamics affects opportunities for making rubber cultivation environmentally friendly;
- considering how stakeholders relate to particular aspects and deciding whose perspectives and roles would be particularly important to take into account;
- developing a semi-structured questionnaire in relation to pertinent issues and asking a range of informants to score pertinent issues (relating to the aspects) in terms of relevance, of what locks into current rubber cultivation practice, and of what creates opportunities for change (Figure 11). Results were expressed in a spider diagram to create an overview and allow for

TABLE 12 Scalability in view of conditions for scaling.

The chance of an innovation going to scale increases if the innovation:
Is relevant for addressing persistent or sharply felt problems
Has a relative advantage over existing practices
Is compatible with existing users' established values, norms, and facilities, not requiring big changes in existing practices
Is enabled by conducive communication (networks, peer-to-peer)

TABLE 13 Scalability when system innovation aspirations are meant to induce 1) matching innovations and 2) matching scaling of those innovations (see Figure 5).

What attracts innovations that match aspired future system conditions? The following are suggested dimensions of scalability from this perspective:
Clear and actionable visions and aspired conditions
Appropriate spaces for scaling (including incentives)
Appropriate capacity to innovate
Appropriate response to societal concerns and interests
Appropriate ways of assessing the match between emerging innovations and aspired conditions

TABLE 14 Systematically scanning (potential) implications of an envisaged scaling initiative.

Modal aspect	Possible related categories	Related actor/ stakeholder motivations/ incentives, issues, conflicts, opportunities relevant to the scaling initiative	Related policy drivers/agendas, and institutions relevant to the scaling initiative and in what way	Related system complications or opportunities relevant to the scaling initiative	Other focus areas (e.g. aspects of potential complication if scaling happens)
Numeric	Sheer numbers	.....	.....	.....	.....
Spatial	Location, geography	.....	.....	.....	.....
Kinematic	Movement, transport	.....	.....	.....	.....
Physical	Built environment	.....	.....	.....	.....
Biotic	Biodiversity, health	.....	.....	.....	.....
Sensitive	Awareness, feelings	.....	.....	.....	.....
Analytic	Education, research	.....	.....	.....	.....
Formative	Technologies	.....	.....	.....	.....
Lingual	Communication	.....	.....	.....	.....
Social	Relationships, culture	.....	.....	.....	.....
Economic	Resource management	.....	.....	.....	.....
Aesthetic	Attraction, appeal	.....	.....	.....	.....
Juridical	Regulatory frameworks	.....	.....	.....	.....
Ethical	Solidarity, sharing	.....	.....	.....	.....
Certitudinal	Mind sets, worldviews, religion	.....	.....	.....	.....

quick comparison. Informants provided scoring in relation to the different aspects in terms of the extent to which these represented issues that limited opportunities for scaling green rubber practice, or which, on the contrary, provided opportunities for change (Figure 12).

This quick-scan approach allowed for combining a (low-resolution) view on specific topics with an integrative systems perspective. Providing such an overview to informants also served as a facilitation tool to help them consider the interrelatedness of issues, concerns, and opportunities from a bigger-picture perspective. Combining scores created a quick overview on commonalities and differences in perspectives on what would be involved in seeing green rubber practice go to scale.

In a workshop setting, we used a soft systems methodology (rich picture) in interactive stakeholder processes to reflect on the integrated nature of issues. This resulted in an initial overview to consider what would need to be addressed and how, and who would need to be involved in what way if the objective was to see environmentally friendly rubber practice going to scale.

4.3 Consolidating a big-picture perspective

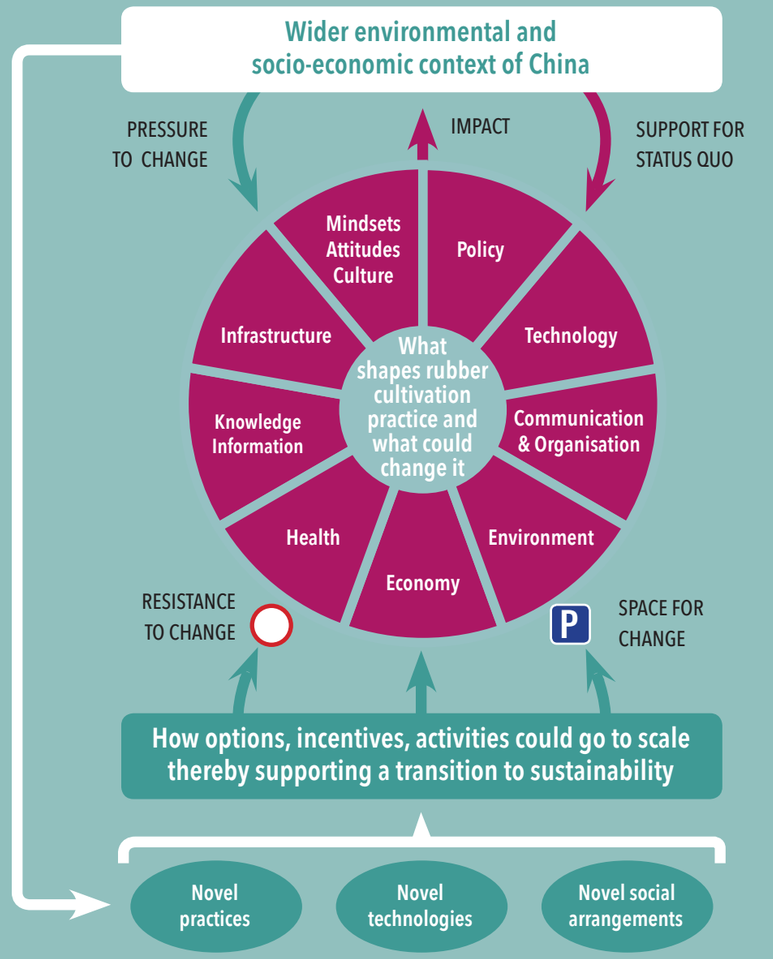
In section 1.4, we discussed the role of metaphors and analogies to communicate about scaling processes (illustrated through examples in Table 5 and Figure 4). This may also be useful in the process of communicating about a big-picture perspective.

Essentially, this element is about creating an overview after having scanned a range of topics and issues to be able to move from divergence (in terms of analysis) to convergence (towards options for action). This will also help in considering what is important to understand better through in-depth study.

TABLE 15 **Exploring initial ideas regarding what would be involved in a scaling initiative.**

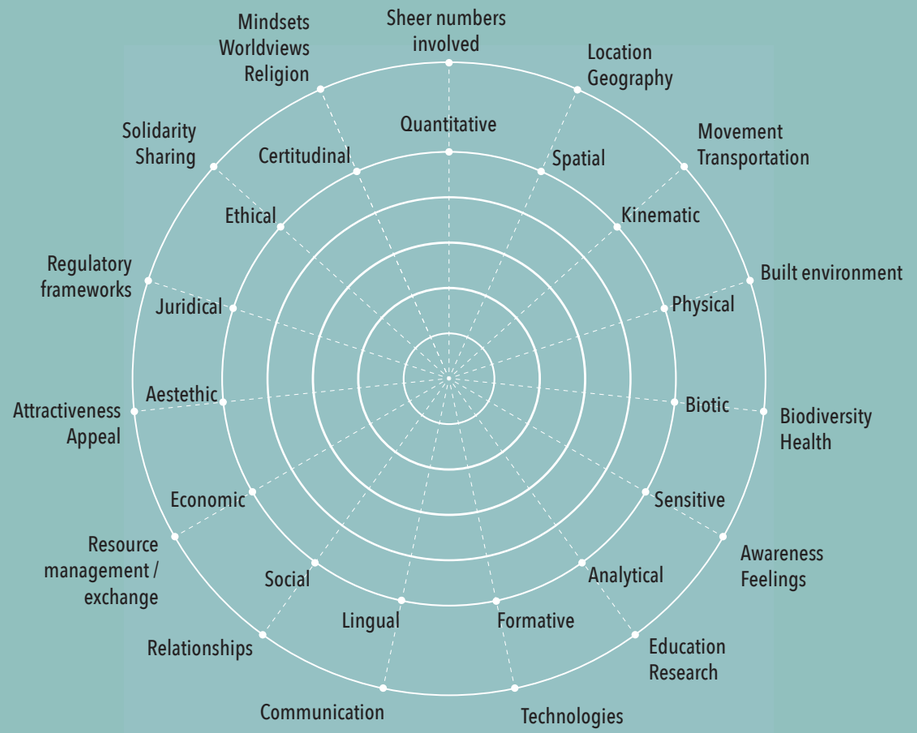
Dimensions to consider	Scaling strategy design questions	Possible implication for scaling strategy
Original benefits	What were the benefits resulting from the innovation in the original setting?	.....
Original context	What were the context characteristics in which the innovation flourished?	.....
Original process leading to innovation	What are the characteristics of the process leading up to the innovation?	.....
Essence of innovation	What is the essence of the innovation? What are the core feature(s) that make people call it innovation? On what key context factors does this innovation depend for its existence and its positive effect?	.....
Purpose of scaling	What is the essential reason for considering scaling this innovation?	.....
Target space for and context of scaling	What are the characteristics of the space for, and context in which, the innovation is projected to be scaled to?	.....
Type of scaling / scaling mechanism	What type of scaling process in envisaged?	.....
Capacities for scaling	What capacities will be required to take this innovation to the proposed scale and how can they be put in place?	.....
Resources for scaling	Which resources will be required to take this innovation to the proposed scale and how will these be secured?	.....
Desirability of scaling	What stakeholder perspectives are known regarding the desirability of the scaling process?	.....
Risk of negative scaling effects	What potential negative effects/side-effects of the scaling process may be anticipated?	.....
Anticipated realistic reach of scaling	What is the anticipated realistic reach of the scaling process until it will be stopped by systemic constraints?	.....
Potential of impact through scaling	Comparing the type of innovation and type of scaling process with the aspired impact to be realised as a result, how plausible is a causal relationship?	.....
Level of process control	To what extent will a scaling process depend on emergence and to what extent could it be steered?	.....
Extent of benefit sharing	Who is expected to benefit exactly and in what way? How does that translate in terms of power relations, distribution of benefits, and addressing whose agendas/ interests?	.....
Adaptability in scaling	What is the range of flexibility in terms of adaptive scaling that would lead to variations in what goes to scale?	.....
Innovation readiness	In the case of a pull scaling approach: how ready is society/the relevant sector(s) to generate innovations and scale these up to align with system innovation aspirations?	.....

FIGURE 11 Integrative assessment leading to implications for scaling green rubber cultivation practice.



Emerging from e.g. farmer initiatives, research and development, government policies

FIGURE 12 Converting the modal aspects to appropriate categories to be used in assessment.



Purpose

Follow up on the quick-scan study, start to structure understanding about what to take into account in developing a situation-specific ToS. The focus is not on developing detail but on developing an initial overview (to be revisited after in-depth analysis).

Useful methods

Rich picture or CATWOE (soft systems analysis); development of metaphor-based narratives in relation to the connection between innovation and scaling; the multi-level perspective as reference framework; historical analysis (e.g. literature research on history of issues); stakeholder exploratory workshop.

The multi-level perspective (MLP) on sociotechnical innovations (Geels 2002) is one useful way of creating a big-picture perspective on the envisaged scaling initiative. In Wigboldus et al. (2016), we explored the application of MLP in the context of scaling processes (see Figure 11).

The following elements may be explored:

- What are the dominant traits of the relevant system in which the innovation is meant to get a place? To what does this relate in terms of institutions, actors, power differences, and so forth? What does this imply for the scaling initiative?
- What room is there be for the innovation? How easy/difficult will it be for it to find a significant place in the relevant system?
- Who are important actors/stakeholders and what are their (differences in) core motivations, perspectives, perceptions, interests, identities?
- What wider societal and natural conditions may affect, or may be affected by, the scaling initiative?
- What is the relevant history of system characteristics and stakeholder relationships?
- What space for change is there and what may help unlock such change?
- And so forth.

4.4 A focused in-depth study on selected topics

Purpose

The quick-scan will have highlighted topics of particular importance that require deeper study (Table 16 and Figure 13). This element is about following up on such issues.

Useful methods

Surveys on specific topics, individual interviews, facilitated focus group discussion, specific multi-stakeholder analysis, partnership analysis, risk/uncertainty analysis, (participatory) modelling, scenario/foresight analysis, process tracing.

Digging deeper into selected topic areas relates to question such as the following: What crops dominate markets and what farmer preferences, ecological conditions, policies, and wider institutional conditions are involved in this? What exactly shapes the dominant way in which the agrifood system is oriented and operating? What exactly are the drivers, motivations, issues, negative implications, and where is there space for changing or unlocking this system configuration (internal or external)?

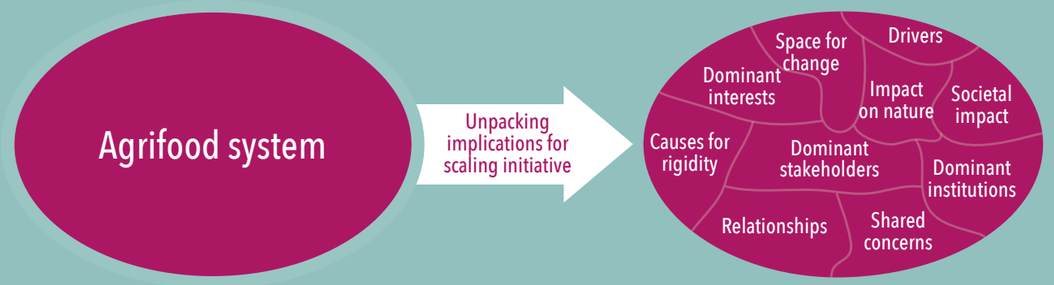
An important part of our research on scaling agro-ecological practice in Nicaragua involved household surveys to understand better why farmers opted for particular modes of agricultural practice. The same frameworks that guided the scoping and quick-scan can be used to select issues and topics that require more in-depth assessment.

One of the central concerns in scaling initiatives is that it is difficult to anticipate implications across boundaries of time, domains of change, ecological conditions (and possibly related carrying capacities), geography, scale levels, administrative levels, and institutional conditions. This includes effects resulting from scaling processes in one (agri)food system on another (agri)food system.

TABLE 16 An illustration of what is meant by zooming in on selected subject matter in the in-depth study.

Modal aspects	Focus questions				
Q					
Sp					
K			Deepen		
P					Deepen
B			Deepen		
Se					
A					
F					
L	Deepen				
So					
E		Deepen			
Ae					
J				Deepen	
E					
C				Deepen	

FIGURE 13 Deepening understanding about system configurations.



For example, the scaling of Dutch agricultural production relied heavily on fodder and other input production in other countries. This may be phrased as one (agri) food system creating a food-print in another. Scenario analysis can help explore such (potential) implications in three ways (based on Börjeson et al. 2005):

Predictive scenarios

In the light of anticipated conditions, what will happen if this goes to scale?

Normative scenarios

What should happen if the scaling initiative is to connect effectively to defined aspirations in the future?

Explorative scenarios

What can happen in terms of plausible futures if the scaling initiative navigates relevant factors and anticipated dynamics? This is closely related to the core idea underpinning a theory of change (scaling).

Findings emerging from this element will be used to update the initial understanding, which was based on the quick-scan study. The steps from scoping to the in-depth study will have created understanding about dimensions and dynamics that the scaling initiative would need to navigate, and this will lead to initial ideas on how this could be approached. The next steps are to explore what capacities and conditions would facilitate such navigating (4.5) and to consolidate an appropriate strategy for engaging with the envisaged scaling process (4.6).

4.5 Exploring capacities and conditions for responsible scaling

Purpose

Consideration of what current and anticipated conditions for scaling would need to be navigated as scaling initiative and what appropriate capacities and competences would be needed to do so (illustrated in Table 17).

Useful methods

Institutional and organisational analysis, capacity assessment (for example based on the 5-Capabilities framework), sense-making, and planning workshop based on gathered information.

This step follows up on what we discussed in section 3. It concerns assessment of what would make for being ready to engage effectively and responsibly in relevant scaling processes. There are two aspects to this: 1) arriving at conclusions on relevant conditions that will need to be navigated (Table 17) and 2) arriving at conclusions on the type of capacities and competences that the scaling initiative will need to have at its disposal for effective and responsible navigation of such conditions.

In section 3, we discussed the need to adopt a team approach in scaling initiatives and to consider what different competences would be needed as compared to managing innovation and pilot projects. A scaling initiative may be about cropping systems, but that does not necessarily mean that a scaling initiative would need to rely only or heavily on crop experts. The relevant type of spaces that will need to be navigated will provide a good idea about the type of expertise and competences needed.

Competences and expertise are two different things. Some agronomists are very good networkers, and some anthropologists may not have strong communication skills. We found in our research (Muilerman and Wigboldus, 2016) that institutional entrepreneurship plays a key role in successful scaling initiatives. A team approach as discussed in section 3 (see for example Table 9) will cater to the diverse needs of scaling initiatives.

4.6 Considering options for a responsible scaling strategy

Purpose

This is what all the analysis and interpretations should lead to: now what? How best to shape this scaling initiative considering all that we have discussed and explored?

Useful method

Sense-making workshop based on gathered information. Parallel thinking (e.g. de Bono's six thinking hats), force-field analysis, role play, scenario thinking, and so on.

A first step would be to summarise the key implications of the earlier stages of informing the ToS. What is important is to think outside the box here. We already pointed to the difference between a more direct approach (push scaling) and a more indirect approach (pull scaling), but there are more ways to distinguish between possible ways to engage in scaling processes than realised at first.

Table 18 looks at this from the perspective of the type of scaling process envisaged. Table 19 explores possible scaling strategies. A more elaborate overview can be found in Annex 4, and Figure 16 provides an illustration of two different strategic approaches. Often, a combination of strategies will be appropriate. This may also relate to playing different roles over time and to different roles being played by different actors (stakeholders) in the scaling initiative.

Different strategies have different implications and therefore also involve different levels of risk. Push scaling may be considered to involve the biggest risk levels as it does not 'go with the flow'. Consequently, it may fail or have undesirable effects when innovations reach a certain scale level. At the same time, push scaling may sometimes be the only way to see something going to scale that is considered to enhance value for society and nature. A Theory of

TABLE 17 Assessing conditions for responsible scaling.

	Concern	No concern	Implications
Fiscal/financial space	.....	.....	.....
Natural resource/environmental space	.....	.....	.....
Social space	.....	.....	.....
Institutions/policy space	.....	.....	.....
Analytical space	.....	.....	.....
Capacity/competency space	.....	.....	.....
Political space	.....	.....	.....
Cultural space	.....	.....	.....
Partnership space	.....	.....	.....
Legitimacy space	.....	.....	.....
Learning space	.....	.....	.....
Management space	.....	.....	.....
Facilitation space	.....	.....	.....

TABLE 18 Ways of engaging in scaling processes.

Changing a particular scale dimension (e.g. more/less use of a certain tool, technology, or practice, system)
Connecting scaling processes at different dimensions (e.g. more production of crop and better access to markets)
Fine-tuning (optimising) scaling processes of different dimensions (e.g. better access to food, but in such a way that it does not increase problems of obesity (utilisation))

TABLE 19 A typology of strategies for engaging with scaling processes.

Strategy orientation	Example	The purpose served	Potential problematic
Control scaling processes – direct approach: making things go to scale			
Solution oriented	The scaling-up of use of a novel product, process, or practice because of their inherent qualities	Make 'solution' generate benefits beyond initial application	Narrow focus (take-it-or-leave-it effect)
Goal oriented	A sector innovation process involving the scaling up/down of the use of particular products, processes, and practices to comply with new sector orientations	Scale up lower-level compliance (e.g. reduction in pesticide use) towards higher-level objectives (e.g. transition to sustainability)	Compliance requirements (blueprint effects)
Catalyse scaling processes – indirect approach: helping things go to scale			
Choice oriented	Providing baskets of options relating to a particular principle of success (e.g. nitrogen fixation)	Enhance opportunities for appropriate match with variety of conditions and preferences	Complicates extension and dissemination; more expensive
Condition oriented	Scaling down tariffs or taxes and/or increasing subsidies to trigger the scaling up/down of the use of products, processes, and practices, or media campaigns that raise awareness about issues relating to sustainability	Create conditions that allow for a variety of scaling processes while still complying with general objectives	Not always sure it will trigger desired scaling (imprecise instrument)
Create conditions for scaling – undirected approach: seeing things go to scale			
Knowledge oriented	Improving access to knowledge about a wide variety of e.g. agricultural technologies; education is a more long-term, even a more general, approach	Provide a menu of options and opportunities to match a wide variety of conditions and preferences	Difficult to provide specific guidance; uncertain outcomes
Process oriented	Facilitating collaborative stakeholder processes (such as through brokering and intermediation) with unknown outcomes in terms of what will go to scale	Facilitate opportunities for convergence of efforts so that shared-vision-related scaling will effectively happen	Open process with possibly unanticipated outcomes

FIGURE 14 Assessing space for scaling in light of the scaling strategy approach.

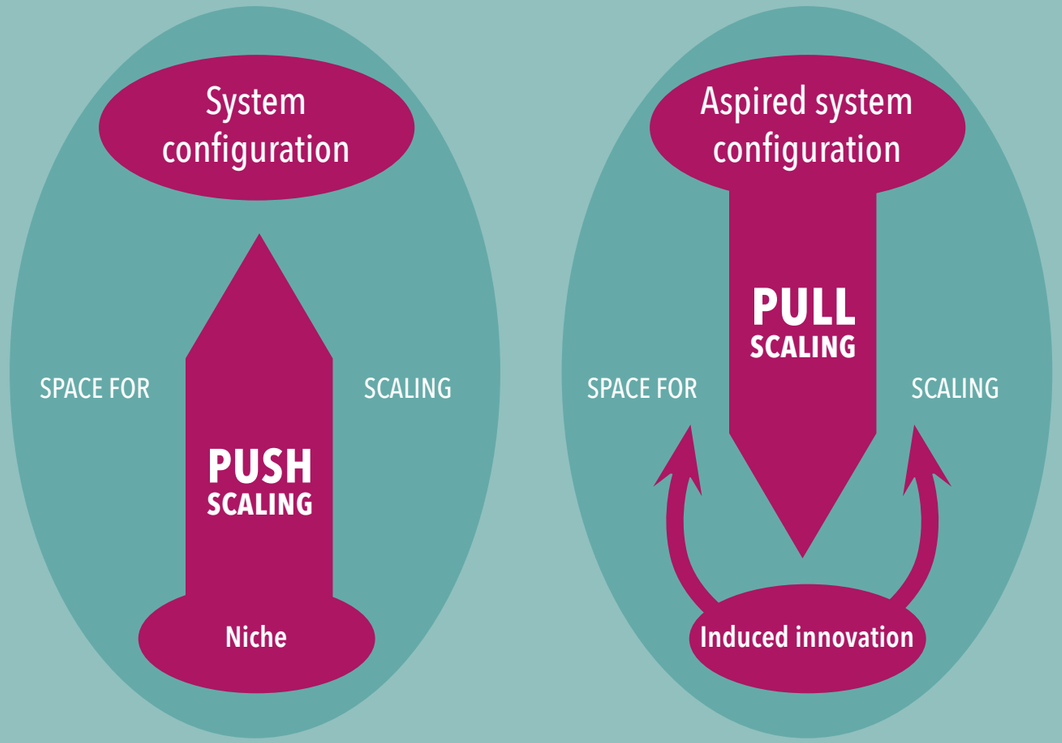
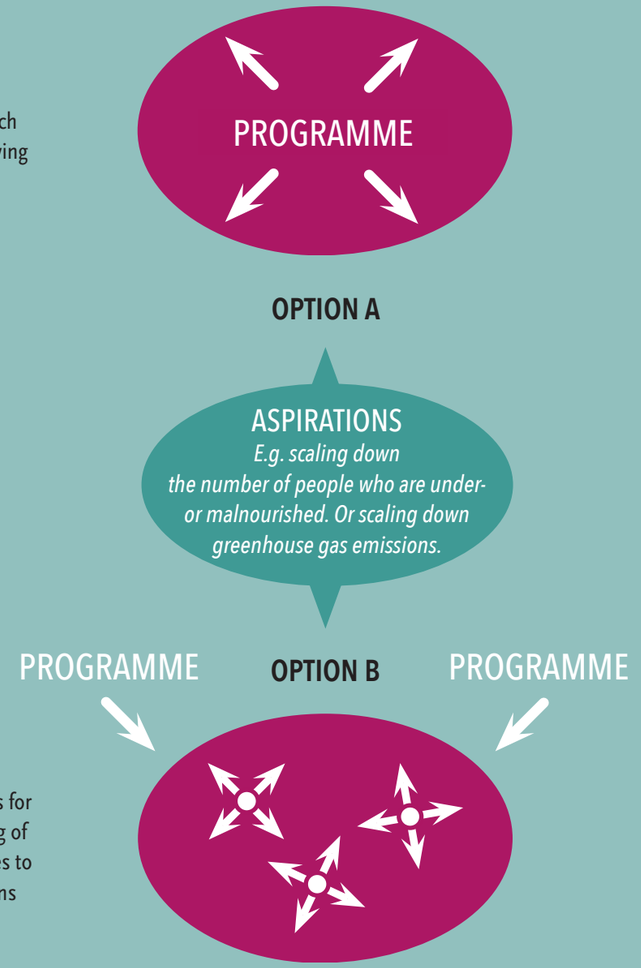


FIGURE 15 Simplified illustration of two types of scaling strategies.

Approach A
Scaling up that which contributes to achieving aspirations



Approach B
Improving conditions for self-propelled scaling of that which contributes to achieving aspirations

Scaling will therefore include considerations regarding what makes the most sense in a particular situation, but with awareness of the potential implications of opting for a particular route.

This process does not just affect scaling strategies. The type of scaling strategies adopted may affect even the way in which related innovation processes are designed and implemented. The innovation process set-up needs to anticipate subsequent (hoped-for) scaling processes and related scaling strategies. It may lead to a change of plan. For example, it may be concluded that, rather than releasing all sorts of innovations and trying to get those to scale, it would be more strategic to influence policymaking to create an environment that will work as a magnet for appropriate technologies. Or a combination of these two approaches could be chosen.

Key message

There are many more options for engaging with scaling processes than just finding out 'what works' and doing more of the same.

This means that it would be even better to think in terms of a theory of innovation and scaling in agrifood systems and not to separate questions regarding how scaling can/should happen from questions regarding how innovation can/should happen.

5

Framing, consolidating, and communicating a ToS

Framing a ToS is about structuring a process to develop a situation-specific Theory of Scaling and how to consolidate this in a visual and/or written format to summarise and communicate its essence. A ToS framework connects ideas on change agents, change factors, and change conditions (such as explored in section 4) towards a strategic perspective on how change – in this case, scaling – can happen.

5.1 ToS as process

As is the case with theories of change, ToS is first of all a way of creating a platform to carefully consider options for engaging in scaling processes. This also involves facilitation of needed input from stakeholders (Figure 16). It will at least include being informed by those perspectives, and sometimes it

FIGURE 16 Deciding on appropriate roles in the process of informing, framing, and consolidating a situation-specific ToS.

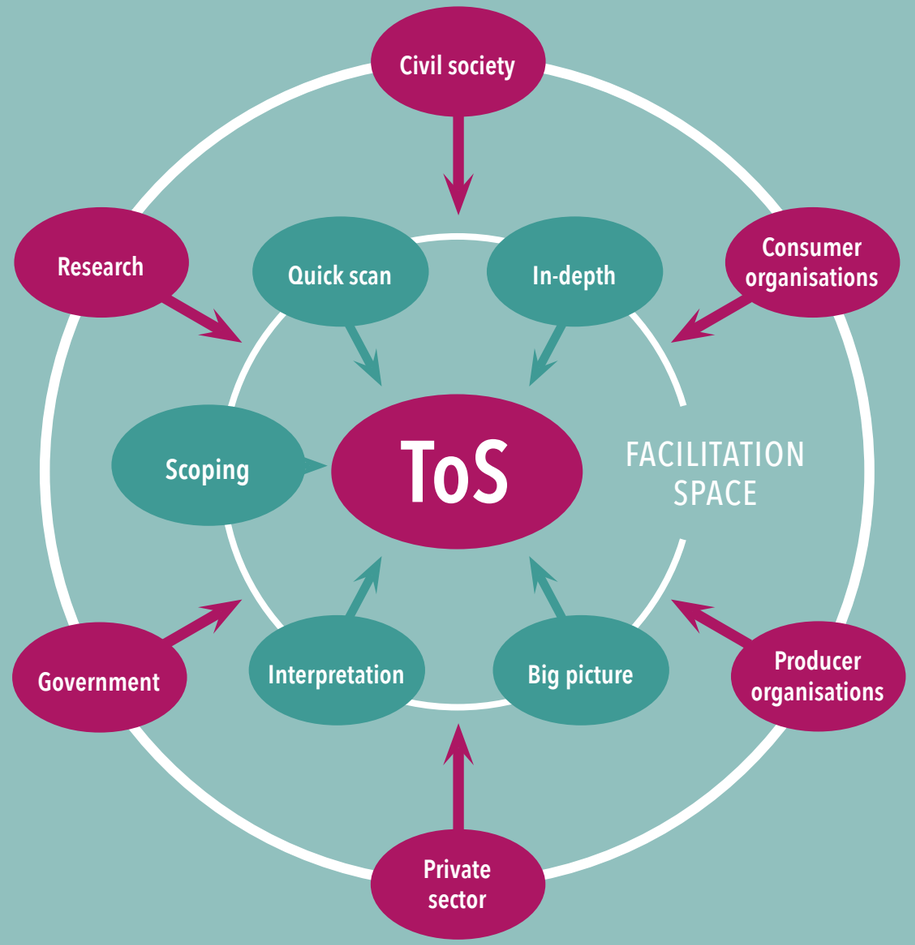
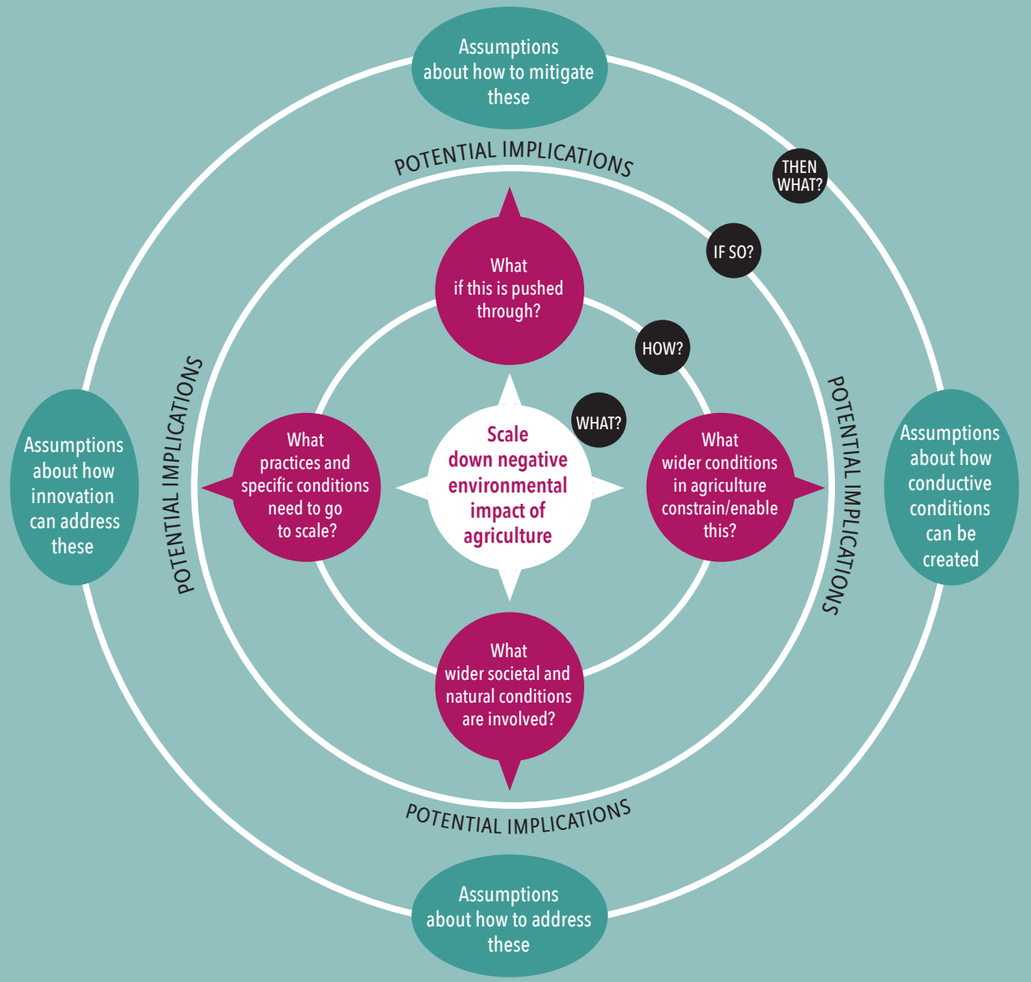


FIGURE 17 Dimensions and iterations in ToS development.



will require engaging particular stakeholders actively in the process. It allows for discussing what would be possible, plausible, preferable, and practical, making assumptions underpinning envisaged pathways to scale explicit, and thereby enabling stakeholders to start better prepared and more ready to engage effectively and responsibly in the scaling process. A core element of the articulation process is asking questions and asking more questions, not just to find answers, but also to get in touch with how much we do and do not know about what is relevant for the scaling initiative (Figure 17).

This means that the way in which this articulation process is facilitated is at least as important as the actual tools for analysis and framing the ToS. Articulating a theory of change – in this case, of scaling – resembles the way in which scenario thinking is meant to take place: rather than 'doing the tool', taking time to think, discuss, and try to make sense of available information: thinking backwards, thinking outwards, thinking and imagining forwards. Specific tools such as the methods suggested in section 4 are first of all a way of creating a platform for interactively exploring things in a structured way that may lead to a rethinking of original ideas about envisaged scaling processes. Metaphors and analogies help create useful images for envisaged scaling processes to create a common language that is less dependent on difficult concepts with potentially hidden meanings or at least different interpretations.

Framing a ToS therefore requires facilitation support to guide stepwise interactive processes so that it will not be based on just a few consultants putting the ToS together. This involves making a choice of processes and methods that suit the defined purpose. Depending on what is needed and what is feasible, such process can be more or less encompassing.

5.2 ToS as framework

For several reasons, it is useful to create some kind of framework to bring together, in one overview, the different elements that feed into a ToS. It allows for considering how the different types of information and perspectives on the scaling initiative relate to one another, as if putting pieces of a puzzle together to form one coherent picture of how scaling could happen and what would make it responsible. Figure 18 illustrates this combination of exploring several perspectives on ToS and the iterations of questions that finally lead to decisions on how to engage and with whom (also see Annex 5). Somehow this needs to be summarised in clusters of understanding and clusters of planning elements. Figure 20 is an example of how a ToS process can be consolidated. There are, however, many ways in which to do this, in the same way as we see many different ways in which theories of change have been articulated. The format chosen should be clear for key stakeholders.

5.3 Communicating a ToS

A ToS may be visualised in many ways. We may use examples from how theories of change have been articulated. In the past, it used to be done in the form of logic models. Today, more artistic presentations are common, which articulate only a number of key elements that characterise the (organisation's or network's) approach to how change is expected to happen through attractive visuals. Koopmanchap and Schaap (2013) provide a range of options for visualising a theory of change, which applies in the same way as a Theory of Scaling.

We advise being careful with visualisations based on abstract logic. The same applies to theories of change. An abstract logic, such as an objective tree, requires good conceptual thinking skills. Some stakeholders may not be able to relate to it for that reason. It is more natural to think and plan in

FIGURE 18 Developing a ToS in the form of a 'ToS Canvas'.

Key partners in scaling	Key scaling strategies/activities	Value proposition for scaling	Key scaling spaces/ conditions	Stakeholders'/ beneficiaries' connection
	Key capacity for scaling		Scaling mechanisms	
Scaling support structure	Key risk and uncertainty monitoring and safeguards		Scaling purpose (aspired impact) and related key indicators	

Adapted from Osterwalder and Pigneur, 2010, and Blank (2016).

FIGURE 19 A simplified illustration of the difference between articulating a Theory of Scaling as abstract logic (e.g. from inputs to impact) and as unfolding process over time and in geographic space. Both are needed.

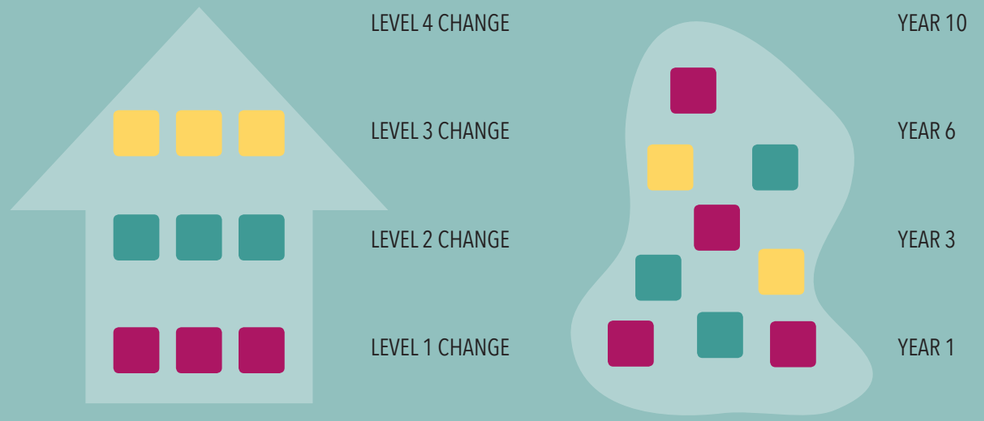
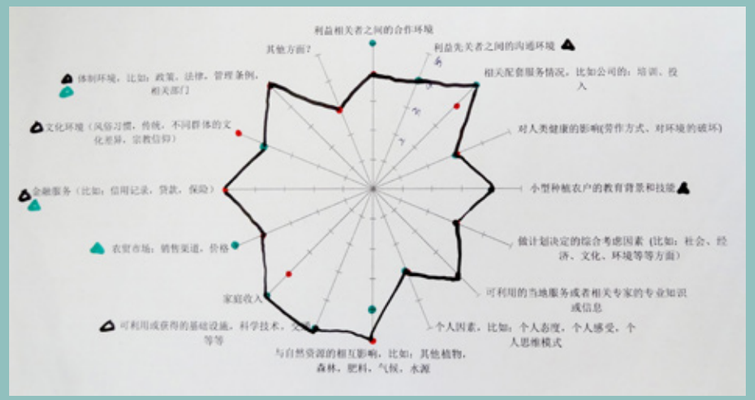


PHOTO 2 Multi-stakeholders workshop output: a scoring sheet related to making a transition to sustainable rubber cultivation in SW China.



a time perspective, which is what everyone does: what will I do today?, what will I do tomorrow?, and so on. This helps to create more powerful images of how change may unfold over time. Complications in underlying logics and assumptions will also be more easily detectable (see Figure 19).

Apart from communicating the situation-specific ToS in a visualised format, a short narrative that puts in words what is in the picture (see Figure 18) will further enhance communication. Such big-picture outlines may be translated to scaling checklists: things to which particular attention should be paid as the scaling initiative unfolds.

Visual and narrative communication about the ToS (if developed as a collaborative effort) will help being and staying together in the scaling initiative as partners and stakeholders and will be the basis for further strategic design and guidance. It will also serve as the big-picture strategic framework that can be translated towards strategic and operational management implications and updated in the same way as we update software on GPS systems to allow for navigation in the light of up-to-date information and understanding.

PART 3
Theory of Scaling application

6

Using a ToS

This guidance document may be used in different ways. In the first place, it may provide material for developing a workshop programme to train people to articulate a Theory of Scaling to enhance readiness for guiding scaling initiatives, or for general sensitisation of decision makers regarding what needs to be taken into account in scaling initiatives. We may also consider that scaling processes require a specific type of expertise. Given that we have experts on monitoring and evaluation, why not also train coaches and advisors in the field of 'responsible scaling'? Training workshops may be tailored to this purpose.

Secondly, and we focus on this in the rest of this section, it can serve as complementary guidance in the design and management of initiatives involving a scaling ambition. In the following, we briefly discuss four possible ways of using this document for such complementary guidance. In essence, this relates to three key ways of using a ToS:

- ToS as a way of **thinking** about scaling
- ToS as a (facilitated) **process** to position scaling initiatives

- ToS as a consolidated (updateable) **product** that reflects core orientations and informs strategic guidance (including M&E) of a scaling initiative.

6.1 Using ToS as policymakers and donors

Many policymakers are actively involved in scaling processes without being aware of this

Many policymakers are actively involved in scaling initiatives without even considering themselves to be involved. They may not be pushing certain scaling processes, but they will often be creating conditions for particular things to go to scale or rather to scale down. Hence, they may also benefit from a ToS approach in their own practice.

First of all, policymakers engage in scaling processes more than is often realised. The indirect or pull approach to scaling is about creating conditions so that particular innovations and particular practices will go to scale. Policymakers create specific areas of attraction and discouragement. As a result, certain things go to scale and others do not.

This makes many policymakers active actors in scaling initiatives, and they may not have looked at themselves in this way. Policymakers for whom this is the case would do well to consider how they could articulate a Theory of Scaling for their efforts to steer what should and what should not go to scale. The suggestions in the following sections for use of a ToS may therefore be as relevant to them as to implementers of programmes and partnerships.

Secondly, donors will often need to decide on investments in initiatives that involve a serious scaling ambition. If appliers and partners are better able to articulate how they think scaling will happen, why that would be a good thing, and as a result would be able to better prepare themselves to engage effectively and responsibly, this would enhance the chance of the initiative indeed leading to aspired change and scaling (see Table 20 for suggested questions for assessment).

It is already quite common practice to ask for the articulation of theories of change in applications for funding for change initiatives. For those initiatives that include a serious scaling ambition, an articulated Theory of Scaling could be requested as part of a wider theory of change for the initiative. This would involve indications of how the anticipated scaling informs (if applicable) innovation

TABLE 20 Assessment of readiness for responsible scaling.

Design phase
Extent to which there is a clear vision on what value addition is aspired to through a process of scaling up
Extent to which there is a clear view on the kernel of (aspired) success (stripped of its specific 'packaging')
Extent to which possible 'variations on the (success) theme' have been explored/developed
Extent to which there is a clear connection to relevant stakeholder perspectives and energies
Extent to which envisaged application contexts and futures are sufficiently clear and related to conditions for success
Extent to which assumptions underpinning the Theory of Scaling have been articulated
Change process phase
Extent to which variability in relation to core success factors is enhanced (e.g. through baskets of options)
Extent to which stakeholder connections are being facilitated effectively towards convergence
Extent to which this is effectively a shared effort (collaborative scaling) of key actors/stakeholders
Extent to which original assumptions underpinning the Theory of Scaling prove to be correct
Extent to which pathways to scale are adapted based on new insights
Evaluation phase
Extent to which available choice of options aligns with (prospective) user preferences
Extent to which access to options for scaling has improved
Extent to which use of tailored options/variations on common theme has expanded/improved
Extent to which value addition is agreed upon by key stakeholders

and partnership processes that are intended to be the stepping stone towards scaling.

Finally, as stated in this guide, for scaling to become effective and responsible, a range of conditions for scaling play a role. One of those roles is that of policymakers and donors in terms of allowing realistic time frames, capacities, budgets, and policy frameworks in support of the aspired scaling. A well thought-out ToS will need to be matched with appropriate support in order for it to be the basis for strategic action.

6.2 Using ToS in the design of scaling initiatives

The primary purpose of developing a situation-specific ToS is to be better prepared for engaging effectively and responsibly in scaling processes. Usually, scaling is an element in a wider innovation and scaling initiative. This means a theory of change that is broader than only a Theory of Scaling will be needed. The following zooms in on the ToS aspect. It will need to be integrated in that wider theory of change for the initiative.

Part one and section 3 of this guidance document may inform discussions during the initial sketching of the envisaged scaling initiative.

Section 4 can then be used to guide the process of bringing together relevant information on the basis of which a ToS can be framed. This may also be part of an inception phase.

Section 5 can be used as a reference for developing a plan to develop a ToS in relation to the envisaged scaling initiative; this will require some research and other preparations.

Finally, section 4, particularly the capacity and strategy elements, can guide the development of specific plans in relation to engaging in (innovation and) scaling processes.

6.3 Using ToS in the strategic guidance of scaling initiatives

This application builds on the use of ToS in the design phase. As is often the case with theories of change in general, translating it into useful input for guidance can be challenging. Often, the scaling process will be part of a wider innovation and scaling initiative. Hence, the following would need to be integrated in a wider framework for strategic guidance.

What unlocks the value of ToS for strategic guidance is first of all the articulation of relevant questions about the envisaged scaling processes. This requires the conversion of all relevant assumptions about the envisaged scaling process into questions that can be monitored, such as:

- Assumed realisation of outputs, outcomes, and impact building up towards responsible scaling (how will we – in a timely way – know this is happening?)
- Assumed causal relationships leading to responsible scaling (how will we – in a timely way – find out whether change happens in the way that we thought it would?)
- Assumed conducive (context) conditions/institutions for responsible scaling, specifically (how will we – in a timely way – know the extent to which required conducive conditions/institutions are a reality?)
- Assumed actor relationships, roles, and capacities/competences (how will we – in a timely way – know whether actors are able to play/are playing their role as envisaged?)
- Assumed relevant wider trends and developments and related uncertainties (how will we – in a timely way – know the extent to which the future unfolds in the way we anticipated?).

A participatory approach involving relevant stakeholders in identifying strategic questions will allow for addressing questions that matter. An initial exploration will lead to a long list of questions from which a short list of to-be-monitored questions will be selected for strategic monitoring of the scaling initiative. The next steps follow good practice in M&E:

- Questions lead to articulated information needs (the information needed to answer the questions);
- Articulated information needs (which may be converted to indicators) lead to a choice of methods and processes to be used for obtaining such information;
- A choice of methods leads to operational plans to implement those methods to gather, process, and communicate findings to inform stakeholders and to inform management decision making;
- Again, involving relevant stakeholders in appropriate ways in such strategic monitoring will enhance effectiveness.

Training (responsible) scaling experts

A Theory of Scaling is meant to enhance readiness to engage effectively and responsibly with scaling processes by supporting four core functions of scaling initiatives: anticipation, inclusiveness, responsiveness, and reflexivity.

It would be good to build up competences more systematically in this field. This booklet may serve as a start for developing an outline of a curriculum for training and education in the field of responsible scaling of agrifood innovations.

6.4 Using ToS in the (ex-post) evaluation of scaling initiatives

Throughout this document, we have provided a range of categories for assessing what a scaling initiative is anticipating (evidenced in the articulated Theory of Scaling). These categories can also be used to evaluate a scaling initiative ex-post. We did so in a retrospective study of an initiative that aimed to scale up the application of cocoa farmer field schools in Cameroon (Muilerman and Wigboldus 2016). This helped to elicit more findings on what exactly had gone wrong and what could be learned from this, particularly in the field of capacities and conditions for scaling.

Middleton et al. (2002) have worked with a number of research questions in relation to scaling-up processes. They clustered questions around seven dimensions on which we have further elaborated:

1. **Methodology and process**
   What did the scaling initiative look like, how was it planned, and so on? How did this help or undermine related processes?

2. **Time perspective**
   When was the scaling initiative initiated, what were critical decision points in time, and so on? How did this help or undermine related processes?

3. **Spatial/geographic**
   What was the geographical/biophysical context, who was involved there, and so on? How did it help or undermine related processes?

4. **Institutional/organisational**
   What was the institutional and social context like, what was the policy context, and so on? How did this help or undermine related processes?

5. **Technological**
   What exactly was being scaled up and what adaptations were made, and so on? How did this help or undermine related processes?

6. **Economic**
   What costs were involved and what benefits realised, what resources were needed, and so on? How did this help or undermine related processes?

7. **Equity**
   Were benefits distributed between stakeholder groups, and so on? How did this help or undermine related processes?

Obviously, if a good ToS is articulated for the scaling initiative, the initiative will be so much easier to evaluate.

7

Discussion and conclusion

In this document, we introduce an approach to scaling in the context of agrifood systems, which we call a Theory of Scaling (ToS). It is based on the following eight building blocks.

A view on:

- Responsible (innovation and) scaling
- Creating systemic perspectives on scaling
- The application of theory-of-change thinking to the context of scaling processes
- A team approach to what makes for 'responsible-ness'
- Conditions and competences that allow or do not allow for responsible scaling
- Informing a ToS
- Articulating, framing, and communicating a ToS
- Using a ToS.

A ToS is meant to enhance readiness to engage effectively and responsibly with scaling processes by supporting four core functions of scaling initiatives:

anticipation, inclusiveness, responsiveness, and reflexivity. It would be good to build up competences more systematically in this field. This booklet may serve as a start for developing an outline of a curriculum for training and education in the field of responsible scaling of agrifood innovations.

This guidance document is our first attempt to apply theory-of-change thinking to the specific conditions and processes involved in scaling. The purpose is to provide a structured approach to enriching perspectives on what scaling initiatives need to take into account in order to support effective and responsible scaling of innovations. We have done so with a particular eye on conditions relating to agrifood systems, although it may also be applied more widely. Initial application of elements of ToS (not the full approach) provided input on application options.

A theory of scaling is meant to be about more than a group of experts devising 'pathways to scale'.

It is, however, a first step and work in progress, providing material for further development and improvement. Additional fine-tuning and field application will be needed to turn this into an approach that is sound and offers sufficient guidance and illustrations of field application. This booklet is not just meant to provide guidance; it also draws attention to the potential of articulating theories of scaling in order to be better prepared for engaging in scaling processes. With all its limitations, we therefore hope that this document whets the appetite for taking this approach to a next level or for developing alternative approaches to taking scaling processes seriously in the context of innovations in agrifood systems.

As we approach scaling initiatives from an integrated perspective on innovation and scaling processes, we could have articulated more the broader view on what we may call a theory of innovation and scaling, which would include a view on a theory of innovation (how we think innovation happens). As a start, we have focused here on a Theory of Scaling, but such an integrated perspective would do more justice to the interrelatedness of innovation and scaling.

This guidance document cannot work as a standalone product and requires the use of methods and processes such as multi-stakeholder processes and various forms of research, which are not further explained here. Guidance on, for example, facilitating multi-stakeholder processes, capacity development, theories of change, and foresight analysis is readily available through other sources, and we see no need to repeat what others have carefully laid out already. Readers are of course free to mix and adapt materials according to what matches specific requirements or preferences. We are open to advice, to helpful suggestions, as well as to partnering with those who would like to use this guide in the development of training workshops, or in the actual application in design, strategic design, and/or evaluation of actual scaling initiatives.

References

Altieri, MA, Toledo VM (2011). The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty and empowering peasants. In: *Journal of Peasant Studies* 38(3):587-612

Basden A (2013). kgsvr.net/dooy/aspects.html. Accessed 2 November 2016

Bebbington A (1999). Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty. In: *World Development* 27(12):2021-2044

Belbin (2016). www.belbin.com/about/belbin-team-roles. Accessed 7 November 2016.

Bindraban PS, Rabbinge R (2012). Megatrends in agriculture. Views for discontinuities in past and future developments. In: *Global Food Security* 1(2):99-105

Blank S (2016). Blog: www.huffingtonpost.com/steve-blank/the-mission-model-canvas_b_9298440.html. Accessed 21 November 2016

Bloom G, Ainsworth P (2010). *Beyond scaling up: pathways to universal access to health services.* STEPS Working Paper 40, Brighton: STEPS Centre

Börjeson L, Höjer M, Dreborg KH, Ekvall T, Finnveden G (2005). T*owards a user's guide to scenarios. A report on scenario types and scenario techniques.* Stockholm: Royal Institute of Technology.

Brandon P, Lombardi P (2011). *Evaluating sustainable development in the built environment* (2nd edition). Chichester, UK: Wiley-Blackwell

Brouwer H, Woodhill J (2015). *The MSP guide. How to design and facilitate multi-stakeholder partnerships.* Wageningen, The Netherlands: Centre for Development Innovation, Wageningen UR

Checkland P, Scholes J (1999). *Soft systems methodology in action.* Chichester, UK: Wiley

Coe R, Sinclair F, Barrios E (2014). Scaling up agroforestry requires research 'in' rather than 'for' development. In: *Current Opinion in Environmental Sustainability* 6:73-77

Cohen J, Easterly W (2009). *What works in development? Thinking big and thinking*

small. Washington, DC: The Brookings Institution
Cooley L, Kohl R (2006). *Scaling up. From vision to large-scale change.* Washington, DC: Management Systems International (MSI)
Cumming GS, Cumming DHM, Redman CL (2006). Scale mismatches in social-ecological systems: causes, consequences, and solutions. In: *Ecology and Society* 11(1):14. www.ecologyandsociety.org/vol11/iss1/art14/
FAO (2014). *Building a common vision for sustainable food and agriculture.* Rome: Food and Agriculture Organization
Garb Y, Friedlander L (2014). From transfer to translation: using systemic understandings of technology to understand drip irrigation uptake. In: *Agricultural Systems* 128:13-24
Gee D, Grandjean P, Hansen SF et al., (eds) (2013). *Late lessons from early warnings: science, precaution, innovation*. EEA Report 1(2013). Copenhagen: European Environment Agency
Geels FW (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. In: *Research Policy* 31:1257-1274
GEO (2011). *How do networks support scale? Reframing the conversation: a GEO briefing paper series on growing social impact.* Washington, DC: Grantmakers for Effective Organizations
German L, Mowo J, Kingamkono M (2006). A methodology for tracking the 'fate' of technological interventions in agriculture. In: *Agriculture and Human Values* 23:353-369
Gerring J (2009). *Causal mechanisms: Yes, but .... Extended version.* Boston, MA: Department of Political Science, Boston University. www.scribd.com/document/255007284/Gerring-2009-Causal-Mechanisms-Yes-But-Extended
Ghiron L, Shillingi L, Kabiswa C et al. (2014). Beginning with sustainable scale up in mind: initial results from a population, health and environment project in East Africa. In: *Reproductive Health Matters* 22:84-92
Giller KE, Franke AC, Abaidoo RT et al. (2013). N2Africa. Putting nitrogen fixation to work for smallholder farmers in Africa. In: Vanlauwe B, Van Asten P, Blomme G (eds.), *Agro-ecological intensification of agricultural systems in the African highlands.* London: Routledge, pp. 156-175
Gillespie S (2004). *Scaling up community-driven development: a synthesis of experience.* FCND Discussion Paper 181. Washington, DC: IFPRI
Green, D. (2015). *Where have we got to on theories of change? Passing fad or paradigm shift?' From poverty to power blog*, 16 April, oxfamblogs.org/fp2p/where-have-we-got-to-on-theories-of-change-passingfad-or-paradigm-shift/
Horton D, Prain G, Thiele G (2009). *Perspectives on partnership: a literature review.* Social Sciences Working Paper 2009-3. Lima: International Potato Center (CIP)
Hounkonnou D, Kossoud D, Kuypere TW et al. (2012). An innovation systems approach to institutional change: smallholder development in West Africa. In: *Agricultural Systems* 108(5):74-83
IFAD (2011). Section XXI: guidelines for scaling up. Updated guidelines and source book for preparation and implementation of a results-based country strategic opportunities programme (RB-COSOP). Volume 1: *Guidelines, International Fund for Agricultural Development.* www.ifad.org/documents/10180/546394d5-d8e7-475c-84db-34b9341602cf
iPES (2015). *IPES-Food: 10 principles to guide the transition to sustainable food systems.* Louvain-la-Neuve, Belgium: International Panel of Experts on Sustainable Food Systems (iPES)
Jiggins J (2012). Diagnostic research in support of innovation. In: *NJAS, Wageningen Journal of Life Sciences* 60-63(0):115-121
Kelley T (2005). *The ten faces of innovation. Strategies for heightening creativity.* London: Profile Books
Kolb DA (1981). Learning styles and disciplinary differences. In: A. Chickering (Ed.), *The modern American college.* San Francisco: Jossey-Bass: 232-255
Koopmanschap E, Schaap M (2013). *ToC reflection notes 4: visualising your theory of change: a must?* www.theoryofchange.nl/sites/default/files/resource/tocrelfectionnote4-visualisingyourtoc.pdf. Accessed 2 November 2016
Krznaric R (2007). *How change happens.* Oxford, UK: Oxfam
Linn JF, (Ed.) (2012). *Scaling up in agriculture, rural development, and nutrition.* Washington, DC: IFPRI

Meadows DA (2009). *Thinking in systems: a primer.* Edited by Diana Wright. London: Earthscan
Menter, H, Kaaria S, Johnson N, Ashby J (2004). Scaling up. In: Pachico D, Fujisaka S (eds), *Scaling up and out: achieving widespread impact through agricultural research.* Cali, Colombia: International Centre for Tropical Agriculture (CIAT), pp. 9-23
Middleton T, de la Fuente T, Ellis-Jones J (2005). Scaling up successful pilot experiences in natural resource management. Lessons from Bolivia. In: Stocking M, Helleman H, White R (eds.), *Renewable natural resources management for mountain communities.* Kathmandu, Nepal: ICIMOD, pp. 221-238
Minang PA, Duguma LA, Alemagi D, van Noordwijk M (2015). Scale considerations in landscape approaches. In: Minang PA et al. (eds.), *Climate-smart landscapes: multifunctionality in practice.* Nairobi, Kenya: World Agroforestry Centre (ICRAF), pp. 121-133
Muilerman S, Wigboldus S (2016). *Scaling and institutionalization within agricultural innovation systems. The case of farmer field schools on cocoa in Cameroon.* Unpublished manuscript.
Osterwalder A, Pigneur Y (2010). *Business Model Generation*. Hoboken NJ: John Wiley & Sons, Inc.
PBL (2012). Nederland verbeeld. *Een andere blik op vraagstukken rond de leefomgeving.* The Hague: Planbureau voor de Leefomgeving (Netherlands Environmental Agency)
Polk M (2015). Transdisciplinary co-production: designing and testing a transdisciplinary research framework for societal problem solving. In: *Future* 65:110-122
Rogers EM (2003). *Diffusion of innovations* (5th edition). New York: Free Press
Schut M, van Paassen A, Leeuwis C, Klerkx L (2014). Towards dynamic research configurations: a framework for reflection on the contribution of research to policy and innovation processes. In: *Science and Public Policy* 41:207-218
Schut M, Florin MJ (2015). The policy and practice of sustainable biofuels: between global frameworks and local heterogeneity. The case of food security in Mozambique. In: *Biomass and Bioenergy* 72:123-135
Searchinger T, Hanson C, Ranganathan J et al. (2013). *Creating a sustainable food future. A menu of solutions to sustainably feed more than 9 billion people by 2050.* Washington, DC: World Resources Institute (WRI)
Stein D, Valters C (2012). *Understanding theory of change in international development.* London: The Justice and Security Research Programme, London School of Economics and Political Science
Stilgoe J, Owen R, McNaghten P (2013). Developing a framework for responsible innovation. In: *Research Policy* 42:1568-1580
Stirling A (2011). Pluralising progress: from integrative transitions to transformative diversity. In: *Environmental Innovation and Societal Transitions* 1:82-88
Tennyson R (2005). *The brokering guidebook. Navigating effective sustainable development partnerships.* The International Business Leaders Forum
UNDP (2011). Scaling up integrated local development innovations. United Nations Development Programme. file:///C:/Users/User/Downloads/ScalingUp%20report_web2011n.pdf
Valters C (2015). *Time for a radical approach to learning in development.* Brighton: IDS
West GB, Brown JH (2004). Life's universal scaling laws. In: *Physics Today* 57(9): 26-42
Wigboldus S, Leeuwis C (2013). *Towards responsible scaling up and out in agricultural development. An exploration of concepts and principles.* Wageningen, The Netherlands: Centre for Development Innovation & Knowledge, Technology and Innovation group, Wageningen University and Research
Wigboldus S, Klerkx L, Leeuwis C, Schut M, Muilerman S, Jochemsen H (2016). Systemic perspectives on scaling agricultural innovations. A review. In: *Agronomy for Sustainable Development* 36:46. doi:10.1007/s13593-016-0380-z
Wigboldus S, Hammond J, Xu J, Yi, ZF, He J, Leeuwis C (submitted). *Scaling green rubber cultivation in South West China – an integrative analysis of stakeholder perspectives*
Wilbanks TJ (2002). Geographic scaling issues in integrated assessments of

climate change. In: *Integrated Assessment* 3(2-3):100-114
Wilson D, Wilson K, Harvey C, (eds.) (2011). *Small farmers, big change. Scaling up impacts in smallholder agriculture.* Oxford, UK: Practical Action Publishing and Oxfam GB

ANNEXES

ANNEX 1 **Creating systemic perspectives on scaling in the context of agrifood systems.**

	Types of scaling processes | increasing complexity of scaling →				
Types of focus of scaling	Hierarchy of aspects of entities	**Quantitative** (numbers)	**Spatial** (area/size)	**Kinematic** (speed/interaction)	**Physical** (scope, level, connections, energetic capacity)
Types of focus of scaling	**Quantitative** (discrete amount)	Towards more/fewer numbers	Towards numbers more/less spread in space	Towards faster/slower movement of numbers	Towards more encompassing numbers
Types of focus of scaling	**Spatial** (continuous space – shape, distance)	Towards more/fewer spaces	Towards spaces more/less distant	Towards faster/slower movement of spaces	Towards more encompassing spaces
Types of focus of scaling	**Kinematic** (movement)	Towards more/fewer movements	Towards movements more/less spread in space	Towards faster/slower frequencies	Towards more/less encompassing movements
Types of focus of scaling	**Physical** (energy, mass, forces)	Towards more/fewer things/ energy	Towards things becoming more/less spread geographically	Towards faster/slower or more/less frequent presence/movement of things	Towards more/less encompassing things/energy
Types of focus of scaling	**Biotic**(expressed in life forms and their vitality)	Towards more/fewer people, animals, plants, etc.	Towards biodiversity hotspots expanding or reducing in (geographic) space	Towards faster/slower or more/less frequent presence/movement of people	Towards more/less encompassing biodiversity
Types of focus of scaling	**Sensitive** (expressed in e.g. awareness, health, physical and mental abilities, disposition, safety)	Towards more/fewer people aware	Towards awareness becoming more/less spread geographically	Towards faster/slower or more/less frequent (emergence of) awareness	Towards more/less encompassing awareness
Types of focus of scaling	**Analytical** (expressed in e.g. knowledge, logic, analysis)	Towards more/fewer knowledge products	Towards knowledge products becoming more/less spread geographically	Towards faster/slower or more/less frequent knowledge product generation	Towards more/less encompassing knowledge products
Types of focus of scaling	**Formative** (expressed in e.g. construction, skill, technology, innovation)	Towards more/fewer events, more/fewer technologies	Towards events or use of technologies becoming more/less spread geographically	Towards technologies or events created faster/more slowly or more/ less frequently	Towards more/less encompassing creative acts
Types of focus of scaling	**Lingual** (expressed in e.g. language, information, communication)	Towards more/fewer communications	Towards communications becoming more/ less spread geographically	Towards faster/slower or more/less frequent communications	Towards more/less encompassing communications

ANNEX 1 Creating systemic perspectives on scaling in the context of agrifood systems (continued).

	Types of scaling processes | increasing complexity of scaling →				
Types of focus of scaling	Hierarchy of aspects of entities	**Quantitative** (numbers)	**Spatial** (area/size)	**Kinematic** (speed/interaction)	**Physical** (scope, level, connections, energetic capacity)
Types of focus of scaling	**Social** (expressed in e.g. relationships, roles, competition)	Towards more/fewer social interactions	Towards social interactions becoming more/less spread geographically	Towards faster/slower or more/less frequent interactions	Towards more/less encompassing interactions
	Economic (expressed in e.g. resource management, care, conservation)	Towards more/fewer signs of (careful) resource management	Towards (careful) resource management becoming more/less spread geographically	Towards faster/slower or more/less frequent occurrences of (careful) resource management	Towards more/less encompassing (careful) resource management
	Aesthetic (expressed in e.g. appeal, enjoyment, art)	Towards more/fewer signs of coherence, harmony	Towards signs of coherence, harmony becoming more/less spread geographically	Towards faster/slower or more/less frequent appearance of signs of coherence, harmony	Towards more/less encompassing coherence, harmony
	Juridical (relates to e.g. rights, policy, legal system, mandate, the state)	Towards more/fewer rights, responsibilities	Towards rights, responsibilities becoming more/less spread geographically	Towards faster/slower or more/less frequent applications of rights and responsibilities	Towards more/less encompassing rights and responsibilities
	Ethical (expressed in e.g. attitude, care, sharing, integrity, solidarity)	Towards more/fewer expressions of love, generosity	Towards expressions of love, generosity becoming more/less spread geographically	Towards faster/slower or more/less frequent expressions of love, generosity	Towards more/less encompassing expressions of love and generosity
	Certitudinal (expressed in e.g. identity, belief, trust, vision, worldview)	Towards more/fewer commitments	Towards commitments becoming more/less spread geographically	Towards faster/slower or more/less frequent commitments	Towards more/less encompassing commitments

Based on Dooyeweerd's theory of modal aspects of experienced reality, e.g. see Brandon and Lombardi (2011).

ANNEX 2 Informing a ToS from a systemic and systematic perspective.

Creating a systemic and systematic perspective

	Where are (potential) cross-scale and cross-domain effects located?	What histories matter and how?	Where is potential for change located?	Where is practice/ system inertia/ lock-in located?	Where are dominance and deviance located?	What are relevant context aspects and dynamics?	Where are important drivers of decision making located?	Where are stakeholder interests, power, etc. located?	What are relevant trends; what if this goes to scale?	Where is a match and where is incompatibility between system characteristics and potential innovations located?
Quantitative	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Spatial	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kinematic	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Physical	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Biotic	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Analytical	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Formative	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lingual	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Social	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Economic	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aesthetical	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Juridical	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ethical	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Certitudinal	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ANNEX 3 **Systematically scanning (potential) implications of an envisaged scaling initiative.**

Modal aspect	Possible related categories	Relevant scientific disciplines	Relevant types of innovation, e.g.	Potential stakeholder roles
Numeric	One, several, many; more and less	Mathematics, statistics		.....
Spatial	Here, there, between, around, inside, outside	Geometry, topology, (geography)		.....
Kinematic	Flowing and going; change	Dynamics, kinematics		.....
Physical	Forces, energy, matter	Physics, chemistry, geology	Technical innovation	.....
Biotic	Biodiversity, health	Biology, botany	Biological innovation	.....
Sensitive	Feeling, responding	Psychology (zoology)	Behavioural innovation	.....
Analytic	Conceptualising, clarifying, categorising (research, education)	Logics, analytics	Research innovation	.....
Formative	Deliberate creative shaping of things (innovation, technologies)	Design sciences, histology	Technological innovation	.....
Lingual	Expressing, recording, interpreting (communication)	Linguistics	Communicative innovation	.....
Social	Relating, agreeing, appointing	Sociology, organisational sciences	Social innovation	.....
Economic	Resource management	Economics, management sciences	Economic innovation	.....
Aesthetic	Attraction, appeal, enjoying, playing	Aesthetics	Artistic innovation	.....
Juridical	Structures of policy and legality	Legal science	Legal innovation	.....
Ethical	Solidarity, sharing	Ethics	Moral innovation	.....
Certitudinal	Mind sets, worldviews, religion	Theology, philosophy	Ideological innovation	.....

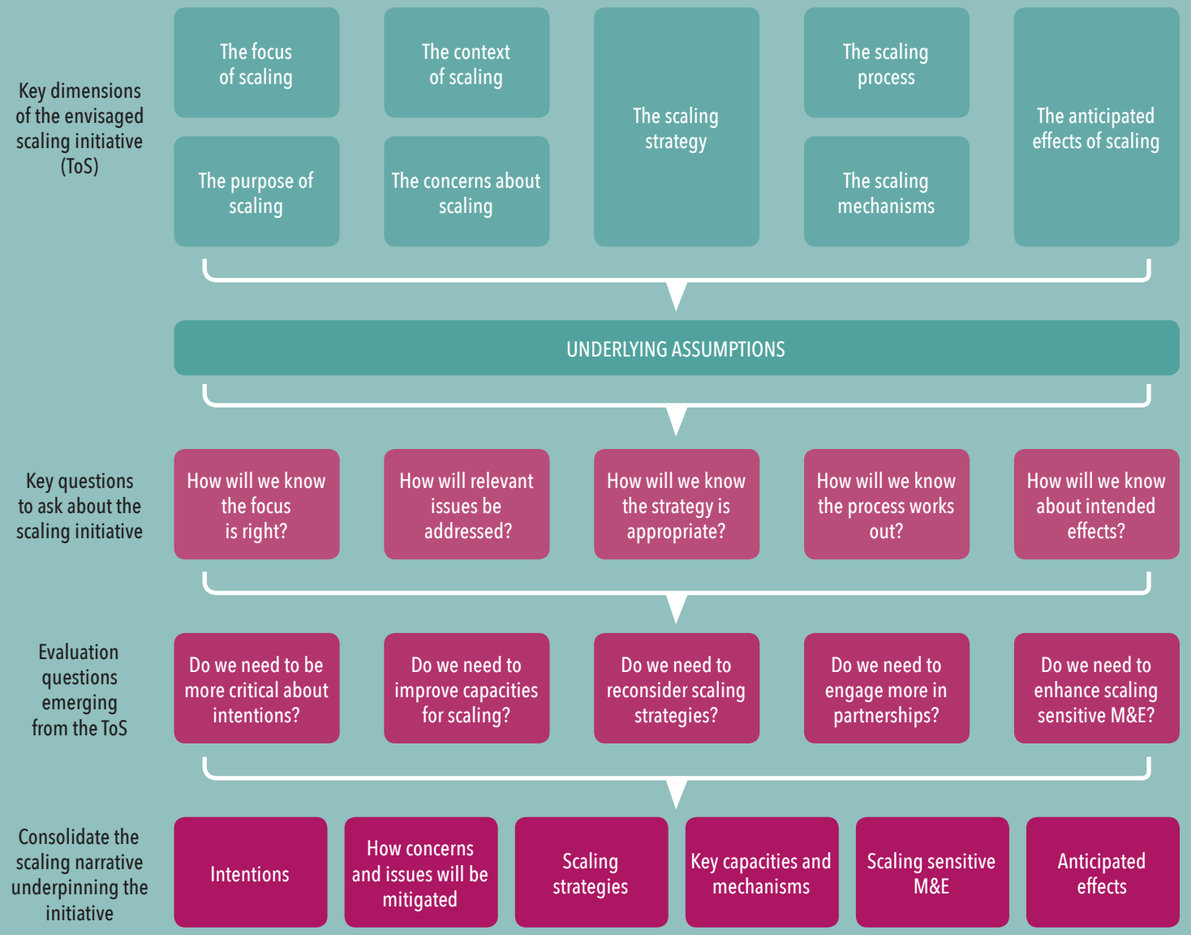
ANNEX 4 Diverse options for engaging in scaling processes

Type of scaling strategy	Metaphor	Focus of scaling process	Example	What makes it particularly attractive?	What are particular potentially undesirable implications?
Focus on specific innovations (seeking to control scaling processes)					
Pushing	Wrestler	Trying to make certain products or practices go to scale through a variety of targeted efforts (creating conditions for scaling).	A project has identified a particular hybrid crop with desirable characteristics as holding a potential for wider application; a variety of efforts are put in place to make this wider application happen (i.e. go to scale).	Makes use of a clear potential.	Tunnel-vision on selected products/practices.
Lubricating	Incubator	Creating a niche environment in which innovation may prove itself and then go to scale (or not).	A particular poultry breeding system may have a potential for wider application. It is, however, quite different from current systems and it is not sure whether it would work.	Allows for testing the ground.	Often the piloting does not lead to learning about 'what if this goes to scale' but only about the innovation itself.
Focus on specific innovation (seeking to influence scaling processes)					
Selling	Salesperson	Through promotion, publicity, or even propaganda entice people to start making use of certain products or services.	A company launches an advertising campaign to sell new farm equipment.	Rather than pushing, relies more on the convincing power of the product/service itself.	Persuading people to use products and services without consideration of wider systemic factors.
Sharing	Advisor	Generating options and waiting to see what is picked up and goes to scale.	An experimental farm or on-farm trial trying out different crops and crop varieties, with an open mind regarding what may be used for wider application and what not.	Letting scaling depend on farmer perspectives on the quality of the specific innovation.	Such laissez-faire attitude may lead to unnecessary investments in generating options, and scaling often requires more than just presenting.

ANNEX 4 Diverse options for engaging in scaling processes (continued).

Type of scaling strategy	Metaphor	Focus of scaling process	Example	What makes it particularly attractive?	What are particular potentially undesirable implications?
Focus on system innovation (seeking to direct scaling processes)					
Creating attraction	Magnet	Creating possibilities for scaling of not specifically predefined innovations. Creating band-width that attracts particular innovations only.	A government wants to see pesticide use reduced. This requires a variety of changes in the agricultural sector. The government provides subsidies on biological pest control, changes legislation on permissible residue on crops, and in other ways creates an environment that is conducive to reducing pesticide use. As a result, actors in the agricultural sector start to scale up a variety of new products and practices.	Connecting to a bigger innovation purpose. Creates room for a more 'organic' selection of what goes to scale and what does not.	The intended effect of policies or subsidies is not a sure thing; they may in fact trigger undesirable effects.
Proposing	Waiter in restaurant (taking order)	Providing options (all linking to the same innovation purpose) for scaling and finding out which of the options go to scale.	Use of baskets of options in terms of particular crops and/or crop varieties, allowing for choice and variability.	Connecting to a bigger innovation purpose. Creates room and freedom for specific choice and thus enhances ownership feeling that stimulates scaling.	The basket of options may not trigger a (desired) response if the focus of the related innovation purpose is too narrow.
Focus on system innovation (seeking to facilitate scaling processes)				Focus on system innovation (seeking to facilitate scaling processes)	
Aggregating	Rugby team (or any other team sport)	Connecting and taking up role as part of a network or alliance to work on multiple scaling processes relating to one goal.	Taking on a big issue such a nutrition through a partnership or platform such as SUN and GAIN.	Interactive fine-tuning of contributions to a range of needed scaling processes.	Difficult to manage, slow.
Enabling	Trainer	Enhancing (scaling) capacities for innovation and scaling – wait to see what goes to scale.	Efforts focusing on (agricultural) innovation capacity, where we would argue that it should focus on innovation and scaling capacity and on capacity for responsible innovation and scaling.	Works from the other side – making more possible in terms of both innovation and scaling.	Uncertain what will emerge out of such process.

ANNEX 5 **Developing a framework for articulating a ToS.**



This booklet is part of a series of legacy products of the CGIAR Research Program on Integrated Systems for the Humid Tropics (Humidtropics). It structures key findings from earlier research towards an approach that connects a theory of change perspective specifically to the question of 'how scaling happens'. By doing so, it offers a way of thinking systemically and systematically about how scaling happens and could happen in the context of agrifood systems.

Over the years, monitoring and evaluation (M&E) became so important that M&E experts were trained to support related processes. Scaling processes are both considered extremely important in the context of agrifood system innovation and relate to a multifaceted picture of dimensions and dynamics. Maybe it is therefore time to start training experts in the field of responsible scaling to advise and support scaling initiatives. If so, this booklet may provide initial ideas on how to strengthen capacity in this field through a curriculum along the lines of a Theory of Scaling.

WAGENINGEN
UNIVERSITY & RESEARCH

CGIAR
RESEARCH PROGRAM ON
Integrated Systems for the Humid Tropics